

# CONTROLLED POST CARD SURVEYS IN OHIO

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## SYNOPSIS

The controlled post-card method, as pioneered in Ohio, lacks some refinements of the comprehensive home interview method of making internal origin and destination traffic surveys. However, it does supply adequate data for most Highway and Street Planning needs and produces a much larger sample in a minimum of time, at a very low cost.

Its use is limited to those states having vehicle registration procedures which permit segregation of vehicle registration data by political sub-divisions or business-machine card records which can make such selection.

This method is in its infancy, compared to other methods, and it is felt that there is considerable opportunity to improve techniques and procedures to effect additional economies in time and money if other states will join in the experimental development of this type of survey. The States of Indiana and West Virginia are complimented for having done pioneer work in this field.

The primary purpose of an origin and destination study of any area is to gain a knowledge of traffic movements within, through, into, and out of the area as a guide in developing traffic arteries and other transportation facilities to their greatest efficiency at a minimum of cost.

The counting of traffic passing given points has long been recognized as inadequate (although important) in solving traffic problems. The trip movements of these vehicles must be known to arrive at a knowledge of the transportation facility needs of the area. The most practical way to obtain this information is from the vehicle drivers.

Various methods have been tried from time to time to accomplish this objective, with varying degrees of success. Some examples are:

1. School Survey in which selected samples of school children are asked to have questionnaires filled out by their parents.
2. Worker's Survey in which workers, at selected industrial plants are interviewed or asked to fill out questionnaires.
3. Driver Interview Surveys in which drivers are stopped and questioned at selected origin and destination stations within the survey area.
4. Parker's Survey in which parkers are interviewed as they leave or return to their parked cars.
5. Multiple-Cordon Survey in which concentric cordon circles are established in the area and drivers are stopped and questioned or given questionnaire cards as they cross a cordon line.
6. Home Interview Surveys in which residents are interviewed in their own homes.

Through years of development of internal origin and destination surveys, the home interview method came to be widely accepted as the most comprehensive of the above methods and consequently has been developed to a high degree and is in general use as the standard method.

Prior to the development of the post-card method, the Ohio Highway Planning Survey had undertaken two other types of survey. In 1940 and 1941 a so-called workers survey was made in Cuyahoga County whereby personal interviews were made of all industrial and business workers employed in the greater Cleveland area. Again in 1941 and 1942 a similar survey was made in greater Toledo, except that instead of personally interviewing all workers, questionnaires were distributed through the medium of school children. In 1945, a home interview survey was made in greater Cincinnati.

Both types of survey produced the desired basic traffic facts essential in developing master plans. In addition to the area surveys described above, the Ohio Highway Planning Survey further supplemented the origin-destination data obtained in the Toledo and Cleveland surveys with comprehensive parking surveys of the respective downtown sections.

In Ohio we have always felt that the home interview survey, although the best of the above methods, is expensive and time consuming and the results are based on a comparatively small sample of vehicular movements. (Usually only 5 or 10 percent of the car owners are interviewed.)

According to cost data compiled by Adolf D. May, Jr., of the civil engineering department of Iowa State College, the average unit cost to pre-select dwelling unit samples and obtain interviews with each resident amounts to \$1.30. This figure was derived from costs submitted by eight cities in the less than 200,000 population bracket, the average population of the eight cities being 124,000. It assumes a 10-percent sample.

May's data shows cost per interview (including pre-selection) for cities in the 200,000 to 300,000 population group and cities over 300,000 population to be \$1.70 and \$2.10 respectively.

Figures furnished by the Bureau of Public Roads covering comparative costs of 17 cities in a wide range of population groups are \$1.54 for passenger cars and \$1.51 for trucks. These Bureau of Public Roads figures tend to support May's findings.

It is readily admitted that the interview in the home obtains information other than vehicular origin and destination; however, it was felt that that data necessary to the solution of highway problems, could be obtained more completely and at less cost by methods other than the home interview. In an attempt to find a substitute for the home interview, the idea of a post-card questionnaire survey was advanced.

Early in the preliminary development of this idea, it became apparent that a considerable saving in time would be effected in addition to the saving in cost. In actual experience to date, after four post card surveys, this original deduction has been borne out. In addition, our experience in the latest survey indicates that improved techniques, particularly in the preparatory stage, will further reduce the time span of the pre-analytical phase.

In our investigations we discovered that Ohio has a motor-vehicle registration law which requires motor-vehicle license applicants to register by city, township, and county of residence and further requires the Bureau of Motor Vehicles to file registration cards by these political subdivision groupings.

