# COMPUTER PROGRAMS SPECIFICATIONS 

for the<br>Quality of Telephone Service Study

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by

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PURPOSE: To accept initial input data and compute required sample sizes for customer surveys in metropolitan areas. The information computed for each exchange or central office is to be printed on the data collection instrument.

INPUT:

## ITEM

SUGGESTED FIETD
Card 1:

|  | Company name  <br> Metro area name  <br> Telephone <br> Book <br> Information First white page number <br> Last white page number <br> Number of columns/page  <br> Last scale number  <br> Sample size $(S)$ $21-40$ $41-45$ right justified |
| :--- | :--- |

Cards 2 through $n+1$ (one for each exchange in the metropolitan area):

Alphanumeric code for the exchange
$1-10$

Community name, if any
$11-30$
Number of residential subscribers ( $\mathrm{X}_{\mathrm{i}}$ )
31 - 40 right fustified
Number of business subscribers $\left(y_{i}\right)$
111-50 right justified
All relevant three digit prefix numbers
separated by ",blank". This may be read as alpha data

NOTATION DESCRIPTION: In the above the following symbols were used: $S, n, x_{i}, y_{i}$ which have the following meaning:
$S=$ Numerical values of the total sample size taken in the metro area.
$\mathrm{n}=$ Number of exchanges in the metro area
$x_{i}=$ Number of residential subscribers served by the $i^{\text {th }}$ exchange, $i=1, \ldots, n$
$y_{i}=$ Number of business subscribers served by the $i^{\text {th }}$ exchange, $i=1, \ldots, n$
Further define the total population size to be $P$, then:
$P=\sum_{i=1}^{n}\left(x_{i}+y_{i}\right)$.

Also define $r$ to be the sample size of residential subscribers to be surveyed for the $i$ th exchange and $b_{i}$ to be the sample size of business subscribers. Then since the surveys are stratified on exchanges and subscriber classification,

$$
r_{i}=\operatorname{INTEGER}\left[(S / P)^{*} x_{i}+0.5\right]
$$

and $\quad b_{i}=\operatorname{INTEGER}\left[(S / P){ }^{\prime} y_{i}+0.5\right]$
where INTEGER[a] refers to the integer part of the number "a" in the brackets. OUTPUT: Each page of output should be a form in the format of Exhibit $A$ or should be printed onto a preprinted form in the format of Exhibit A. Each page will correspond to only one exchange and each exchange will correspond to atleast one page of output. The information that will change from page to page of output is as follows:
a) Heading - should include company name, metro area name, exchange code and name, and all prefixes used in the exchange.
b) Residential and business sample sizes ( $r_{i}, b_{i}$ ) printed in the instructions.
c) A list of 30 sets of random numbers. Each set printed in the following format:
$\mathrm{XXXX}-\mathrm{X}-\mathrm{XXX}$
where the first four digits give a uniformly distributed (u.d.) random integer between the first white page number and the last white page number inclusive (both given on card 1). The single digit is a u.d. random integer between 1 and the number of columns/page inclusive (again found on card 1). The last three digits give a uniformly distributed integer between 0 and the last scale number inclusive (Card 1).
d) The number of lines for recording subscriber responses should be computed as follows: $r_{i}+b_{i}+$ EXTRA where EXTRA is either 2 or $20 \%$ of $r_{i}+b_{i}$ which ever is largest. Given the total lines required, determine the number of pages required for the exchange where each
page contains all information so that it could stand alone.
e) As each line is printed an " $R$ " should be printed in the first column of the first $r_{i}$ rows and a " $B$ " printed in the first column of the next $b_{i}$ rows with the first column of the last EXTRA rows left blank.

Notes: 1) Exhibit B shows the connection on the form with the above paragraph reference letters.
2) Exhibits $A$ and $B$ are Xerox reductions of the standard $11 \times 15$ computer printout page.

## Program IIa: Subscriber Survey Analysis

## Purpose

To organize subscribers' survey data and to compute statistical comparisons of the performance of the telephone services as indicated by subscribers in metropolitan areas and companies.

## Definitions

Item
Each kind of possible response, as classified in the questionnaire, (See Exhibit E) is considered to be an item nested within a question. [i.e. Question 3: A "good" response is a different item than "very good"]. Strata

The general group to which the subscriber belongs. Residential subscribers (R) or Businesses (B).

