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Information for Users of the 1971
Place of Work Data

Municipal User Summary Tape
Information Paper No. 3

*see computer printout
labelled*

POLIREADR

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This paper is one of a series of five on 1971 Place of Work data. Titles of these papers are:

1. Background Information on the 1971 Census Place of Work Data
J.K. Simpson, Research Memorandum, Characteristics Division No. 71-PW-2
- 2 - 4. Information for Users of the 1971 Place of Work Data
 2. "Census Tract Place of Work Data " - H. Puderer, I. Zawadzinski, J.K. Simpson
 3. "Municipal User Summary Tape" - M. Cromie, J.K. Simpson
 4. "C.T. User Summary Tape" - to be released
5. Evaluation of Inconsistencies between CT Data and Municipality Data - to be released.

Copies of these papers are (will be) available from Customer Services Section, Data Dissemination Division, Census Field, Statistics Canada, Ottawa K1S 5A4, telephone 613-996-5254.

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I Introduction

The Place of Work Municipal User Summary Tape (Mun UST) is designed to produce a summary work flow file by municipality for Canada. One record is produced for any pair of points (municipalities) which have a flow of employed labour force between them. The system uses the 1971 Census STATPAK data base as the primary source of data.

These data contain information tabulated from two questions on the 1971 Census 2B Form. These questions were therefore put to the members of every third private household in most parts of Canada, and to each resident 15 years old or over of a collective dwelling.* Question 34 asked "For whom did you work?" with suitable space for a written reply and Question 38 asked "Where do you usually work?" with lines for street, municipality, county and province particulars. For the User Summary Tape, only the Employed Labour Force data were used, as will be described in the following section, page 4.

The UST was created through retrieval of the data collected and mounted on the census data base, which were then summarized to produce flows both to and from each municipality. From this tape, the user extracts the information he wishes, in the format he prefers. A sample FORTRAN program and the accompanying output are described in this document. It must be remembered that this program is only an example, and need not be considered as the only form in which the data can be retrieved from the Tape.

It is possible, of course, to obtain Place of Work data in other forms than the Summary Tape. Individual requests can be made for information directly from the data base. This method also permits cross classification of place of work by such variables as occupation, income or age. However, when simpler labour force flows, and counts at place of work, are requested, it is likely to be less expensive to use the Summary Tape, than to request information from the data base.** Simple tables of in-and outcommuter flows for any given municipality, can be built from the information on the Tape. Distances between places of residence and work are immediately accessible. All municipalities in Canada in which some member(s) of the employed labour force reside or are employed, are included on one Tape.

In the end, it remains up to each potential user to decide individually, after reading this documentation, if a copy of the Tape is desired. An order form is included at the end of the paper.

* Each person's response was weighted so that the complete population could be approximated. A weight is the numerical value assigned to a sample person indicating the number of population persons the sample person represents.

** A cost estimate for an individual request can be obtained from Customer Services Section, Data Dissemination Division, Census Field, Statistics Canada, Ottawa K1S 5A4, telephone 613-996-5254.

The body of this paper is divided into four sections. Section II includes definitions of some terms frequently encountered when using this data and general information about the technical aspects of the Tape(s) themselves. Section III describes in detail the layout and contents of the entire Mun UST. Section IV concentrates on difficult parts of the FORTRAN program used to retrieve information from the Tape. The last Section discusses very briefly the quality of the data.

II Technical Documentation

1. Definitions

(a) Location A and Location B

In describing the UST, municipalities as places of residence and/or places of work are termed Location A and Location B respectively. The census term applied to municipalities is Census Subdivision or (CSD). In actuality, the term CSD covers municipalities, Indian Reserves, unorganized territories and census subdivisions although in practical use it refers primarily to municipalities. The codes used to identify each location in Canada will be described in the next section.

(b) Unique Pair

In this document, reference will be made to the term "unique pair". This is a pair of points (locations) such that persons in the employed labour force reside in one and work in the other. Accordingly, each CSD of residence forms a unique pair with every CSD employing labour which resides in the first CSD. By the same reasoning, each CSD of work forms a unique pair with every CSD containing residents who are employed in the first location. Location A - Location A entries (i.e. live and work in Location A) are considered as unique pairs, as are Location A - Location B when B is either outside Canada or place of work Not Stated. Therefore, referring to Appendix I, Chapel Arm Newfoundland is part of 18 unique pairs.

coded 9260000

(c) Not Stated

coded 9300000

This category results from respondents giving either no information or faulty or incomplete information on the 2B Form, for the Place of Work questions. How this segment of the employed labour force is shown on the Tape, will be described in the next section of this paper. Of the 8,117,380 persons in the 1971 Census Employed Labour Force, approximately 9.2% were coded Place of Work Not Stated. Unfortunately, this category is not evenly distributed throughout the Employed Labour Force. Some groups were more difficult to code than others: for example, construction workers, transport workers and others with no fixed place of work account for a disproportionate share of the Not Stated group (J.K. Simpson, 1974 p. 5).

The Not Stated category includes both those who gave no information for Questions 34 and/or 38 and what are referred to as 'county partials' and 'province partials'. A 'county partial' refers to a province and county designation with no municipality specified. A 'province partial' includes the name of only the province of work.

(d) Employed Labour Force

The employed labour force is comprised of all non-inmates 15 years of age or over, who, during the week prior to enumeration for the 1971 Census, worked for pay or profit or in unpaid family work. It also includes persons who had a job from which they were temporarily absent because of illness, vacation, strike etc. (provided they were not also looking for work). For this second category of persons, the data refers to their 'usual' job, not to the job held in the week before enumeration, as with the first category (from Dictionary of the 1971 Census terms). This category differs therefore from that of the "Experienced Labour Force" which includes both those employed in the week prior to enumeration, and those unemployed who worked since January 1, 1970.

