THE DEVELOPMENT OF A FULLY AUTOMATED
PROCEDURE TO PRODUCE A TECHNOLOGY TRANSFER
DIRECTORY OF PEOPLE TO FACILITATE THE
LINKER FUNCTION IN THE TECHNOLOGY
TRANSFER PROCESS.

Richard Walter Modrowski

NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

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by

Richard Walter Modrowski

and

Michael Milton Henderson

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Thesis Advisor: J. W. Creighton

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The process of Technology Transfer is dependent on personal communication between individuals knowledgeable in new technology and who are willing to share this knowledge with others for the purpose of increasing the benefits to mankind. This work facilitates the communication process by developing a fully automated system to produce a directory listing of people who comprise this category. Furthermore, the system's computer programs constitute a model by which the process of gathering, storing, extracting

20. (continued)

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by

Richard Walter Modrowski
Lieutenant Commander, Supply Corps, United States Navy
B.A., University of Notre Dame, 1965

and

Michael Milton Henderson
Captain, United States Marine Corps Reserve
B.A., University of California, 1969

Submitted in partial fulfillment of the
requirements for the degree of

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from the

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information is made possible.

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I. INTRODUCTION

It was never necessary to reinvent the wheel; still it has been done many times. Recently there has been a widespread recognition of the benefits that can accrue from the utilization of available information. Many organizations, including the Federal Government, are constantly looking for means of improving information flow and exchange. Documentation, search facilities, and distribution channels are significant elements contributing to the movement of technical information from the source to the user. However, the movement process is supported primarily by individuals who facilitate the flow of information by a linking function, which is often the catalyst that causes the implementation of an innovation. The Linker is the prime ingredient in the process of technology transfer. He is the intermediary between the source of knowledge and its application. The Linker need not be a third party but rather may be, and most often is, incorporated in the supplier or user environment. Wherever the Linker is situated, one common characteristic stands out: he is an individual who tends to take the initiative on his own behalf to seek out scientific knowledge and to further expose that knowledge to potential users that might find it applicable in their current endeavor.

The objective of this thesis is to facilitate the linker function in the technology transfer process through the development of a fully

automated procedure to produce a Technology Transfer Directory of People.

Section II will provide some insight and background to the technology transfer process with emphasis on the need for personal contact. Section III will provide the history of the Technology Transfer Directory of People. Section IV will detail the analysis performed on the original system used to produce the directory and will identify the deficiencies and problems encountered. Section V will describe the methodology utilized to develop a fully automated system and correct the existing deficiencies. Section VI will draw conclusions concerning the benefit and interest in the directory and will make recommendations for future system enhancements and utilization. Finally, a statistical analysis of the benefit and interest in the directory, an addendum to the 1977 directory, and a system user's guide will be presented in appendices A thru E.

II. TECHNOLOGY TRANSFER PROCESS

A. RECENT ADVANCEMENTS

The technological advancements of the past two decades have been
significant. In the medical field, transplants of human organs and use
of animal organs have become a common place occurrence. Vaccines
for rubella and polio have almost entirely eliminated these dreaded
diseases. Cancer research and the development of the pacemaker have
been instrumental in prolonging human life. In the electronics field,
the development of the solid state transistor, laser beam, communica-
tion satellites, minicomputers, including the hand held calculator and
microwave ovens, have enhanced our way of life. The energy crisis
was a catalyst to the development of new fuels from waste matter,
increased utilization of nuclear and solar energy and the emergence
of more efficient power plants. Advancements in the aviation field
have had the effect of shrinking the world with the Boeing 747, Lockheed
L1011 and the British Concord. The threat of a diminishing food supply
has been removed with the evolvement of new farming techniques in-
cluding the use of the oceans.

Notwithstanding the significance of the foregoing technological
achievements, undoubtedly the one area most responsible for public
recognition of advanced technology has been the space program. Just
over twenty years ago we entered the space age with the successful

launching of the Soviet Union's first Sputnik. Less than ten years ago

the United States, after several manned orbital flights, placed the first

man on the moon. Today these achievements continue with orbiting

space laboratories and space probes to other planets.