Input
The following data may be keypunched directly from completed versions of Exhibit A..

Company
Metro area name
Exchange
Interviewer's name
\# of residential subscribers
\# of business subscribers
Date
Hour
All items of response for each question
An indicator if there is a remark
Transmission quality rating

Number of each of the following for each sheet

| No answer | Not in service | Others |
| :--- | :--- | :--- |
| All trunks busy | Refused |  |
| Problems on line | Busy |  |

Contingency Table 1: Comparison of Ratings of Service
A program will analyze the results of Question 3 (rating of service by subscribers) to identify exchanges, areas and companies whose service is rated lower than average. An exact statistical method of comparison is applied to determine significant differences in the ratings between a specific exchange (or area or company) and all the rest.

Notation:
a - the number of subscribers that gave $G$ or VG ratings to exchange $j$.
b - the total number of subscribers that gave $G$ or VG ratings to all the other exchanges in the area.
$c$ - the number of subscribers that give $F$ or $P$ ratings to exchange $j$.
d - the total number of subscribers that give $F$ or $P$ ratings to all the other exchanges in the area.
$n$ - the total number of subscribers interviewed in the area.
E - the total number of exchanges in an area.
The program will calculate the probabilities for the following contingency table. This calcualtion should be done $E$ times, each time the results for a specific exchange $j$ is compared with the results of the rest of the exchanges.

| For Exchange $j$ |  |  |  |
| :---: | :---: | :---: | :---: |
|  | $j$ | All Other <br> Exchanges |  |
| $G$ | $a$ | $b$ | $a+b$ |
| $B$ | $c$ | $d$ | $c+d$ |
|  | $a+c$ | $b+d$ | $n=a+b+c+d$ |

The formulas to make the calculation for each exchange $j$ are as follows:

$$
\begin{aligned}
P_{1_{j}} & =\frac{(a+b)!(c+d)!(a+c)!(b+d)!}{a!b!c!d!n!} \\
P_{2 j} & =\frac{(a+b)!(c+d)!(a+c)!(b+d)!}{(a-1)!(b+1)!(c+1)!(d-1)!n!} \\
P_{i j} & =\frac{(a+b)!(c+d)!(a+c)!(b+d)!}{(a-i+1)!(b+i-1)!(c+i-1)!(d-i+1)!n!} \\
& =\frac{(a+b)!(c+d)!(a+c)!(b+d)!}{0!(b+a)!(c+a)!(d-a)!n!}
\end{aligned}
$$

and finally:

$$
P_{j}=\sum_{i=1}^{a+1} P_{i j}
$$

If $P_{j}<0.90$, there is a significant difference in rating of the $j^{\text {th }}$ exchange in comparison with the rest of the exchanges. This should be noted by a star in the last row of the j 's column in the output as given below. To determine whether the $j^{\text {th }}$ exchange's ratings are better or worse than the others, the column percentages in the output table should be considered.

To test for significant differences in ratings among different areas, the same procedure should be performed for a table consisting of the "area total" columns to replace the j's columns.

Output
The output heading should include the table's name, company, metro area, strata, and date of edition. For each area, the following table should be printed:

|  | Exchange 1 | Exchange 2 | $\xi$ | Exchange E | Total |
| :---: | :---: | :---: | :---: | :---: | :---: |
| VG | $\mathrm{V}_{1}$ | $\mathrm{v}_{2}$ | 35 | $V_{E}$ | $\Sigma v_{j}$ |
| G | $\mathrm{g}_{1}$ | $\mathrm{g}_{2}$ | $\} \leqslant$ | $g_{\text {E }}$ | $\Sigma g_{j}$ |
| F | $\mathrm{f}_{1}$ | $\mathrm{f}_{2}$ | $\left.\sum\right\}$ | $\mathrm{f}_{\mathrm{E}}$ | $\Sigma f_{j}$ |
| P | $\mathrm{p}_{1}$ | $\mathrm{p}_{2}$ | $\} \sum$ | $\mathrm{P}_{\mathrm{E}}$ | ${ }^{\Sigma p_{j}}$ |
| TOTAL | $v_{1}+g_{1}+f_{1}+p_{1}$ | $\mathrm{v}_{2}+\mathrm{g}_{2}+\mathrm{f}_{2}+\mathrm{p}_{2}$ | $\} \leqslant$ | $v_{E}+g_{E}+f_{E}+p_{E}$ | $\Sigma\left(v_{j}+g_{j}+f_{j}+p_{j}\right)$ |
| $P_{j}$ | $\mathrm{P}_{1}$ | $\mathrm{P}_{2}$ | $\xi \xi$ | $P_{E}$ |  |
| SIGNI- FICANCE | $\text { *if } P<.90$ <br> otherwise blank | ```*if P <.90 otherwise blank``` | $\sum_{3} \xi$ | $\begin{gathered} \text { *if } \mathrm{P}_{\mathrm{E}}^{<} \mathrm{.} 90 \\ \text { otherwise } \\ \text { blank } \\ \hline \end{gathered}$ |  |

where:
$v_{j}=\begin{aligned} & \text { Total number of subscribers in exchange } j \text { who rated their service } \\ & \text { very good. }\end{aligned}$
$g_{j}=$ Total number of subscribers in exchange $j$ who rated their service good.
$\begin{aligned} & f_{j}=\text { Total number of subscribers in exchange } j \text { who rated their service } \\ & \text { fair. }\end{aligned}$
$p_{j}=$ Total number of subscribers in exchange $j$ who rated their service poor.
$P_{j}=$ Probabilities computed with the formulas given earlier.

For each comparison among areas or companies, a similar table should be printed, for Area 1, Area 2, etc., or company 1, company 2, etc.

Contingency Table 2: Comparison of Proportions of Subscribers Who Had At Least One Difficulty with the Telephone Service.

The program will analyze the results of questions 1 and 2 (technical and administrative difficulties subscribers have with the telephone services) to identify exchanges, areas and companies that have higher proportion of customers who have at least one difficulty with the service. The method is similar to that used for contingency Table 1.

## Notation

a - the number of subscribers that did not mention any difficulty in exchange $j$.
$b$ - the number of subscribers that did not mention any difficulty in all the other exchanges.
c - the number of subscribers that mentioned at least one difficulty in exchange $j$.
d - the number of subscribers that mentioned at least one difficulty in all the other exchanges.
$n$ \& E keep the same meaning.
The program is identical to that performed for contingency Table 1 , except that $a, b, c, \& d$ will have the new values just defined.

Output
The headings and format are similar to those for contingency table 1.

|  | Exchange 1 | Exchange 2 | 3 \% | Exchange E | Total |
| :---: | :---: | :---: | :---: | :---: | :---: |
| No Difficulties | $\mathrm{n}_{1}$ | $\mathrm{n}_{2}$ | $\sum_{i}^{3} \xi^{3}$ | $n_{E}$ | $\Sigma n_{j}$ |
| Some Difficulties | $\mathrm{S}_{1}$ | $\mathrm{S}_{2}$ | $\begin{aligned} & \{ \\ & \{ \\ & \} \end{aligned}$ | ${ }^{\text {S }}$ E | $\Sigma^{\Sigma S}$ |
| TOTAL | $\mathrm{n}_{1}+\mathrm{s}_{1}$ | $\mathrm{n}_{2}+\mathrm{s}_{2}$ | $\} \xi$ | $\mathrm{n}_{\mathrm{E}}+\mathrm{S}_{E}$ | $\Sigma\left(n_{j}+s_{j}\right)$ |
| $P_{j}$ | $\mathrm{P}_{1}$ | $\mathrm{P}_{2}$ | < | $\mathrm{P}_{\mathrm{E}}$ |  |
| Significance | $\begin{gathered} * \text { if } P_{1}<.90 \\ \text { otherwise } \\ \text { blank } \end{gathered}$ | $\begin{aligned} & \text { *if } \mathrm{P}_{2}<.90 \\ & \text { otherwise } \\ & \text { blank } \end{aligned}$ |  | $\begin{aligned} & \text { *if } P_{E}<.90 \\ & \text { otherwise } \\ & \text { blank } \end{aligned}$ |  |

where:
$n_{j}=$ Number of subscribers in exchange $j$ who had no difficulties.
$s_{j}=$ Number of subscribers in exchange $j$ who has some difficulties.
$P_{j}=$ Probabilities computed by formulas given earlier.