The original and fundamental purpose of such filing is to effect proper distribution of gasoline tax and license revenues among the various political sub-divisions according to the complicated formulae provided in the Ohio gasoline and license laws. By accident, therefore, we have the ideal instrument to determine the number of vehicles in each class, registered in any desired political sub-division.

Using this basic fact, we developed a manual of procedure for a controlled post card survey of the Canton, Ohio, area in 1947 and submitted it to the Bureau of Public Roads for approval and for permission to proceed with a survey on an experimental basis. The cordon area was entirely urban and comprised approximately 65 sq. miles.

The general procedure as set forth in the manual was to:

1. Contact each registered automobile or truck owner within the cordon area by mailing him a self-addressed prepaid post-card questionnaire requesting him to list all trips, by addresses of origin and destination, made by his car on the day after his receipt of the card.
2. Interview all outbound traffic leaving the area on an average day.
3. Obtain manual and machine counts of vehicular traffic movements at strategic locations within the area for an average day.
4. Establish a screen line through the area and count vehicular movements across the screen line for an average day.

In short, the post-card method of obtaining samples of internal vehicular movements, was the only major item of departure from the accepted practice of conducting an internal origin and destination survey by the home interview or any other accepted method.

The response of the citizens of Canton to our first effort exceeded our expectations:

- (a) 22,684 Cards were sent to passenger vehicle registrants.
- (b) 12,498 Cards were returned, representing 55.1% of the passenger vehicles registered in the area.
- (c) 3,291 Cards were sent to commercial vehicle owners, and fleet owners of commercial vehicles were contacted by special form letters. Response by commercial vehicle owners was 1,786 cards or 54.27% of the commercial vehicles registered. Taxi-cab trips were obtained from a review of the trip manifests.

At the time of the post card survey in 1947, Canton had an estimated population of 120,000 and 33,000 dwellings. On the basis of the compiled average costs for a home interview survey a 10-percent home interview sample in Canton would have cost \$4,290 for passenger cars plus an additional \$388 for trucks, this latter figure being based on interviewing a 10-percent truck sample at \$1.18 per sample. Thus, the total cost of such a survey would amount to \$4,678 or \$38.96 per 1,000 population.

But by cost account records, the post-card method used in Canton averaged only 13.1 cents per card returned, or sample. This cost was for both passenger cars and trucks. It covers the cost of stock, printing, addressing, processing, and postage of each card up to the coding phase. Instead of a 10-percent sample, the survey yielded a 55-percent sample. The cost was \$1,869.95 or \$15.58 per 1,000 population or only 39 percent of the cost of a home interview type of survey.

Of course, it is readily recognized that a large sample is not necessarily more accurate than, nor even as accurate as, a small, well-selected sample, such as produced in a home interview survey.

In accordance with accepted practice in all good traffic surveys, a screen check was included as a part of the Canton survey. The traffic pattern across the screen line as reconstructed from the post-card survey was within 5 percent of the manually counted traffic across that line. Screen-line checks have been included in all Ohio post card survey procedures. Those checks analyzed to date show a satisfactory degree of accuracy.

As a result of the Canton and subsequent surveys, it was found that the success or failure of such a survey depends on several specific factors:

1. Well-organized publicity.
2. Properly-zoned study area.
3. Carefully pre-zoned cards.
4. Preparation of a good zone-and-street directory.
5. Well-selected screen line.

Cards in the Canton Survey were zoned prior to mailing and trips were coded by a women's organization retained by Canton. The report of this survey was entirely technical and was intended for use only by planning engineers.

Shortly after the completion of the Canton survey, Franklin County and the City of Columbus jointly petitioned the State Highway Department for assistance in conducting an origin and destination study. The success attained in the Canton survey prompted the selection of the post-card method. This afforded an opportunity to test our techniques and experience when applied to a much larger area. Franklin County is roughly square, contains 539 sq. miles and had approximately 460,000 inhabitants in 1948. Columbus and its satellites comprise a compact urban area of 50.2 sq. miles and 383,000 population as of 1948 and is located approximately in the center of the county. The industry of this urban area is generally light with no outstanding or dominating installations. Fourteen other incorporated villages ranging in size from 221 to 3,146 population are scattered throughout the rural county area which surrounds this central urban hub.

You will note that the Columbus-Franklin county survey differed from the Canton survey in that the cordon of the Columbus survey enclosed a rural area which completely surrounded the urban hub and acted as a buffer or cushion between the cordon line and the urban area, whereas the Canton cordon line was the corporation line which excluded some urban fringe development.

The Columbus survey included three times more population and an urban area 3.5 times the size of the Canton area.

The manual of procedure of the Columbus-Franklin county survey was written to take full advantage of local spirit by placing local authorities in charge of publicity and by publicizing the work in the names of the local authorities. This item of appealing to local pride and local patriotism has been of great importance in obtaining a favorable response.