B. TECHNOLOGY TRANSFER BENEFITS

What benefits, other than the knowledge that another frontier had

been conquered, has society received from the billions of dollars

expended on the space program? Unlike previous benefits to mankind,

e.g., radar, commercial jet engines and nuclear power resulting from

World War II military R & D, critics of the space program claimed it

was too exotic to have many uses here on earth [Harvard Business

Review, 1964, p. 108]. However, the space program has provided

more than its share of new technology successfully transformed into

everyday useful applications. Among these are:

1. A plasma arc torch has been developed for fabricating ultra-
   hard materials and coatings by mass production methods.

2. Medical research and our health problems can use such
   things as film resistance thermometers. Electronic equip-
   ment capable of measuring low level electrical signals is
   being adapted to measure body temperatures and blood
   flow. In a dramatic breakthrough it has been found that a
   derivative of hydrogen, developed as a liquid missile pro-
   pellant, is useful in treating certain mental illnesses and
   tuberculosis.

3. Ground-to-air missiles that ride a beam to their targets
   must measure the distance to the target plane with an
   accuracy of a few feet in several miles. This principle is
   now applied to surveying techniques.

4. Silicone for motor insulation and subzero lubricants is used in new glass making techniques for a myriad of products.

5. Heat resistant materials used to coat missile nose cones are now used in cookware and smoking pipes.

6. Automatic gun cameras are now used in banks, retail stores and toll booths.

7. Fluxless aluminum solder is now used for kitchen utensil repairs, gutters, flashings, antennas, electrical joints, automobile repairs, etc.

8. Satellite scan devices are used in infrared appliances, e.g., lamps, roasters, ovens, switches, etc.

9. Missile accelerometers, torquemeters, strain gage equipment are used in auto crash tests, motor testing, shipbuilding and bridge construction.

10. Automatic control components are used in proximity switches, plugs, valves, cylinders; other components are already an integral part of industrial conveyor systems. [Bauer, p. 159].

How did this specialized technology, developed for an exotic space program, find its way into commercial application? Did it spin off or drop out automatically as was envisioned would happen when the space program began? No, it occurred through a complicated process known as technology transfer.

C. TECHNOLOGY TRANSFER CONCEPT

The concept of technology transfer is not a simple one to define, for the meaning of the phrase seems to depend on the audience considering it and the point in time. Furthermore, the process is known by several names, e.g., technology utilization, technology exchange,

technology redistribution, technology diffusion, etc. By whatever name it is known, the meaning of this transfer process, as it is used here, is understood to be the movement or passing of information and knowledge from one application, directly or indirectly, to another application. This movement of information can occur either vertically, within interacting institutions, or horizontally, from one type of institution to another.

According to Professor J. W. Creighton of the Naval Postgraduate School, technology transfer is primarily a people thing. If left on its own, new technology requires approximately twenty five years to spread to other fields. Professor Creighton's position is supported by Samuel I. Doctors who stated that the innovators responsible for turning knowledge into products, processes, and services are oriented toward internal communications within their own organizations rather than toward their external professional communities; their communication processes, because they are not documented, are not easily available for study by outside scholars [Doctors, p. IX]. In the Department of Defense User Needs Study, for example, a survey of engineers and scientists in the laboratories of industrial defense contractors indicated that in five out of seven cases in which it was necessary to search for information, the man first consulted a source within the company or his own or departmental files. "Project Hindsight," a Defense Department study of the origin of information and ideas that were important

in the development of twenty successful weapons systems, illustrated
that in 70% of the cases, personal contact was the medium by which
the information was introduced into the using organization [Rosenbloom,
p. 14]. Therefore, the process of technology transfer implies more
than the mere dissemination of technical information; it implies the
necessity for active participation by a transferor and a transferee.
It was this recognition that led students of Professors Jolly and
Creighton at the Naval Postgraduate School, to embark on a project
that resulted in the creation of a TECHNOLOGY TRANSFER DIRECTORY
of PEOPLE.