Contingency Table 3: Effect of Difficulties in Telephone Performance on Ratings of Service in an Area.

This table provides some insight of the effect of difficulties on subscribers' rating of service. Generally, it is expected that more difficulties will cause lower ratings.

Notation:

$$
\begin{aligned}
& x_{i j}=\text { number of subscribers who gave a rating described in row } i \\
& \text { and the number of difficulties in the heading of row } j \text { of } \\
& \text { the matrix shown in the output section below. } \\
& x_{i .}=\underset{j}{\Sigma x_{i j}} \\
& \text { i } j \\
& x_{. j}=\underset{i}{\sum x_{i j}}
\end{aligned}
$$

In this case the statistical values will be computed using a Chi Square approximation to the exact probabilities. This is accomplished by using the following formulas:

$$
\begin{aligned}
& \left.\begin{array}{l}
e_{i}=\left(x_{. j}\right)\left(x_{i .}\right) / n \\
f_{i}=\left(n-x_{. j}\right)\left(x_{i .}\right) / n
\end{array}\right\} \quad \begin{array}{r} 
\\
i=1,2,3,4
\end{array} \\
& \mathrm{CH}(0 \text { difficulties column })=\sum_{i=1}^{4}\left[\left(x_{i 1}-e_{i}\right)^{2} / e_{i}+\left(x_{i}-x_{i}-f_{i}\right)^{2} / f_{i}\right] \\
& \mathrm{CH}(1 \text { difficulty column })=\sum_{i=1}^{4}\left[\left(x_{i 2}-e_{i}\right)^{2} / e_{i}+\left(x_{i} .-x_{i 2}-f_{i}\right)^{2} / f_{i}\right] \\
& C H(2 \text { difficulties column })=\sum_{i=1}^{4}\left[\left(x_{i 3}-e_{i}\right)^{2} / e_{i}+\left(x_{i} .-x_{i 3}-f_{i}\right)^{2} / f_{i}\right] \\
& \mathrm{CH}(3 \text { or more difficulties } 4 \\
& \text { column) } \\
& =\sum_{i=1}^{4}\left[\left(x_{i 4}-e_{i}\right)^{2} / e_{i}+\left(x_{i} .^{-x_{i 4}}-f_{i}\right)^{2} / f_{i}\right]
\end{aligned}
$$

where CH is the Chi Square valve for the column indicated in parantheses.

## Output

The heading is similar to those for contingency Tables 1, 2 (different name). The table below should be the output for metro areas and/or companies,
but not for specific exchanges because the number of interviews in each exchange is most likely too small for the Chi Square approximation to be a good one.

If any CH value > 7.815 an '*' should be printed in the last row of its column to indicate a difference in the distribution of ratings between the subscribers that had $M$ difficulties and all the others. The numbers in the appropriate column should be considered to interpret the meaning of that difference (i.e. Is it better or worse than all the others?)

| Number of <br> Difficulties | 0 | 7 | 2 | 3 or <br> more | Total |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Rating VG | $x_{11}$ | $x_{12}$ | $x_{13}$ | $x_{14}$ | $x_{1}$ |
| G | $x_{21}$ | $x_{22}$ | $x_{23}$ | $x_{24}$ | $x_{2} \cdot$ |
| F | $x_{31}$ | $x_{32}$ | $x_{33}$ | $x_{34}$ | $x_{3} \cdot$ |
| Total | $x_{41}$ | $x_{42}$ | $x_{43}$ | $x_{44}$ | $x_{4} \cdot$ |
| Significant <br> Difference |  | $x_{2}$ |  | $x_{3}$ | $x_{4}$ |

Summary Table 1: List of Survey Results for an Area
The purpose of this table is to summarize the raw data results of an area survey. The list should include the frequencies of all the items in the questionnaire, and the equivalent percentages of the total number of interviews. The following example shows the suggested output format.

| Question <br> No. | Item <br> No. | Item <br> Description | Frequency | Percent |
| :---: | :---: | :--- | :---: | :---: |
| 1 | 1 | Cut off | 3 | 1.0 |
| 1 | 2 | Late D.T. | 12 | 4.0 |
| 1 | 3 | Slow Connect | 5 | 1.7 |
| 1 | 4 | ATB | 17 | 5.7 |
| etc. | etc. | etc. | etc. | etc. |

Summary Table 2: List of Exchanges Whose Interviews Included Special Remarks
This list should include all exchanges that had special remarks noted on their survey forms. Whenever a remark appears, the phone number of the subscriber that made the remark should be printed, for further investigation.