The Columbus Chamber of Commerce volunteered to take charge of publicity for this study and to retain and finance the services of a professional publicity agency. Another marked deviation in procedure in the Columbus survey over the Canton survey was the employment of more highly skilled temporary help in coding. This was accomplished by arranging with the local postal authorities to obtain the off hour services of postal clerks and carriers who were thoroughly familiar with the survey area.

Another important improvement in procedure was the publishing of an attractive report which could be read and understood by the general

public, and at the same time contained the charts and tables so necessary to the professional planner.

The public response to the Columbus-Franklin county survey was even better than the response in the Canton survey.

Some comparative figures are:

Item	Canton	Columbus
Cards Mailed Out	25975	117297
Percent Return (Over All)	55.0	60.6
Percent Return Passenger	55.1	61.3
Percent Return Commercial	54.3	54.8

It is noteworthy that in both surveys the passenger car owner response was better than the commercial vehicle owner response. Two more recent surveys, (Massillon and the Mahoning Valley) conducted in 1950 show this same trend.

Because the Canton internal survey did not have any rural area included, a comparison of relative response from rural and urban areas is not possible for that study. However, an urban-rural comparison in the Columbus-Franklin county survey showed that urban residents responded much better than rural residents. The comparative response for all types of vehicles being 62.5% for urbanites and 53.3% for ruralites.

Approximately the same relation of urban over rural response was discovered in our Mahoning Valley survey conducted in 1950.

In attempting to assign reasons for this condition we offer the following possibilities:

(1) Urban traffic problems in Ohio are more acute and urgent than rural traffic problems.

(2) Publicity coverage is better in urban areas.

(3) Mailing facilities are better in urban areas.

In analyzing the cost of the post-card section of Columbus-Franklin county survey we found that each returned card brought to the coding stage, cost 16.6 cents. This was an increase of 3.1 cents over the unit cost of the Canton survey.

We attribute this increase in cost to two items:

(1) Increase in wage or salary costs of 1949 over 1948 and

(2) Additional cost of preparing and zoning rural cards.

For the third controlled post-card survey in Ohio, we selected Massillon, a heavy-industrial city of approximately 30,000 population.

This was a relatively minor job and a review of it in this paper is of interest only because it is the smallest city in which we have attempted a post-card survey and because its cordon line was patterned after that of the Canton survey in which some fringe urban area was excluded from the cordon area. Our experience here supported our earlier conclusion that wherever possible the cordon area should include a cushion of rural area surrounding the urban core.

It was in this survey also that we first came across the problem presented by the growth of automobile registration in the time interval between April 1st, which date begins the auto-plate fiscal year, and the date of traffic recording day. In our two previous surveys, traffic day had been so close to "License Plate Day" that growth of registration could be ignored as a factor. Data on registration for the entire state is available in Ohio on a monthly basis, and political sub-division registration is available on a yearly basis. By plotting these two curves of the state and Massillon registrations over a period of five years and

projecting the city curve from April 1 to Traffic Day in 1950, we obtained a fairly accurate estimate of the number of cars registered in the survey area on Traffic Day.

Our fourth and latest study concerns the Youngstown-Warren-Niles area and has been called the Mahoning Valley traffic survey. This study is patterned after and slightly smaller than the Columbus-Franklin county study. The cordon encloses eight townships in Mahoning County and eight townships in Trumbull County, an area of slightly more than 400 sq. miles. The urban area is roughly a long string of heavy industrial development along both banks of the Mahoning River. As in the Columbus Study, this urban area is surrounded by a rural cushion within the cordon.

The manual of procedure of the Mahoning Valley study is also patterned after the Columbus-Franklin county survey.

In many respects we have learned more in the fields of technique and procedure from the Mahoning Valley survey than from all the other surveys combined.

If your experience has been similar to ours in Ohio, you will readily recognize that temporary or part-time help presents many problems and is undesirable at its best. In the Mahoning Valley survey we found it impossible to obtain the part-time services of postal employees and had to resort to the State Employment Service and recommendations of local officials for this help.

We were prosecuting this study on a very tight time schedule to meet a traffic reporting date which was already near the end of the normal traffic season and so could not be further postponed. Early in the pre-zoning operation it became apparent that our rate of progress was too poor to meet our scheduled "T" Day.

In desperate search for a way out of our difficulties we hit upon the idea of an index of city streets using the city directories and tax plats and coördinating the streets and house numbers by zones with our maps. We found that a trained permanent employee unfamiliar with the survey area but using this index could produce five times the work of a temporary employee in pre-zoning cards from his personal knowledge of the survey area. The index put us back on schedule. Because of this success in the pre-zoning stage we expanded the index during the lull period surrounding "T" Day. This expanded index included zoning information on street intersections, public buildings, parking lots, major industrial plants, recreational facilities, etc.