(e) Random Rounding

All census data released outside Statistics Canada is subjected to a confidentiality procedure known as "random rounding". This process prevents the possibility of associating very small figures with any identifiable individual. Under this method all last digits of figures are rounded either up or down to "0" or "5". For example, 233 might be released as either 230 or 235, depending on the random selection by the computer. The same applies to 231 and 234. However, the probability of 231 being rounded to 235 is 1 in 5 while for 234 it is 4 in 5. There is therefore a definite probability but not a certainty, as to whether the rounding of a particular number will be up or down. This process is only applied to the counts of people and not distances travelled, on the UST.

2. Technical Information

The Mun UST is available in several different forms to suit various users' needs. The following options are possible:

<u>File Type</u>	<u>Bytes per Inch</u>	<u>No. of Tracks</u>	<u>No. of Reels</u>
Packed Decimal	1600	9	1
	800	9	1
	800	7	1
	556	7	2
Packed Decimal named*	1600	9	1
	800	9	2
	800	7	2
	556	7	2
External Decimal	1600	9	1
	800	9	2
	800	7	2
	556	7	2
External Decimal named	1600	9	2
	800	9	2
	800	7	2
	556	7	3

* With municipality names (p. 6)

The price for the file is \$55.00 per reel.

The External Decimal Named file, at 1600 bytes per inch is on two reels. However, there is much less on the second reel than is the case for the other options requiring two reels. That is, the second reel contains only some of the entries for British Columbia and all the Northwest Territories and Yukon, plus the end of file 9200000 and 9300000 entries (see p. 14). Therefore, it may be that some users will require only the first reel. When ordering a copy of the Tape, this preference should be clearly specified. At the same time, if a user wants to work with just British Columbia, for instance, this province can be split off the file and placed on one reel, rather than necessitate the purchase of two reels. For all file types that require more than one reel of tape, it would be wise for the user to specify the geographic area for which he is seeking information. In this way, if the area bridges two reels, the appropriate records can be split off and placed on one reel.

In total, there are 143,902 records on the Tape, one for each unique pair of place of residence and place of work. The total includes as unique pairs, Location A-Location B, when B is either Outside Canada or the Not Stated category.

When ordering the Tape, users must specify whether standard labels or no labelling is desired, BCD or EBCDIC character format, and the maximum block size their system can handle.

NO OF CSD'S =

III UST Layout

1. Unique Pairs

An itemization of information contained on the UST for each unique pair, is found in the Record Layout, Figure 1, page 7. The values contained in the last column of this Figure refer to information from the sample retrieval from the UST, of Chapel Arm, Newfoundland and Subdivision E-Heart's Delight, the CSD of work paired (Appendix 1).

This layout is for the External Decimal File with municipality names. Each of the other three file types available have different record layouts that reflect different numbers of fields, field size, positions filled and so on. For example, the External Decimal File with no municipality names, contains the same information in fields 1-3, fields 4-6 are the Location B area identifiers and fields 7-28 contain the labour force data - each field set back by 2 from the External Decimal Named File fields. The correct record layout will be included with each order for a Tape.

The following description of the contents of each of the fields on this record layout, Figure 1, will provide a general indication of the elements a user can access from all the Tapes, with a brief explanation of their meaning.

Fields 1 to 8

These eight fields identify Locations A and B. A seven digit code is used for each location to identify the province, county and municipality. For example, the code for Chapel Arm, Newfoundland is 100105A. Position 1 references the "Standard Region", which refers to one of six broad geographic units created by Statistics Canada, consisting of one province or territory or a group of contiguous provinces or territories. The Regions of Canada are 1. Atlantic Region - Newfoundland, Prince Edward Island, Nova Scotia and New Brunswick; 2. Quebec; 3. Ontario; 4. Prairie Region - Manitoba, Saskatchewan, Alberta; 5. British Columbia; 6. Northern Territories - Yukon and Northwest Territories. Chapel Arm, Newfoundland is therefore coded as belonging to Standard Region 1.

The second digit identifies the province within each Standard Region. Province and Territory codes range from 0 to 9 as indicated below:

- 0 Newfoundland
- 1 P.E.I.
- 2 Nova Scotia
- 3 New Brunswick
- 4 Quebec
- 5 Ontario
- 6 Manitoba
- 7 Saskatchewan
- 8 Alberta
- 9 British Columbia
- 0 Yukon
- 1 Northwest Territories

Hence the "0" in the Chapel Arm code.

Figure 1
Record Layout

<u>Field</u>	<u>Size</u>	<u>Position</u>	<u>Description</u>	<u>Value from Appendix 1</u>
1	2	1-2	LOCATION A: Region, Province Code	10
2	2	3-4	County Code	01
3	3	5-7	Municipality Code	05A
4	28	8-35	Municipality name	CHAPEL ARM LID
5	2	36-37	LOCATION B: Region, Province Code	10
6	2	38-39	County Code	01
7	3	40-42	Municipality Code	32D
8	28	43-70	Municipality name	SUB. E- HEART'S DELIGHT
9	9	71-79	Total employed labour force living at Loc. A	M 115
10	9	80-88		F 35
11	9	89-97	Living at Loc. A working at home	M 30
12	9	98-106		F 20
13	9	107-115	Living at Loc. A working outside Canada	M 5
14	9	116-124		F 0
15	9	125-133	Living at Loc. A Place of work not stated	M 5
16	9	134-142		F 5
17	9	143-151	Living at Loc. A working outside Loc. A	M 80
18	9	152-160		F 10
19	9	161-169	Total employed labour force working at Loc. A	M 145
20	9	170-178		F 95
21	9	179-187	Working at Loc. A living outside Loc. A	M 115
22	9	188-196		F 70
23	9	197-205	Living at Loc. A working at Loc. B	M 0
24	9	206-214		F 0
25	9	215-223	Living at Loc B. working at Loc. A	M 70
26	9	224-232		F 40
27	9	233-241	Weighted average distance Loc. A to Loc. B	0
28	9	242-250	Weighted average distance Loc. B to Loc. A	8
29	5	251-255	Population centroid distance	12
30	3	256-258	Filler	-

The third and fourth positions are the county code. Similar to the preceding two elements, this code starts at 01 in the far south east of Newfoundland and increases in an east to west direction across the province. Chapel Arm lies within county "01".