III. HISTORY OF THE TECHNOLOGY TRANSFER DIRECTORY

The first Technology Transfer Directory of People was published in October 1975. The idea for the directory emerged from discussions between Professors Creighton and Jolly of the Naval Postgraduate School and Mr. Harold Metcalf, head of the Federal Laboratories Technology Transfer Consortium at one of the Consortium meetings in October 1973. The Consortium is a voluntary organization and has been established to coordinate the technology transfer efforts of its members. A better understanding of the goals and objectives of the Consortium can be found in its operating policy stated below:

> "The Department of Defense laboratories are a source of technology for the solution of those civil sector problems which are amenable to technological solutions. The primary role of the in-house laboratories is to provide a research and development base for the development of systems required to fulfill the national security mission of the Department of Defense. However, these laboratories can serve a vital secondary role in the adaption of technology to other fields and areas of need to the extent that it does not adversely impact on the primary Department of Defense mission. A consortium of Department of Defense laboratories is formed for the purpose of coordinating interactions with other federal agencies and technology users at the federal, state, and local level, and of coordinating the efforts in this endeavor. The Technology Transfer Consortium is an association of Department of Defense laboratories working together through an informal affiliation. The main thrust of the consortium activity is through the individual and cooperative efforts of the laboratories involved with the emphasis on the transfer and adaption of technology through person-to-person mechanism." [Journal of Technology Transfer, 1976, p. 110]

The discussion between Professors Creighton and Jolly and Mr. Metcalf was centered on the person-to-person mechanism of the technology transfer process and basically around the possible need for a listing or directory of individuals, other than members of the Consortium, who would be willing to communicate with others in fields of similar interests. Another attendee at the Consortium meeting was Mr. Richard Stone of the National Science Foundation who agreed that such a need may exist and indicated that the Foundation would be willing to fund such a project.

Early the following year, Professors Creighton and Jolly discussed this project with students in their Technology Transfer course. The primary objective of the course is to provide the students with an appreciation of the benefits that can be obtained through the technology transfer process, specifically with regard to military R & D efforts, and to enhance their capabilities to innovate and bring about change. One of the Technology Transfer course students, J. W. Gilroy, decided to perform a market survey to determine the degree of interest in the type of directory proposed. Although no documentation of Gilroy's survey exists, Professors Creighton and Jolly indicated that the results showed sufficient interest to justify further efforts on the project [Creighton, 1978] [Jolly, 1978].

Later that year, Professor Jolly incorporated the aid of another student at the Naval Postgraduate School, J. T. Nededog, and together

Office for Technology
    Utilization and Movement Studies
Code 55Jo Naval Postgraduate School
Monterey, California 93940

Please include my name and address in the OTUMS DIRECTORY of persons interested in the processes, concepts, framework and/or methodology of technology movement, dissemination, transfer and/or utilization. I understand that the OTUMS DIRECTORY will be distributed by NSF/NPS to those persons whose names appear in the OTUMS DIRECTORY.

My areas of interest and expertise are: NAME:- -
    Interest areas from Code Sheet

                                        ADDRESS: - - - - - - - - - - - - - - - - - - -

        Expertise areas from Code Sheet

                                        Signature: . . . .

Figure 1.   Original Invitation/Authorization Form

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they developed the format for the directory and designed the system to process the data and prepare the manuscript. To accumulate the required data for the directory, Nededog designed an invitation form (figure 1) and sent it to persons whose names had been provided by Professors Creighton and Jolly. These names were acquired from various sources but they were all individuals known to be interested in the process of technology transfer. While awaiting the responses to the invitations, Nededog solicited the assistance of a computer science student at the Postgraduate School to write the necessary programs to process the data upon its receipt. Once the over 2000 responses began arriving, Nededog and his wife, Carmen, set upon the tedious task of sorting, keypunching and filing the 6000 cards (three per record) and eventually the first directory was published and distributed in October 1975.