Using this index, when we arrived at the trip coding stage of our study, we found that we could release the majority of our temporary personnel, retaining only a few of the most efficient to zone the relatively few trips which could not be located by use of the index.

Although cost figures are not yet available for this survey, we are sure that the index has saved us money and time.

From our staff discussions of the faults, mistakes and experiences in the prosecution of the Mahoning Valley survey we are thoroughly convinced that we can save time and money and produce a better job in the future, by application of several refinements in procedure. We hope to make many other post card surveys in Ohio. On our next project we plan to punch directly from Bureau of Motor Vehicle Records automobile registration information into business machine cards using alphabetical equipment. We will then zone these cards by machine sorting and punch the zone number into each card. By use of a Card-a-Type machine we will

pre-zone and address post-card questionnaires automatically from the punch cards.

By using a carefully prepared and complete index, we can code trips faster and cheaper than in any previous survey. This procedure should materially reduce survey costs.

However, we believe that the above proposed improvements in technique are only a beginning and that many other improvements lie ahead, particularly if other states will experiment with this method of internal survey and will exchange ideas.

In conclusion, we believe that our post card method, although lacking some of the refinements of the comprehensive home interview method, has some advantages of its own not found in any other method. Principally: Economy, large sample and speed.

If other states wish to consider trying this method, the State of Ohio will be happy to cooperate with them in developing procedures and solving problems which are peculiar to their particular locale.

We would be remiss in our report if we failed to acknowledge the work of Indiana and West Virginia in the field of controlled post card surveys.

STATISTICAL AND COST ANALYSIS OF ORIGIN  
TO DESTINATION SURVEYS CONDUCTED IN OHIO  
BY THE "POST CARD" METHOD

NAME OF SURVEY	YEAR CONDUCTED	AREA IN SQUARE MILES	POPULATION	CARDS MAILED			CARDS RETURNED				COST PER CARD RETURNED UP TO CODING	COST PER CARD RETURNED INCLUDING CODING	COST PER CARD RETURNED INCLUDING CODING AND ANALYSIS		
				PASSENGER CAR	COMMERCIAL	TOTAL	PASSENGER CAR NUMBER	%	COMMERCIAL NUMBER	%				TOTAL NUMBER	%
Canton	1947	14 0	120,000	22,684	3,291	25,975	12,498	55.1	1,786	54.3	14,284	55.0	\$ 0.131	\$ 0.155	\$ 0.195
Columbus-Franklin County	1949	539.0	460,000	104,975	12,322	117,297	64,382	61.3	6,753	54.8	71,135	60.6	0.166	0.233	0.287
Massillon	1950	6 5	28,524	7,707	780	8,487	3,639	47.2	362	46.4	4,001	47.1	0.345	0.471	0.595
Mahoning Valley	1950	400.0	358,530	78,807	7,997	86,804	36,686	46.5	4,110	51.4	40,796	46.9	0.237	"	"

\*Information not yet available

MANUAL OF PROCEDURE  
FOR CONDUCTING AND ANALYSING  
THE COLUMBUS-FRANKLIN COUNTY ORIGIN-DESTINATION SURVEY

PURPOSE OF SURVEY

The purpose of the Columbus-Franklin County Origin-Destination Survey is to obtain the daily origin to destination movements of motor vehicles, where those movements are completely or partially within Franklin County.

USE OF SURVEY DATA

The data secured by the Survey is to be used by the City of Columbus and Franklin County, Ohio, to prepare a master plan of major street and road improvements. The Ohio Department of Highways is to prepare a report detailing the findings of the survey.

RESPONSIBILITY OF PARTICIPATING AGENCIES

On December 28, 1948, a contract between the City of Columbus and the Ohio Department of Highways was signed by the Director of Public Service and the Director of Highways respectively. The contract stipulates as follows:

The City of Columbus shall:

1. Upon completion of the survey and preparation of the report, pay to the Ohio Department of Highways, a sum of money equal to 25% of the total cost of the origin-destination survey and report.
2. Supply any technical advice, services or material at their own expense.

The Ohio Department of Highways shall:

1. Conduct the external and internal surveys supplying all supervision, personnel and material required.
2. Prepare a report outlining the facts obtained from the survey questionnaires.
3. Defray 25% of the total cost of the origin-destination survey and report.

The Public Roads Administration shall:

1. Supply technical advice if requested to do so by the Ohio Department of Highways.
2. Review survey procedures.
3. Defray 50% of the total cost of the origin-destination survey and report.