The last three digits of the location code identify the specific CSD by an alpha-numeric designation. 05A indicates Chapel Arm. Statistics Canada has published Official Lists of which Series I, Part-1a to 1d list every municipality in Canada by county (column one) and by municipality (column two). It is from these listings that the location identifiers are drawn for the UST. The user is referred to page 1, Series I, Part-1a (Atlantic Provinces) for the example of Chapel Arm. The fifth line down lists Chapel Arm as a Local Improvement District under county (Co)01 and Municipal Code 05A01.

This coding system is used to identify every location A and every Location B across Canada. In this layout, fields 4 and 8 contain the municipality name for Locations A and B respectively. As indicated previously, Tapes are available either with or without the name fields.

Fields 9 to 18

These fields contain counts of the various components of the employed labour force resident at Location A, by sex.

Fields 9 to 10

Fields 9 to 10 contain totals for the resident employed labour force, for males and females respectively. In the case of Chapel Arm, there are 115 resident employed males and 35 resident employed females. These figures include those working "At Home".

Fields 11 to 12

Fields 11 and 12 list the number of males and females respectively living at Location A and working At Home.

Fields 13 to 14

The number of people living at Location A but working Outside Canada is indicated in Fields 13 and 14. Diplomats, Armed Forces personnel enumerated abroad and other persons working in foreign places are included in this category.

Fields 15 to 16

Fields 15 and 16 show the number of people living at Location A but whose place of work is not stated. For this designation, respondents to the questionnaire gave either no information at all for the relevant questions, or faulty or incomplete information. More information on this category is found in Section II.

Fields 17 to 18

Fields 17 and 18 indicate the number of people living at Location A but working outside that CSD (commuters). This category includes those working in other CSD's within the same province and those working in other provinces. Thus, it comprises the total number of outcommuters leaving Location A, excluding those working Outside Canada, who are found in a separate category.

Fields 19 to 20

Fields 19 and 20 show the total employed labour force working at Location A, regardless of place of residence, for males and females respectively. These figures include therefore, those working At Home, those persons in the Employed Labour Force resident at Location A and working at Location A, plus all incommuters to Location A.

Fields 21 to 22

These fields include all incommuters to Location A, who reside anywhere in Canada outside Location A.

Fields 23-26

Outcommuters from Location A to a unique Location B (place of work CSD) are identified in Fields 23 and 24. Accordingly, the work flow between this unique pair is determined. It may be that no people travel from A to B, in which case, a zero will be placed in either or both sex categories. The next two fields (25-26) indicate the reverse work flow between the same pair of points. In the case of Chapel Arm - Sub E-Heart's Delight, there are in fact no persons travelling from Chapel Arm to work in Heart's Delight, although 110 persons travel in the reverse direction.

At the same time, because of random rounding, there may actually be no flow indicated in either direction between Locations A-B. The unique pair remains included as part of the Tape, because before random rounding, some flow did exist. The distance values in the next three fields are suppressed when no flow is shown. However, any location that is not part of any in - or outcommuter flow before random rounding, is not found on the Summary Tape at all.

Fields 27 to 28

These fields contain a measure of distance between each unique pair in both directions. The distance is described as a "weighted average". An explanation of this measurement follows.

The smallest statistical unit used in the Census is the Enumeration Area (EA). However, even though place of residence is located to this level, it is obviously necessary to use a representative measure for the actual distances between an individual dwelling and an office, for example. Therefore, a

population centroid (or central point of population concentration) was determined for each Enumeration Area and also one for each larger CSD. It is the distance between these centroids that is used to represent the distance travelled between EA's of residence and CSD's of work. This is a straight line measure, given in integer miles.

Because EA-CSD distance is a more precise measure than CSD-CSD distance, the former is used for the Summary Tape. For each EA in a given CSD of residence, the number of people travelling from the EA to a given work CSD is multiplied by the distance* involved. The sum of the products obtained for each EA of the residence CSD is divided by the total number of people moving between the CSD's to give the weighted average distance. Some of the distance values are 999. This figure represents the distances to CSD's too far from Chapel Arm to warrant actual calculation of the distances.

Because of different numbers of people and different EA-CSD distances, (because of different centroids), distance AB may not equal distance BA. Fields 27 and/or 28 will contain a value of "0" if in fact, there are no people travelling between the particular Locations A and B. There might be a distance for one of the fields and not for the other, because of travel in only one direction.

Field 29

Field 29 contains the unweighted CSD to CSD distance from municipal population centroid to municipal population centroid. These distances, if 100 miles or greater, are assigned code 999, based on a previously selected cut off point.

2. Municipal Groupings

Each of the unique pairs for any given municipality of residence (Location A) has a separate record. These records are on the Tape sequentially, by Location B area codes.

Appendix 2 (page 22) is the first page of a listing, in order of entry, by province, of all municipalities in Canada that appear on the Tape. The number of unique pairs (records) per Location A is given, as is the cumulative total for all preceding municipalities of residence. It can be seen that the last record for Branch L.G.C. (Local Government Community) is the 51st record on the Summary Tape. Consequently, the first record for Chapel Arm as place of residence is the 52nd on the Tape.

* This distance is from EA of residence to CSD of work.

An examination of Figure 2 (page 12), using Chapel Arm (Location A) as an example, should help to clarify the layout of the Tape. Having a code of 100105A, Chapel Arm is the fifth entry in the Official Lists of Newfoundland. There are no persons who live in Chapel Arm and work in any of the four preceding municipalities. However, since there are people who live and work in Chapel Arm, the Location B appearing in Fields 5-8 of the first record for Chapel Arm is Chapel Arm, 100105A. Consecutive Location B's for the following 17 records are listed in numeric order by code until all unique pairs of CSD's are shown. The total of 18 unique pairs for Chapel Arm (see Appendix 1 and Appendix 2) includes a Location B code for those living in Chapel Arm and working Outside Canada (9200000) and one for those living in Chapel Arm whose place of work was Not Stated (9300000). These two categories are identical to those described as fields 13-14 and 15-16 earlier in this Section, as part of each record.