## Program IIb: Statistics Of Survey

## Purpose

To report the rate of response and reasons for nonresponse in the subscriber's survey. [The report will be used to estimate the overall time required for a subscriber survey in an area, and to indicate possible difficulties in condủcting it.]

Input
The input data is already contained on the cards that were keypunched directly from the completed versions of Exhibit A.

## Output

The output should be a condensed summary of the data in the following table structure:


Where the rates are computed as percentages. In addition, a useful factor to compute is the total number of attempts per completed interview in the area and if several areas are summarized in one program then the total number of attempts per completed interview for all areas surveyed would be printed.

PROGRAM III: Trunking Forms

PURPOSE: To accept initial trunking arrangement data and to print it in a format that will aid the trunk traffic data collection procedure.

INPUT:

Card 1 (type 1):
Company Name
Metro Area Name
21-40
Number of Exchanges ( $n$ )
41-45 right justified
Number of Tandem Offices and Double Tandem Combinations (m) 46-50 right justified

Card 2 through $n+1$ (type 2), each card will contain:
Exhange code, usually consisting of an abbreviated community name and a prefix related numerical code and must be shortened to no more than eleven characters

Sequentially assigned integer code, obtained by numbering exchanges from 1 to $n$. This will be referred to as an exchange's internal code to distinguish it from the alphanumeric code given in columns 1-11 $14-15$ left justified

OUTPUT: Each page of output should be a form in the format of Exhibt C or should be printed onto a preprinted form in the format of Exhibit C. Each page will correspond to only one exchange and each exchange will have at least one page corresponding to it. The information printed onto the form that will change from page to page is as follows:
a) Heading - This should include company name, metro area name, and one originating exchange code. Each exchange will be an originating exchange once per run.
b) The form in Exhibit $C$ is divided into two identical forms on the left and right halves of each page and two sections labled A and B. Listed in the left hand "TERMINATION" column are approximately half of all exchanges given on cards of type 2 and listed in numerical order according to their internal codes. The remaining exchanges should be similarly listed in the right hand "TERMINATION" column. Enough extra blank's should be provided to equal about $20 \%$ of $n$ (number of exchanges).
c) For each originating exchange, section $B$ for terminating tandem offices should also be provided. Enough blank spaces should be provided so that a total space of approximately 3.33 * m will be available (counting left and right parts).
d) For most metro areas in Ohio the terminating exchange section (section A) and the tandem office section (section B) will both fit one page of output for each originating exchange. For the Cleveland area, the terminating exchange area may fit one page and a separate page should be devoted to the tandem office section. Splitting within a section should be avoided if possible.
e) Each tandem office should also serve as an originating point but since the tandem office designations are not known at the time their program is run, then 4 * $m$ additional froms, complete except for being left blank in the heading whose origanization code would go, should be printed. A number of completely blank forms should also be provided.

Notes: 1. Exhibit $D$ shows the association between the elements of output and the above descriptive paragraphs. Both Exhibits $C$ and D show typical exchange codes used by Ohio Bell in the Columbus area.
2. Both Exhibits $C$ and $D$ are xerox reductions of the standard $11 \times 15$ computer printout page.

PROGRAM IV: Trunk Data Analysis

PURPOSE: The purpose of this program is to receive all trunk traffic data collected and recorded on the forms produced by program III and to provide estimates of the maximum percentage of calls blocked between any two central offices when the data does not already show the percent blocked.