At subsequent meetings of the representatives of the participating agencies, it was decided that the survey should be publicized as being conducted by Columbus-Franklin County Officials rather than by the State of Ohio or the Federal Government. It was also decided that the local representatives should be responsible for the publicity program which is so important in this type of survey.

#### GENERAL METHOD OF PROCEDURE

The Columbus-Franklin County Origin-Destination Survey is to be conducted in the following manner:

A list is to be prepared of all passenger cars and trucks registered by persons living within Franklin County. The list contains the Name, Address, and Registration Number for each vehicle registered. Each person on this list will receive a card through the mail. On the card is provided space for listing one day's trips of the vehicle owned by the individual. The cards will then be mailed back to the survey office. Cards are to be mailed on a day that will preclude the listing of Saturday or Sunday trips. Traffic leaving the Columbus-Franklin County area will be interviewed at the External Origin-Destination Stations. A very extensive program of publicity will be employed during the period of the survey. Newspapers, radio, posters, and public speakers will be used in the program. Data obtained by the survey will be coded, expanded and adjusted. It will then be punched on IBM tabulating cards to facilitate preparation of the Origin-Destination tables.

#### CHRONOLOGICAL DETAIL OF SURVEY PROCEDURE

The detailed discussion of the survey is divided into three phases. The first phase covers those steps taken up to the time of actual field operations. It is called the Preliminary Phase. The Field Operations, or second phase, covers the details of collecting all survey data. The third phase is called Analysis and gives detailed information as to the coding, expansion and adjustment of the data.

#### THE PRELIMINARY PHASE

The Cordon boundary is shown on Figure 1. The cordon coincides with the boundaries of Franklin County. It was considered desirable to have the cordon coincide with the county line because it would simplify the task of preparing the list of vehicle owners from the records of the Bureau of Motor Vehicles.

After the cordon had been established, all possible locations for External Origin-Destination Stations were selected. Traffic counts were taken on all roads and streets which intersected the cordon. Those roads and streets with 24-hour volumes of more than 500 vehicles were selected as sites for External O & D stations. Figure 1 shows the location of the stations selected.

The area within the cordon was divided into zones. The following factors were considered in developing the zone map:

- a. To keep heavy industry segregated from business and residential areas.
- b. To make the downtown business district into one zone.
- c. In residential areas, to base the size of zones on population density, if possible.
- d. To see that zones were bisected by primary or arterial streets where possible.
- e. To adjust zone boundaries so that a screen line check could be made of the survey data, (Fig. 1 shows the zone boundaries and numbers).

Two lists of motor vehicles, registered by people living in Franklin County are to be prepared. One list will contain Passenger Cars, and the other trucks. No list will be prepared for busses. The lists are to be prepared from the records of the Ohio Bureau of Motor Vehicles. The lists will contain the name of the registrant, license number, and address.

### FIELD OPERATIONS PHASE

The field operations are sub-divided into the Internal Survey and the External Survey for purposes of discussion.

The Internal Survey consists of addressing and mailing cards to all vehicle owners living within the cordon area. It also includes keeping accurate records of the cards returned.

The interview card to be used is shown by Figure 2. This card should be self-explanatory. Cards for passenger cars and trucks are identical in all respects except color. The card for passenger cars is pink and the truck card is yellow.

Cards will be addressed from the registration lists previously prepared. After the cards are addressed they will be segregated into zones of residence. The same zone boundaries will be used for zones of residence as shown in Figure 1 for zones of origin and destination. On the return portion of each card, in the upper right hand corner, will be entered the residence zone number.

An accurate count of the passenger car cards and truck cards sent to each zone of residence, will be obtained. This count will be entered in Column 3 of the Internal Interview Control Form, Figure 3. Separate counts will be made on passenger cars and trucks.

The Internal Interview Control Forms provide space for listing the cards returned each day. The Publicity Section will be notified of those zones where returns are slow and the following day's publicity will be directed at those areas.

In zones where the returns are considered to be too small, and where publicity fails to produce good results, it is planned that a crew of interviewers will pick up additional information by house-to-house canvas.

When the volume of returned cards has diminished to a point where they no longer contribute materially to the information already received,

the internal survey will be considered to be completed and all additional cards received will be discarded.

It is known that many trucks and taxicabs will make more than eight trips per day. Since there is space on the card for only eight trips, it will be necessary to give such vehicle questionnaires special handling. A letter will be sent to all taxicab companies in the area requesting that they hold their cards until a representative of the survey office contacts them. This representative will obtain all desired trip data on supplementary forms. This procedure has been devised because it would be a very difficult job to sort out taxicab licenses before mailing. Truck operators of vehicles making more than eight trips per day will be instructed by radio, newspapers and posters to enter any additional trips on a sheet of paper, attach it to the card and mail the information to the survey office.