At the 70th (18+51)* record on the file, Location A (Chapel Arm) becomes the next CSD (in terms of Official List code order - i.e. Come-by Chance), and the Location B codes would vary as indicated above.

The entire municipal file may be displayed in a number of different ways. Appendix 1 is a printout directly displaying the elements of Fields 1 to 29 in the simplest manner. Three of the many other forms of data display possible are illustrated by Tables 1, 2, and 3(pp 13-14). Data in these forms were requested through the sample FORTRAN program (Section 1V), which is certainly not the only means available for retrieval from the Tape.

Table 1 presents the static Location A information that is the same for the first 22 fields for all 18 unique pairs for Location A, Chapel Arm. In some cases, the counts for Living and Working in Area (including the At Homes) are less than those for working at Home. This apparent discrepancy is due to the prior random rounding of the next 3 values used to calculate the Living and Working in Area total.

Table 2 shows the flow of outcommuters from Chapel Arm. The destination municipalities have been arranged in descending order of total number of persons commuting from Chapel Arm. An entry for Chapel Arm itself would normally be included here also, unless suppressed as in this Table, in order to present a more accurate picture of the destinations of the people working outside Chapel Arm. The weighted average distances travelled to each of the CSD's are also given.

A similar Table 3 shows the incommuters to the municipality of Chapel Arm from place of origin. Again, the value for Chapel Arm has been suppressed. This value would have been the same as that of the entry Living and Working in Area of Table 1, excluding the At Homes.

* 18 unique pairs for Chapel Arm plus the cumulative total of the records of the unique pairs of the four preceding municipalities.

Figure 2

MunUST Layout

Chapel Arm - Municipality A

Record 52 Fields 1-4 (Loc A) 100105A	Record 53 Fields 1-4 (Loc A) 100105A	Record 54 Fields 1-4 (Loc A) 100105A		Record 68 Fields 1-4 (Loc A) 100105A	Record 69 Fields 1-4 (Loc A) 100105A
Fields 5-8 (Loc B) 100105A	Fields 5-8 (Loc B) 100106A	Fields 5-8 (Loc B) 100113A		Fields 5-7 (Loc B) 9200000	Fields 5-7 (Loc B) 9300000

All Canada UST

Municip A ¹	Municip A ²	Municip A ³		9200000 (Outside Canada)	9300000 (Not Stated)
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Age structure

Table 1

AREA	CHAPEL ARM LID	100105A	
	MALE	FEMALE	TOTAL
RESIDENT EMPLOYED LABOUR FORCE	115	35	150
LIVING AND WORKING IN AREA (INCLUDING AT HOME)	25	20	45
WORKING AT HOME	30	20	50
WORKING OUTSIDE AREA (OUTCOMMUTERS)	80	10	90
WORKING OUTSIDE CANADA	5	0	5
POW NOT STATED	5	5	10
EMPLOYED LABOUR FORCE WORKING IN AREA	145	95	240
LIVING IN AREA	25	20	45
INCOMMUTERS	115	70	185

Table 2

AREA	CHAPEL ARM LID	100105A			
DESTINATION	MALE	FEMALE	TOTAL	DISTANCE	
OUTCOMMUTERS FROM AREA					
100114A	LONG HARBOUR LID	40	5	45	11
100133A	ST JOHN'S	25	0	25	44
100116A	NORMAN'S COVE-LONG COVE	5	5	10	2
100154A	WHITBOURNE T	5	5	10	10
100106A	COME-BY-CHANCE LID	5	0	5	26
100610A	GANDER T	5	0	5	108
100724A	CLARENVILLE T	5	0	5	46
100113A	LAWRENCE POND LID	5	0	5	30
100409A	STEPHENVILLE T	5	0	5	239
101011D	SUB. D. - WEST LABRADOR	5	0	5	999
TOTAL OUTCOMMUTERS (EXCLUDING OUTSIDE CANADA)	105	15	120		

Table 3

AREA		CHAPEL ARM LID				100105A
INCOMMUTERS TO AREA						
ORIGIN			MALE	FEMALE	TOTAL	DISTANCE
100132D	SUB. E - HEART'S DELIGHT		70	40	110	8
480105A	MEDICINE HAT C		40	25	65	999
480108A	REDCLIFF T		5	10	15	999
100132W	SUB. Y - WHITBOURNE		5	5	10	6
462002A	FORT GARRY		5	0	5	999
100133A	ST JOHN'S		5	0	5	44
100106A	COME-BY-CHANCE LID		0	5	5	26
100116A	NORMAN'S COVE-LONG COVE		5	0	5	2
TOTAL INCOMMUTERS			135	85	220	

3. All Canada

At the end of the entire UST, there are again entries for codes 9200000 and 9300000* These entries are for all the municipalities on the Tape, of the people working Outside Canada and of those whose place of work is Not Stated. However, in this case, the 9200000 and 9300000 appear as Location A. Location B's in the case of the 9200000 code are all the CSD's (listed in code order) which have resident employed labour force working Outside Canada. Similarly, Location B's in the case of the 9300000 code are all the CSD's (listed in code order) which have resident employed labour force that did not state a place of work. There will be as many records with this structure as there are CSD's in either category.

* Refer to Figure 2, page 12

IV Assistance to FORTRAN Programmers

The FORTRAN program shown at Figure 3 (pp 17-18) is included in this documentation as an example only.* It provides one means by which data can be extracted from the tape and is not in any way purported to be the most efficient or the only means by which data may be obtained.

The program was run on an IBM 370/165 under OS, requiring 4.20 seconds CPU time. The program extracts data for two areas of Newfoundland, Chapel Arm Local Improvement District and St John's. The output from the program for Chapel Arm is shown as Tables 1, 2 and 3.

Very briefly, the function of the program is to read in data for the control CSD (Chapel Arm), output certain static counts (Table 1), list the destination CSD's of all outcommuters from the control CSD, arranged in descending order by size of flow (Table 2), and list the origin CSD's of all incommuters to the control CSD, in a similar arrangement (Table 3). The weighted average distance between the control CSD and the origin or destination CSD is also shown.