INPUT: The input will consist of all data available on the completed forms produced by program III (see Exhibits C and D) for a given metro area. Specifically they are:

1. Name of telephone company
2. Name of metropolitan area
3. All origination points
4. All termination points
5. Connection information
6. Number of CCS (a measure of telephone traffic) offered each trunk link
7. Number of CCS transferred to ${ }^{\text {b }}$ ackup trunk paths.
8. Percent of calls blocked
9. Busy hour information

The completed forms should contain this data for all central offices, tandem offices and tandem links.

OUTPUT: The output should be an exact image of the input data except that the "\% Block" column should contain one of the following in each row of both halves of Section A:

1. If the input data included a value for percent block in a row then print the input value and a blank if it is less than . 05 or an "*" if it is greater or equal to . 05 .
2. If the input data does not include a value for percent blocked in a row, also no value for "CCS TRANS," and is blank in the connection column but does give "\#CCS" and "TRUNK SIZE" values, then the Erlang Formula B given below should be used to estimate the percent blocked. Then print the estimted percent, an E, and the blank or asterisk according to the criteria above. The E will indicate that the value is an estimate.
3. If the input indicates "CCS TRANS" and a "CONNECTION", that connection is a backup trunk. Follow the formulas given below to determine an estimate of percent blocked and print the estimate, an E , and the blank or asterisk as before.
4. If the input indicates a "CONNECTION" only then the only path is by tandem connections. Again follow the formulas below and print the estimated percent blocked, an E, and the blank or asterisk as before.
5. All other situations represent insufficient data so that a percent blocked cannot be estimated. In this case print an "M" to indicate missing data.

## Computational Procedures

The Erlang B Formula is:

where
$a=$ offered load in Erlang's $=\frac{C C S}{36}$
$\mathrm{c}=$ number of trunks in service
$B=$ estimated fraction of calls that would be blocked.
There are two fundamental formulas for the cases of backup and tandem connections. Complex network configurations can be solved by iterative applications of these two fundamental formulas.

1. In the case of a tandem connection, if one tandem office provides the path in the following pattern:
origination tandem termination
$b_{1} \quad b_{2}$
where
$b_{i}=$ fraction blocked on the individual links,
then

$$
\begin{equation*}
B=1-\left(1-b_{1}\right)\left(1-b_{2}\right) \tag{1}
\end{equation*}
$$

where
$B$ is the total fraction blocked from origination to
termination points.
2. In the case of a backup connection the fundamental situation is as follows:

where
$C_{0}=\operatorname{CCS}$ offered to the system
$T_{0}=$ CCS transferred from the primary path
$b=$ fraction blocked on the final path
then

$$
\begin{equation*}
B=\frac{T_{0}}{C_{0}} b^{1} \ldots . \cdot \cdot \cdot . \cdot . \cdot . \cdot . \cdot . \tag{2}
\end{equation*}
$$

where

$$
B=\text { fraction of all traffic blocked in the system. }
$$

Two examples will now be given to demonstrate how these two fundamental formulas may be used iteratively to solve the percent blocked in more complex trunking arrangements.

Example 1: Consider the case of two tandem offices as intermediate points:


Let $B_{1}$ be the percent blocked from origination to tandem 2 and let $B$ be the total blocked, then from equation (1):

$$
B_{1}=1-\left(1-b_{1}\right)\left(1-b_{2}\right)=1-(1-.05)(1-.03)=.0785
$$

and again from equation (1):

$$
B=1-\left(1-B_{1}\right)\left(1-b_{3}\right)=1-(1-.0785)(1-.07)=.143
$$

Example 2: Consider a more complex case involving multiple backup as well as tandem connections.
origination termination

$$
c_{0}=564, T_{0}=212
$$



Let $B_{1}$ be the percent blocked from origination to tandem 1101T, and $B_{2}$ be the percent blocked from origination to termination by the alternate tandem path, and finally let $B$ be the total percent blocked from origination to termination. 1101T, (AF) and (IF) were used here since this is a real configuration commonly found in the Columbus area involving the $1101 T$ tandem office.
Then, from equation (2):

$$
B_{1}=.1\left(\frac{299}{624}\right)=.048
$$

from equation (1)

$$
B_{2}=1-(1-.048)(1-.03)=.07656
$$

and again from equation (2):

$$
B=.07656\left(\frac{212}{564}\right)=.0288
$$

Thus, equation (1) and (2) can be used iteratively to compute the percent blocked between any two points regardless of the actual trunking configuration. The specific configuration between any two central offices can be determined from the information in the "CONNECTION" column and the "CCS TRANS" column of the input data sheets.
OHIO BELL, INC. COLUMFIJS METEO AFEA UFFEF AFLINGTON 481, 48G, 4RE
 INTEFUIFWER