The external survey consists of stopping all outbound vehicles crossing the cordon boundary and obtaining the information provided for by the External Interview Form, Figure 4. This is the standard form used by the Ohio Department of Highways on rural origin-destination studies.

Figure 1 shows the locations of the stations. Traffic counts were made at all locations to determine the volumes of traffic crossing the cordon. Stations will not be operated where the volume is less than 500 vehicles per day.

Only outbound traffic will be interviewed. The hours of operation will be from 6:00 AM to 10:00 PM. Manual traffic counts will be obtained for 24 hours. The density form to be used is shown by Figure 5.

Through vehicles which do not stop in Franklin County will be asked one additional question not provided for on the External Interview Form, Figure 4. The question will be "What route did you use and from what direction did you come when you entered Franklin County?" The route number and direction will be entered beside the origin. This provides the information needed for tracing all through traffic, by routes, across the Survey Area.

#### GENERAL PUBLICITY PLAN

The success or failure of this type of survey is entirely dependent upon the degree of cooperation which can be generated in the residents of the survey area. A strong, well planned publicity program is therefore a major phase of the study.

The Columbus Chamber of Commerce has offered to employ the services of an advertising firm to handle the publicity for the survey. The cost of the publicity program will not be charged against the cost of the survey.

#### THE ANALYSIS PHASE

For purpose of discussion, this part of the manual is divided into the Internal Survey and External Survey.

The Internal Interview cards will be given to the coder as soon as they have been entered on the Internal Interview control form. The coders must be employees who are thoroughly familiar with the Survey Area. All origin and destination addresses will be coded into zones. The zone numbers which are shown on the map, Figure 1, will be used. The zone numbers will be entered on the cards in colored pencil.

When the cards are given to the coder they will be subdivided into passenger cars and trucks, and tied together in separate bundles. All cards within each bundle will be for the same zone of residence. The coders will retain this sorting while the cards are being coded and return all cards to their original bundles. The coded and sorted bundles will then be given to key punch operators so that all data may be punched onto IBM cards.

When the internal survey field operations are completed and no more cards are being accepted, the internal interview control form will contain data to be used for determination of the expansion factor. Each residence zone will have two factors, one for passenger cars, one for trucks. The factors will be entered in the column headed "factor value" and are obtained by dividing the number of cards shown in the column headed "number of cards mailed" by the number of cards in the column headed "total cards returned".

It is apparent that duplication of trips data will exist where a vehicle owner living in Franklin County crosses the cordon line in making a trip. This trip will be reported on the postcard and will also be reported on the External Interview Forms. In order to eliminate these duplications, the Coders will be instructed to draw a line through all trips with either an origin or destination outside of Franklin County reported on the postcards.

The data from the Internal Interview Cards will be punched on the IBM card shown in Figure 6. The codes used for all items other than origin and destination zones (previously discussed) are shown below:

Vehicle Type:	Passenger Car	Code 1
	Truck	Code 2
Residence Zones:	Previously explained.	
Origin Zone:	Previously explained.	
Destination Zone:	Previously explained.	
Factor Value:	A list of factor values calculated as previously described, will be given to the key punch operators so that a separate master card can be prepared for each residence zone.	

The External Interview Forms will be turned in at the Survey Office at the end of each day's work. The Density Sheets will accompany the interview forms. The Density Sheets for each station will be totalled and filed until the interview data are coded. As the coding for each station is completed, expansion factors will be calculated for each station.

Separate expansion factors for Passenger Cars and Trucks will be developed. The factors will be calculated in the following manner:

For Passenger Cars:

$$\text{Factor} = \frac{\text{Number of outbound passenger cars counted in 24 hours}}{\text{Number of outbound passenger cars interviewed in 16 hours}}$$

For Trucks:

$$\text{Factor} = \frac{\text{Number of outbound trucks counted in 24 hours}}{\text{Number of outbound trucks interviewed in 16 hours}}$$

To provide for inbound trips, which will not be interviewed, a duplicate set of IBM cards will be prepared. This duplicate set will be the same as the original except that the "hour period" columns will be left blank and the "destination" codes of the original cards will be reproduced in the "origin" columns of the duplicate cards. The "origin" codes on the original cards will be reproduced in the "destination" columns of the duplicate cards. Cards for outbound vehicles, with both origin and destination outside of the survey area will not be duplicated because this would erroneously double the number of such trips.