The description of the program which follows is intended to bring out some points that may assist other programmers in extracting data. First, the dimensioning information must allow for the CSD with the maximum number of unique pairs, in this case, St. John's with 250. In addition, the names for Location A or Location B must be read in 7 groups of 4 characters each. Thus, the variable NA representing the Location A name is dimensioned NA (7) and NB, the Location B representation is NB (250,7). The remaining variable names are interpreted as follows. LOC 1 and LOC 2 represent the first six digits of the codes for Location A and B. LOC 1A and LOC 2A are alphanumeric variables representing the alphanumeric portion of the code. The variables K9 - K29 represent the values shown in the fields 9-29 as shown in Figure 1.

Now how to reach the first record for Chapel Arm. Chapel Arm is the fifth CSD on the file and in order to reach the first record for Chapel Arm, 51 records must be read. This is accomplished by the DO statement at line 14 with NST = 51. The DO statement at line 17 reads all 29 fields of the 18 records for Chapel Arm.

Before proceeding further it must be explained that the number of unique pairs for any given CSD and the accumulative total for that CSD is available in a format such as that shown in Appendix 2. A booklet containing the number of unique pairs and cumulative totals for each CSD on the file will accompany each Tape sent to a user.

* Statistics Canada will not accept responsibility for this program run on any other system.

The next point concerns the assignment of values to the variable NU (lines 26-29). Generally, the last two records for any given CSD show a Location B code of 9200000 representing working Outside Canada and 9300000 representing place of work Not Stated. However, if the given CSD has no resident employed labour force working Outside Canada and/or Not Stated, there will be no record for these categories. Thus, NU varies from N to N-2, where N= number of unique pairs for the given CSD.

The purpose of the variable is to exclude the Not Stated and Outside Canada "locations" from the sort procedure and to suppress printing of these two items in the lists of destinations or origins.

The statements contained in lines 30-39 are relatively straight forward since they add male and female values to produce totals and output the data shown at Table 1.

The purpose of SUBROUTINE SORT is to rank origins or destinations in descending order by size of flow. It should be noted that while the sort is actually required only for the total flow, it is necessary to sort the male female values, the name fields and the distance field, so that these variables are kept in step with the variable representing total flow.

Once the sort has been completed and control returned to the main program, the destination list for outcommuters is output and finally an origin list for incommuters is output, in both cases showing totals. Users should be aware that the total values shown in Tables 2 and 3 may be somewhat different from comparable figures shown at Table 1 due to random rounding.

The only other noteworthy feature of the output operation is that in statements number 67 and 86 the final value of the index of the DO statement is given by NU which avoids printing values for Outside Canada and Not Stated. The two IF statements within the range of the DO statements act to suppress printing of 0 values and to suppress printing of values for the control CSD. Without this latter statement, the control CSD would appear as one of the CSD's in the lists of origins or destinations.

One final point concerns the COMPUTED GO TO STATEMENT at line 97. If users wish to extract data for more CSD's they would have to know the correct value of N (number of unique pairs) and calculate new values for NST. Via an Arithmetic Assignment Statement and a Statement No., the additional values for N and NST could be inserted after line 9 in the present program.