IIA TE

|  | FHONE NO | HOUR | 1. EQUIF. FROF. | 2.CO. FROF. | 3.FATING | $4 . l o c a l ~$ | $5 . L .1$ | 6.FEMARAS | hllality |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 下 |  |  |  | 12345678 | UG G F F |  |  |  | G H XT W |
| R |  |  |  | 12345678 | VG G F F |  |  |  | OHxTH |
| R |  |  |  | 12345678 | UG G F F |  |  |  | G $\mathrm{N} \times \mathrm{T} W$ |
| H |  |  | 123345566788910 | 12345678 | UG GFFF |  |  |  | G is XT H |
| E |  |  | 12234566789910111213 | 1223456678 | UG G F F |  | . |  | 6 H $11 \times 1$ |
|  |  |  | 12234566789810111213 | 12345678 | UG $\quad$ FFF |  |  |  |  |
|  |  |  | 12234546789910111213 | 12345678 | UGGFF |  |  |  |  |







Introduction: HELLO, I'M CALLING FOR THE PUBLIC UTILITIES COMMISSION OF OHIO. WE ARE CONDUCTING AN INSPECTION OF LOCAL TELEPHONE FACILITIES. OUR INVESTIGATION INLCUDES A CUSTOMER SURVEY AND AS PART OF THIS WE NEED SOME INFORMATION FROM YOU.

1. THE FIRST QUESTION INVOLVES THE OPERATION OF YOUR TELEPHONE. THIS PAST WEEK, HAVE YOU HAD PROBLEMS IN PLACING OR RECEIVING TELEPHONE CALLS? (Do not suggest an answer. Classify the customer's response according to the following categories and circle the appropriate codes. You may use more than one.)
Code
Categories
1.......Cut off in the middle of a conversation
2......Late dial tone
3......Slow connections
4.......Busy trunks (fast busy signal)
5......Noise on the line
6......Cross talk
7......Subscribers telephone equipment faulty
8.......Dead line
9.......Intercept
§ $10 \ldots .$. Wrong number
11....... Does not get all incoming calls
12...... Party line equipment problems
13...... Other (Remarks
2. HAVE YOU HAD ANY PROBLEMS WITH THE TELEPHONE COMPANY OR ITS SERVICES? (Instructions are the same as Quest. 1)
Code
Categories
1......Directories
2......Directory assistance
3...... Repair service
4.......Non payment disconnection
5.......Billing
6....... Regrades
7.......New installation
8.......Other (Remarks)
3. CONSIDERING ALL THIS, WOULD YOU RATE YOUR TELEPHONE AS VERY GOOD, GOOD, FAIR, OR POOR?
4. PLEASE ESTIMATE THE NUMBER OF LOCAL CALLS YOU MAKE IN A USUAL DAY. (Classify the response into the following ranges and record the corresponding code number.)

| Code | Range on Number of Local Calls |
| :---: | :--- |
| 0 | NONE |
| 1 | 1 TO 2 CALLS |
| 2 | 3 T0 5 CALLS |
| 3 | 6 T0 10 CALLS |
| 4 | 11 TO 15 CALLS |
| 5 | MORE THAN 15 CALLS |

5. AS A LAST BIT OF INFORMATION THAT WE NEED TO KNOW, PLEASE ESTIMATE THE NUMBER OF LONG DISTANCE CALLS YOU MAKE IN A USUAL WEEK. (Instructions are the same as Quest. 4)
Code Range on Number of Toll Calls"
0 NONE

11 TO 2 CALLS
23 TO 5 CALLS
36 TO 10 CALLS
411 TO 20 CALLS
521 TO 30 CALLS
$6 \quad 31$ TO 50 CALLS
7 MORE THAN 50 CALLS
6. IS THERE ANYTHING ELSE YOU WOULD LIKE TO ADD FOR OUR INFORMATION? (Record in remarks column, if any.)