For the purpose of this survey, the area outside of the cordon will not be zoned. Vehicles entering the cordon area will have for their origin code, the External Station number through which they pass when entering the county. Vehicles leaving the survey area will have for their destination code the External Station at which they were interviewed. The interview sheets, however, will contain the actual origins and destinations by cities and states. These data will be available for analyses of specific problems as they are encountered.

The origins and destinations within the cordon will be coded into zone numbers. All other codes are shown below:

For IBM card see Figure 7.

Station Number:            Punch without coding

Vehicle Type:            Passenger Car Code 1  
                              Single Unit Trucks Code 2

Combinations Code 3

Origin Zone:            Previously explained

Destination Zone:      Previously explained

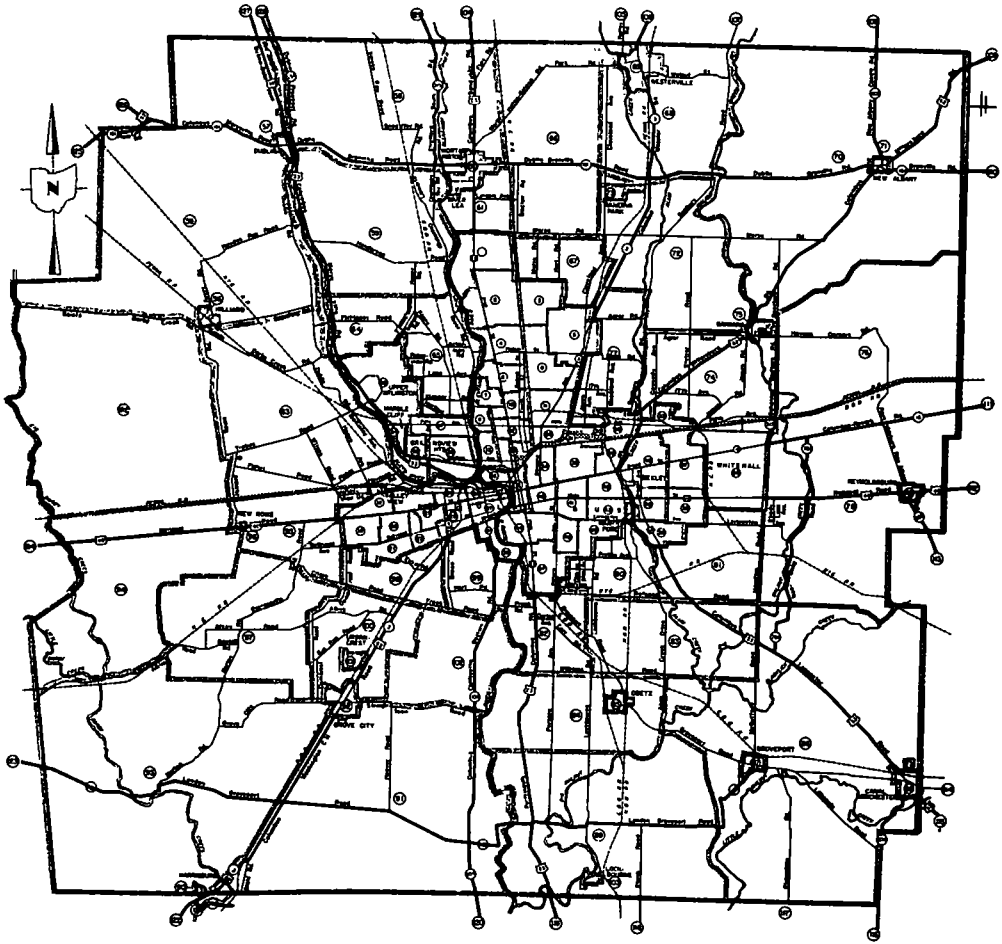
Factor Value:            A list of factor values, calculated as previously explained, will be given to the key punch operators so that a separate master card can be prepared for each station.

SCREEN LINE CHECK

A screen line check will be made of the origin-destination data obtained by the survey. A screen line is usually located along a river, stream, railroad track or some other traffic carrier which has a limited number of traffic crossings. The screen line must also be located so that it will approximately bisect the survey area and in such position that few if any trips will require crossing it more than once in traveling from origin to destination.

Twenty-four traffic counts will be obtained at each traffic crossing along the screen line. This gives the actual volume of traffic which crosses the barrier each day. The number of trips which would be forced to cross the screen line in order to move from their origins to their destination is obtained from the expanded origin-destination data. The number of vehicles counted is then compared with the number of vehicles obtained from the survey data. Many traffic authorities consider a close comparison of these data to be a good check of survey accuracy.

The location of the screen line in Franklin County is shown on Figure 1.