Figure 3

FORTRAN IV G LEVEL 20

MAIN

DATE = 75294

17/13/49

PAGE 0001

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C DIMENSION = MAXIMUM NUMBER OF UNIQUE PAIRS
C N = NUMBER OF UNIQUE PAIRS FOR CONTROL CSD
C NST = NUMBER OF RECORDS THAT MUST BE READ TO GET TO FIRST RECORD
C OF CONTROL CSD
C ICON = COUNTER FOR THE COMPUTED GO TO
C ISTOP = CONTROL CARD FOR PRINTING INPUT RECORDS
C IF ISTOP .GT. 0 INPUT RECORDS WILL BE PRINTED
0001 DIMENSION NA(7), NB(250,7), K23(250), K24(250), K25(250), K26(250)
      1, K27(250), K28(250), K29(250), LOC2(250), LOC2A(250),
      23(250), KT25(250), NBK(250,7), LOC2K(250), LOC2AK(250)
      INTEGER TF, TM, TT
      ISTOP = 1
      ICON = 0
0005 C CHAPEL ARM NFLD
      N = 18
      NST = 51
      GO TO 9
0007 C ST JOHN NFLD
      1000 N = 250
      NST = 945
      9 NX = N-1
      NF = 7
      WRITE (3,700)
      IF (NST .EQ. 0) GO TO 19
      DO 10 J = 1, NST
      10 READ (5,900) LOC1
      900 FORMAT (I6)
0017 C NOW READING VALUES FOR CONTROL CSD
      19 DO 20 J = 1, N
      20 READ (5,905) LOC1, LOC1A, (NA(K), K = 1,7), LOC2(J), LOC2A(J), (NB(
      1J,K), K=1,7), K9,K10,K11,K12,K13,K14,K15,K16,K17,K18,K19,K20, K21,
      2K22,K23(J), K24(J), K25(J), K26(J), K27(J), K28(J), K29(J)
0019 905) FORMAT (I6,A1,7A4,I6,A1,7A4,20I9,15)
      C NOW OUTPUTTING INPUT RECORDS
      IF (ISTOP .EQ. 0) GO TO 49
      WRITE (3,700)
      DO 21 L = 1, N
      21 WRITE (3,906) L, LOC1, LOC1A, (NA(K), K = 1,7), LOC2(L), LOC2A(L),
      1(NB(L,K), K=1,7), K9,K10,K11,K12,K13,K14,K15,K16,K17,K18,K19,K20,
      2K21,K22, K23(L), K24(L), K25(L), K26(L), K27(L), K28(L), K29(L)
0024 906 FORMAT (5X,I4,3X, 2(I6,A1,3X,7A4), 19//12X,10I9//12X, 10I9/)
      49 CONTINUE
0026 C NOW CHECKING 92 AND 93 IE NOT STATED AND OUTSIDE CANADA
      IF (LOC2(NX) .EQ. 920000 .AND. LOC2(N) .EQ. 930000) NU = N - 2
      IF (LOC2(N) .EQ. 920000) NU = N -
      IF (LOC2(N) .EQ. 930000 .AND. LOC2(NX) .NE. 920000) NU = N - 1
      IF (LOC2(N) .NE. 920000 .AND. LOC2(N) .NE. 930000) NU = N
0030 C NOW ADDING MALE AND FEMALE FOR TOTALS
      KT9 = K9 + K10
      KT11 = K11 + K12
      KT13 = K13 + K14
      KT15 = K15 + K16
      KT17 = K17 + K18
      KT19 = K19 + K20
      KT21 = K21 + K22
      DO 50 I = 1, N
      KT23(I) = K23(I) + K24(I)
      KT25(I) = K25(I) + K26(I)
      700 FORMAT (IHI)
0041 C NOW OUTPUTTING STATIC INFORMATION
      WRITE (3,700)
      WRITE (3,950) (NA(J), J=1,7), LOC1, LOC1A
      950) FORMAT (25X, 4HAREA, 3X, 7A4, 5X, I6, A1//)
      WRITE (3,952)
      952) FJRMAT (47X, 4HMALE, 5X, 6HFEMALE, 4X, 5HTOTAL//)
0046 C KT50 = ELF LIVING AND WORKING IN THE AREA
      K50 = K9 - (K13 + K15 + K17)
      K51 = K10 - (K14 + K16 + K18)
      KT50 = K50 + K51
      WRITE (3,954) K9,K10,KT9,K50,K51,KT50
      954) FORMAT (5X, 'RESIDENT EMPLOYED LABOUR FORCE', 10X, 3(I7,3X)//,
      114X, 'LIVING AND WORKING IN AREA', 5X, 3(I7,3X))
      WRITE (3,955)
      955) FORMAT (17X, '(INCLUDING AT HOME)//)
      WRITE (3,956) K11, K12, KT11, K17, K18, KT17
      956) FORMAT (20X, 'WORKING AT HOME', 10X, 3(I7,3X)// 14X, 'WORKING
      1OUTSIDE AREA', 11X, 3(I7,3X) / 17X, '(OUTCOMMUTERS)//)
      WRITE (3,957) K13, K14, KT13, K15, K16, KT15
      957) FORMAT (14X, 'WORKING OUTSIDE CANADA', 9X, 3(I7,3X) // 14X, 'POW
      1NOT STATED', 16X, 3(I7,3X)//)
      WRITE (3,958) K19, K20, KT19, K50, K51, KT50, K21, K22, KT21
      958) FORMAT (5X, 'ELF WORKING IN AREA', 21X, 3(I7,3X)// 14X, 'LIVING
      1IN AREA', 15X, 3(I7,3X)// 14X, 'INCOMMUTERS', 20X, 3(I7,3X))
      CALL SORT (N,K23,K24,KT23,K27,NB,LOC2,LOC2A,NF,NBK,LOC2K,LOC2AK,NU
      1)
0060 C NOW OUTPUTTING DESTINATIONS-ORDERED BY SIZE
      WRITE (3,700)
      WRITE (3,950) (NA(J), J=1,7), LOC1, LOC1A
      WRITE (3,970)
      970) FORMAT (5X, 'OUTCOMMUTERS FROM AREA', ///5X, 'DESTINATION', 34X,
      1'MALE', 4X, 'FEMALE', 3X, 'TOTAL', 4X, 'DISTANCE'//)
0064 C NOW CALCULATING TOTAL OUTCOMMUTERS
      TF = 0
      TM = 0
      TT = 0
      DO 975 L = 1, NU
      IF (KT23(L) .EQ. 0) GO TO 975
      IF ((LOC2(L) .EQ. LOC1) .AND. (LOC2A(L) .EQ. LOC1A)) GO TO 975
      TM = TM + K23(L)
      TF = TF + K24(L)
      TT = TT + KT23(L)
      WRITE (3,972) LOC2(L), LOC2A(L), (NB(L,I), I=1,7), K23(L), K24(L),

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Figure 3 - Continued

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FORTRAN IV G LEVEL 20          MAIN          DATE = 75294          17/13/49
0075          WRITE (3,973) TM,TF,TT
0076          973  FORMAT (2X//5X, 'TOTAL INCOMMUTERS', 20X, 3(2X,17))
0077          972  FORMAT (5X,16,A1,3X,7A4, 4(2X,17))
C          NOW GETTING INCOMMUTERS
0078          C
          CALL SORT (N,K25,K26,KT25,K28,NBK,LOC2K,LOC2AK,NF,NB,LOC2,LOC2A,NU
          1)

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FORTRAN IV G LEVEL 20          MAIN          DATE = 75294          17/13/49          PAGE 0003
C          NOW OUTPUTTING ORIGINS
C
0079          WRITE (3,700)
0080          WRITE (3,950) (NA(J),J=1,7),LOC1,LOC1A
0081          WRITE (3,980)
0082          980  FORMAT (5X, 'INCOMMUTERS TO AREA'//5X, 'ORIGIN', 39X, 'MALE', 4X,
          'FEMALE', 3X, 'TOTAL', 4X, 'DISTANCE'//)
C          NOW CALCULATING TOTAL INCOMMUTERS
          TF = 0
          TM = 0
          TT = 0
          DO 977 L = 1,NU
          IF (KT25(L) .EQ. 0 ) GO TO 977
          IF ((LOC2K(L) .EQ. LOC1) .AND. (LOC2AK(L) .EQ. LOC1A)) GO TO 977
          WRITE (3,972) LOC2K(L), LOC2AK(L), (NBK(L,I),I=1,7), K25(L), K26(L)
          1), KT25(L), K28(L)
          TM = TM + K25(L)
          TF = TF + K26(L)
          TT = TT + KT25(L)
          977  CONTINUE
          WRITE (3,974) TM,TF,TT
          974  FORMAT (2X//5X, 'TOTAL INCOMMUTERS', 21X, 3(2X,17))
          ICON = ICON + 1
          GO TO (1000,982),ICON
          982  CONTINUE
          STOP
          END