The first directory contained an OTUMS (Office of Technology Utilization and Movement Study) Directory Acknowledgement Form (figure 2) which provided the first recipients with an opportunity to comment, criticize and/or recommend future improvements to the directory. Several months after the initial distribution of the directory, the OTUMS forms started to be returned and Professor Jolly compiled statistics concerning the benefit and interest in the first directory. The analysis (Appendix A) strongly supported the argument that the directory was useful to scientists, engineers and managers.

OTUMS DIRECTORY

Document Acknowledgement

PLEASE ANSWER THE FOLLOWING QUESTIONS AND/OR PROVIDE ANY COMMENT DESIRED:

1. The OTUMS Directory was received on _____ and will become a permanent source of reference

   in the _____
   (Name of office, Agency, Library, Institute, etc.)

2. How would you rate the general value of the information provided in the directory?

   ☐ EXCELLENT   ☐ FAIR

   ☐ GOOD   ☐ POOR

3. Will the information in the directory be of assistance to you in administering your programs?

   YES

   YES, But _____

   NO

4. To what extent can this directory be useful in terms of getting information on

	HIGHLY USEFUL	SOMEWHAT USEFUL	NOT USEFUL
a. New Research and development (R&D) management mechanisms.......	☐	☐	☐
b. Existing research and development (R&D)........................	☐	☐	☐
c. Technology dissemination, Transfer and Utilization............	☐	☐	☐

5. What change(s) would you recommend for improving this directory?

   a. FORMAT:

   b. CONTENT:

6. General comments:

7. Do you desire a copy of the first revision to this directory which will be published in 1976?

   ☐ YES   ☐ NO

8. In the interest of providing better and easier identification of each individual's expertise areas, revised Codes will be used starting with the first revision. If you desire your name listed in the revised directory, please complete the following. Use the revised Codes on the opposite page for identifying your areas of interest and expertise:

AREAS OF INTEREST Please check appropriate blocks.				AREA OF EXPERTISE			OCCUPATION
A	B	C	0				
☐	☐	☐	☐	☐	☐	☐	☐

YOUR NAME:_____ ORGANIZATION:_____

ADDRESS: _____ ADDRESS:_____

CITY:_____ STATE:_____ ZIP:_____

TELEPHONE: _____ AREA CODE:_____

_____
(SIGNATURE)

Figure 2.   Document Acknowledgement Form

Furthermore, the responses supported the publication of a revised directory which was to incorporate several changes recommended by the initial recipients.

Once again students at the Naval Postgraduate School provided the manpower for the accumulation of data and subsequent printing of the revised directory. Robert Steidle and William Green issued new invitations for listing in the revised directory to the original recipients and also to the numerous individuals who sent letters or telephoned requesting a copy of the directory and an opportunity to be listed in future issues. Meanwhile, the OTUMS forms continued to be received with comments concerning the usefulness of the directory and additional recommendations for its improvement. Steidle and Green performed an analysis similar to Professors Creighton and Jolly (Appendix B) which solidified the benefit and interest in the directory and supported its continued publication.

IV. SYSTEM ANALYSIS

The emphasis of the system analysis concentrated on the need to reduce the clerical effort required to maintain the data base and produce the directory. The original system was designed to accept data, process it and produce a directory. Its originators, handicapped by unknown factors, lack of time and limited resources, managed to develop a system to fulfill all the anticipated requirements at the time and as a first time effort, it proved to be more than adequate for its intended purpose. Much to their credit, the interest and acceptance of the directory rapidly outgrew the system they designed. This is a compliment to their initiative and efforts.

The widespread interest in the first revision to the 1975 Technology Transfer Directory of People created an obstacle to its publication. The continuous receipt of up to ten or more signed invitation/authorizations each day resulted in delaying the publication of the directory. The inclusion of an invitation/authorization form in the first directory significantly contributed to this problem since individuals who casually picked up the directory could and did send in the form at any time.