LEGEND

--- Columbus Metropolitan Area Boundary	⊗ Screen Line
--- Corporation Line	⊞ Zone Line
--- Cardon	⓪ Zone Number

Figure 1. Columbus-Franklin County Origin-Destination Zone Map

Figure 2. Return Post-Card Interview Form

Front

COLUMBUS, OHIO

25c 562, P. L. & R.  
U. S. POSTAGE  
**1c PAID**  
COLUMBUS, OHIO  
Permit No. 444

This Is Your  
TRAFFIC SURVEY CARD  
For Vehicle Number

**COLUMBUS—FRANKLIN CO. TRAFFIC SURVEY**

Authorized by Columbus City Council, Franklin Co. Commissioners, and Participated in by Ohio Department of Highways

Please list below ALL the trips made by your vehicle 'On The Day After You Receive This Card but DO NOT use Saturday or Sunday trips. If your vehicle makes no trips write 'NONE' across the face of the card. As soon as you have the card filled out, DROP IT IN A MAIL BOX. No postage stamp is required

Trip No.	(Origin—Place where trip started)	(Destination—place where trip ended)
1	from .. .. .	to .. .. .
2	from .. .. .	to .. .. .
3	from .. .. .	to .. .. .
4	from .. .. .	to .. .. .
5	from .. .. .	to .. .. .
6	from .. .. .	to .. .. .
7	from .. .. .	to .. .. .
8	from .. .. .	to .. .. .

DO NOT SIGN YOUR NAME

Back

COLUMBUS 16, OHIO

Court House

Franklin Co. Planning Commission

DIRECTOR OF SURVEY

4c—POSTAGE WILL BE PAID BY—

**BUSINESS REPLY CARD**  
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

POST CLASS  
PERMIT No. 1660  
(Sec. 516, P.L.R.R.)  
COLUMBUS, OHIO

READ INSTRUCTIONS CAREFULLY — FILL OUT CARD — TEAR OFF AND MAIL AT ONCE

- 1—You and your car and the trips you make each day are important to the solution of our traffic problems. Columbus and Franklin County are eligible for State and Federal funds to help in street improvements if we meet their requirements. These funds are from taxes you have already paid. By returning this card you will aid materially in getting these funds for Columbus and Franklin County. PLEASE FILL OUT THE CARD—AND MAIL.
- 2—What Shall I Consider As A Trip? Answer: Mrs. Smith takes her husband to his work—that is a trip. From there Mrs. Smith goes shopping—that is another trip. Mrs. Smith then goes home—that is another trip. In other words, anyplace that Mrs. Smith stops for some purpose, is the end of one trip and the beginning of another.
- 3—Origins (Place where trip started) and Destinations (Place where trip ended) may be listed as an address, such as 500 North High Street, or an intersection, such as Fifth Street and High Street, or as a place, such as the Court House, State Office Building, or any of the well known stores, banks, buildings, etc. Do not say you went from home to work; we don't know where you live or where you work.
- 4—You will have done a good job of filling this card out if after it is finished, any other person could read it and quickly tell where the trips had started and where they ended.
- 5—If you have any difficulty filling the card out, call any of the following telephone numbers for assistance: Ma. 1265 Ext. 780 Ad. 7474, Ma. 2211; Ad. 4261 Ma. 1321
- 6—If you have more than 8 trips, list them on another sheet and mail, or bring them to the Survey Office.
- 7—DON'T FAIL TO FILL OUT THE ATTACHED CARD AND MAIL. Thank you.

Director of Survey



# COLUMBUS & FRANKLIN CO. TRAFFIC SURVEY

## INTERVIEW CONTROL FORM FOR COMMERCIAL VEHICLES

ZONE NO. MAILED	NUMBER OF CARDS RETURNED BY DAYS	FITCHES FACTOR RETURNED VALUE	ZONE NO. CARDS MAILED	NUMBER OF CARDS RETURNED BY DAYS	TOTAL VEHICLES	CENTER VALUE
1			54			
2			55			
3			56			
4			57			
5			58			
6			59			
7			60			
8			61			
9			62			
10			63			
11			64			
12			65			
13			66			
14			67			
15			68			
16			69			
17			70			
18			71			
19			72			
20			73			
21			74			
22			75			
23			76			
24			77			
25			78			
26			79			
27			80			
28			81			
29			82			
30			83			
31			84			
32			85			
33			86			
34			87			
35			88			
36			89			
37			90			
38			91			
39			92			
40			93			
41			94			
42			95			
43			96			
44			97			
45			98			
46			99			
47			100			
48			101			
49			102			
50			103			
51			104			
52			105			
53			TOTAL			

Figure 3. Interview Control Form for Commercial Vehicles