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FORTRAN IV G LEVEL 20          SORT          DATE = 75294          17/13/49          PAGE 0004
SUBROUTINE SORT (N, KM, KF, KT, KD, NAM, L, LA, NF, NAMK, LK, LAK, NU)
DIMENSION KM(N), KF(N), KT(N), KD(N), L(N), LA(N), LK(N), LAK(N)
DIMENSION NAM(250,7), NAMK(250,7), NENM(1,7)
INTEGER TEMP
DO 50 J = 1,N
DO 45 NA = 1,NF
NAMK(J,NA) = NAM(J,NA)
LK(J) = L(J)
50  LAK(J) = LA(J)
IF (NU .EQ. N) KA = N-1
IF (NU .EQ. (N-1)) KA = N-2
IF (NU .EQ. (N-2)) KA = N-3
KG = KA + 1
DO 12 I = 1,KA ← IP ?
IP = I + 1
DO 12 J = IP,KG
IF (KT(I) .GE. KT(J)) GO TO 12
TEMP = KT(I)
KT(I) = KT(J)
KT(J) = TEMP
TEMP = KF(I)
KF(I) = KF(J)
KF(J) = TEMP
TEMP = KM(I)
KM(I) = KM(J)
KM(J) = TEMP
DO 10 JA = 1,7
NENM(I,JA) = NAM(I,JA)
NAM(I,JA) = NAM(J,JA)
10  NAM(J,JA) = NENM(I,JA)
TEMP = KD(I)
KD(I) = KD(J)
KD(J) = TEMP
TEMP = L(I)
L(I) = L(J)
L(J) = TEMP
TEMP = LA(I)
LA(I) = LA(J)
LA(J) = TEMP
12  CONTINUE
RETURN
END

```

V Data Reliability

Place of work data are derived from the municipalities reported by 1971 Census respondents as their places of work, and are therefore, subject to certain forms of response error.

The "Not Stated" category has been described previously in Section II, page 3.

Another response problem occurred when respondents did not distinguish among existing municipal jurisdictions. For example, two municipalities with similar names (e.g. North Vancouver city and North Vancouver district municipality) may not be differentiated in an individual's mind. This may result in a simple designation of 'North Vancouver' being given or the larger place of the two may be overstated.

Persons also tend to incorrectly identify the central or largest city of the CMA in which they work, as their place of work. For example, a person who works in Scarborough might state 'Toronto' as place of work, rather than the correct component municipality. Consequently, data for the largest cities of census metropolitan areas (CMA) and census agglomerations (CA) tend to be inflated at the expense of counts for some of the remaining municipalities. At the same time, those with clearly identifiable boundaries tend to be well-reported or even overstated, often resulting in understatement of newer and suburban fringe areas.

A more detailed account of the reliability of the place of work data is found in J.K. Simpson's paper, referenced at the end of this documentation.

There are however, certain other anomalies in the Place of Work data. Flows may be shown between two locations that are far apart spatially. One explanation for these seemingly improbable commuter flows stems from the question itself on the 1971 Census 2B Form. Place of Work data were requested for the job held in the week prior to enumeration. Accordingly, those individuals who changed their place of residence during that week would state their new location as Place of Residence and the location of their job the previous week, as Place of Work. This explanation usually applies to small flows.

Other, less easily explained inconsistencies are the result of various errors that can occur between the respondent filling in his questionnaire form, a clerk coding these responses, the original forms being micro-filmed and the data mounted on the data base. These processes, when applied to some 120 data characteristics and many millions of respondents, naturally results in some error. Also, error that does not appear in straight counts of static labour force characteristics may show up in these presentations of residence - work place flows.

It would appear that some form of processing error has occurred in the Medicine Hat - Chapel Arm unique pair. Table 3, page 14 and Appendix 1 show 65 persons living in Medicine Hat Alberta and working in Chapel Arm Newfoundland. An examination of the original questionnaires reveals that in fact, this was not the case. However, the place name codes for these two municipalities are 80105 and 00105 respectively. It is quite possible that a consistent coding mistake in the first digit of these codes, gave some residents of Medicine Hat a work place of Chapel Arm instead of their home municipality. It is not possible to individually check each entry on the Tape for errors that occur before the data are even mounted on the data base. It remains therefore, for the user to carefully examine possible economic, employment or demographic factors that could result in observed data peculiarities, and if no explanation seems viable, to assume a coding or processing error in the original mounting of the data.

Appendix 1

1	100105A	CHAPEL ARM LID		100105A	CHAPEL ARM LID		115			
	35	30	20	5	0	5	5	80	10	145
	95	115	70	5	5	5	5	1	1	6
2	100105A	CHAPEL ARM LID		100106A	COME-BY-CHANCE LID		115			
	35	30	20	5	0	5	5	80	10	145
	95	115	70	5	0	0	5	26	26	26
3	100105A	CHAPEL ARM LID		100113A	LAWRENCE POND LID		115			
	35	30	20	5	0	5	5	80	10	145
	95	115	70	5	0	0	0	30	0	30
4	100105A	CHAPEL ARM LID		100114A	LONG HARBOUR LID		115			
	35	30	20	5	0	5	5	80	10	145
	95	115	70	40	5	0	0	11	0	11
5	100105A	CHAPEL ARM LID		100116A	NORMAN'S COVE-LONG COVE		115			
	35	30	20	5	0	5	5	80	10	145
	95	115	70	5	5	5	0	2	2	2
6	100105A	CHAPEL ARM LID		100132D	SUB. E - HEART'S DELIGHT		115			
	35	30	20	5	0	5	5	80	10	145
	95	115	70	0	0	70	40	0	8	12
7	100105A	CHAPEL ARM LID		100132W	SUB. Y - WHITBOURNE		115			
	35	30	20	5	0	5	5	80	10	145
	95	115	70	0	0	5	5	0	6	5
8	100105A	CHAPEL ARM LID		100133A	ST JOHN'S		115			
	35	30	20	5	0	5	5	80	10	145
	95	115	70	25	0	5	0	44	44	44
9	100105A	CHAPEL ARM LID		100154A	WHITBOURNE T		115			
	35	30	20	5	0	5	5	80	10	145
	95	115	70	5	5	0	0	10	0	10
10	100105A	CHAPEL ARM LID		100409A	STEPHENVILLE T		115			
	35	30	20	5	0	5	5	80	10	145
	95	115	70	5	0	0	0	239	6	999
11	100105A	CHAPEL ARM LID		100610A	GANDER T		115			
	35	30	20	5	0	5	5	80	10	145
	95	115	70	5	0	0	0	108	0	999
12	100105A	CHAPEL ARM LID		100724A	CLARENVILLE T		115			
	35	30	20	5	0	5	5	80	10	145
	95	115	70	5	0	0	0	46	0	46
13	100105A	CHAPEL ARM LID		101011D	SUB. D - WEST LABRADOR		115			
	35	30	20	5	0	5	5	80	10	145
	95	115	70	5	0	0	0	999	0	999
14	100105A	CHAPEL ARM LID		462002A	FORT GARRY		115			
	35	30	20	5	0	5	5	80	10	145
	95	115	70	0	0	5	0	0	999	999
15	100105A	CHAPEL ARM LID		460105A	MEDICINE HAT C		115			
	35	30	20	5	0	5	5	80	10	145
	95	115	70	0	0	40	25	0	999	999
16	100105A	CHAPEL ARM LID		480108A	REDCLIFF T		115			
	35	30	20	5	0	5	5	80	10	145
	95	115	70	0	0	5	10	0	999	999
17	100105A	CHAPEL ARM LID		9200000			115			
	35	30	20	5	0	5	5	80	10	145
	95	115	70	5	0	0	0	0	0	0
18	100105A	CHAPEL ARM LID		9300000			115			
	35	30	20	5	0	5	5	80	10	145
	95	115	70	5	5	0	0	0	0	0

Appendix 2

CODE	NAME	NO. PAIRS	ACCUMULATIVE TOTAL
PR CTY CSD			
10 01 01A	ADMIRALS BEACH LGC	7	7
10 01 02A	ARNOLD'S COVE	18	25
10 01 03A	BISHOP'S COVE	15	40
10 01 04A	BRANCH LGC	11	51
10 01 05A	CHAPEL ARM LID	18	69
10 01 06A	COME-BY-CHANCE LID	44	113
10 01 07A	FERMEUSE LGC	13	126
10 01 08A	FOX HARBOUR LGC	15	141
10 01 09A	GASKIERS LGC	14	155
10 01 10A	HANT'S HARBOUR	9	164
10 01 11A	HARBOUR MAIN LGC	15	179
10 01 12A	HEART'S CONTENT	19	198
10 01 13A	LAWRENCE POND LID	9	207
10 01 14A	LONG HARBOUR LID	41	248
10 01 15A	MOUNT CARMEL-MITCHELLS BROOK	16	264
10 01 16A	NORMAN'S COVE-LONG COVE	19	283
10 01 17A	NORTH RIVER LGC	10	293
10 01 18A	PETTY HARBOUR LID	14	307
10 01 19A	PORT KIRWIN LGC	5	312
10 01 20A	PORTUGAL COVE SOUTH LGC	6	318
10 01 22A	RENEWS LGC	10	328
10 01 23A	RIVERHEAD LGC	11	339
10 01 24A	ST JOHN'S AREA	59	398
10 01 25A	ST JOSEPH'S	10	408
10 01 26A	ST MARY'S	12	420
10 01 27A	ST SHOTT'S	12	432
10 01 28A	SOUTHERN HARBOUR LID	15	447
10 01 29A	SUNNYSIDE LID	18	465
10 01 30A	WEDGEWOOD PARK LID	6	471
10 01 32A	SUB. A - ISTHMUS OF AVALON	38	509
10 01 32B	SUB. B - PLACENTIA	44	553
10 01 32C	SUB. C - ST. BRIDE'S	12	565
10 01 32D	SUB. E - HEART'S DELIGHT	44	609
10 01 32E	SUBD. F - NEW PERLICAN - WIN	23	632
10 01 32F	SUBD. G - NORTH SHORE OF CON	33	665
10 01 32G	SUB. H - CARBONEAR	30	695
10 01 32H	SUB. I - HARBOUR GRACE	16	711
10 01 32I	SUB. J - SPANIARD'S BAY	11	722
10 01 32J	SUB. K - BAY ROBERTS	11	733
10 01 32K	SUB. L - PORT DE GRAVE	20	753
10 01 32L	SUB. M - CLARKE'S BEACH	24	777
10 01 32M	SUB. N - BRIGUS	13	790
10 01 32N	SUBD. O - HEAD OF CONCEPTION	40	830
10 01 32O	SUB. P - KELLI GREWS	37	867
10 01 32P	SUB. R - BELL ISLAND	15	882
10 01 32Q	SUBD. 'S - ST. JOHN'S EAST EX	27	909
10 01 32R	SUB. T - BAY BULLS	15	924
10 01 32S	SUB. U - SOUTHERN SHORE	25	949
10 01 32T	SUB. V - TREPASSEY BAY	2	951
10 01 32U	SUB. W - ST. MARY'S	27	978
10 01 32V	SUB. X - COLINET	20	998
10 01 32W	SUB. Y - WHITBOURNE	16	1,014
10 01 33A	ST JOHN'S	250	1,264
10 01 34A	BAY DE VERDE T	11	1,275
10 01 35A	BAY ROBERTS T	43	1,318
10 01 36A	BRIGUS T	19	1,337

REFERENCE

Simpson, Keith - Background Information on the 1971 Census Place of Work Data, Statistics Canada, Characteristics Division, "Research Memorandum No. 71-PW-2", Nov. 1974.