Steidle and Green graduated in June of 1977. The authors of this thesis then accepted the responsibility of processing the outstanding authorizations and preparing the manuscript for printing. It was during

this time that the limitations in the original system became evident
and the need to reduce clerical efforts recognized.

A. DATA BASE LIMITATIONS

The initial distribution of invitations to be listed in the revised
directory was made in January 1977. By late June, some 1400 authoriza-
tions had been received and processed. Another 368 authorizations had
been received but not yet processed while more were being received
each day. Moreover the directory was not scheduled to be printed for
an additional three months. This lengthy time period, from distribution
of the invitations to printing of the directory, was responsible for some
of the information subsequently placed in the directory being outdated
and therefore inaccurate. The problem was compounded by the fact
that there was no existing procedure to identify and correct errors in
the data base either before or after printing. Additionally, there was
no procedure to include those hundreds of individuals who could not
be included in the directory due to late receipt of their authorization
forms.

1. The Authorization Form

The data base for the directory was established from a signed
authorization form, figure 3. Several problems were encountered in
extracting information from the authorization form and applying it to
the data base.

OTUMS DIRECTORY

Document Acknowledgement

PLEASE ANSWER THE FOLLOWING QUESTIONS AND/OR PROVIDE ANY COMMENT DESIRED:

1. The OTUMS Directory was received on _____ and will become a permanent source of reference

   in the _____
   (Name of office, Agency, Library, Institute, etc.)

2. How would you rate the general value of the information provided in the directory?

   ☐ EXCELLENT   ☐ FAIR

   ☐ GOOD   ☐ POOR

3. Will the information in the directory be of assistance to you in administering your programs?

   YES

   YES, But _____

   NO

4. To what extent can this directory be useful in terms of getting information on

	HIGHLY USEFUL	SOMEWHAT USEFUL	NOT USEFUL
a. New Research and development (R&D) management mechanisms.......	☐	☐	☐
b. Existing research and development (R&D)........................	☐	☐	☐
c. Technology dissemination, Transfer and Utilization............	☐	☐	☐

5. What change(s) would you recommend for improving this directory?

   a. FORMAT:

   b. CONTENT:

6. General comments:

7. Do you desire a copy of the first revision to this directory which will be published in 1976?

   ☐ YES   ☐ NO

8. In the interest of providing better and easier identification of each individual's expertise areas, revised Codes will be used starting with the first revision. If you desire your name listed in the revised directory, please complete the following. Use the revised Codes on the opposite page for identifying your areas of interest and expertise:

AREAS OF INTEREST Please check appropriate blocks.				AREA OF EXPERTISE	OCCUPATION
A	B	C	D		
☐	☐	☐	☐	☐ ☐ ☐	☐

YOUR NAME: _____ ORGANIZATION: _____

ADDRESS: _____ ADDRESS: _____

CITY: _____ STATE: _____ ZIP: _____

TELEPHONE: _____ AREA CODE: _____

_____
(SIGNATURE)

Figure 3. Authorization Form

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a.   Record Length

The data base is maintained on magnetic tape: input by three separate eighty column data processing cards for each individual record.   Specific information is limited to the length of the field on the data processing card allocated for it, e.g., card 1, columns 29 through 63 are allocated to the first line of a three line address.   The authorization form did not specify where the first line of the address was to be listed nor the maximum length it could be.   Therefore, when the first line of the address exceeded the maximum characters, abbreviations had to be employed.   Since several individuals key-punched the information, the abbreviations were not always consistent nor accurate.

b.   Correct Address Identification

The authorization form contained two lines titled "address," but only one city, state, and zip code line.   It is assumed that the in-tent was to have the respondent indicate his home and/or business ad-dress.   However, if both address lines were completed, as occurred in over 18% of the cases, it could not be certain which was appropriate to the city, state, and zip code line.   The problem was most acute for those whose place of employment was Washington, D.C. but who lived in Virginia or Maryland.   Furthermore, the respondent often used both address lines to complete a four line address which created another problem because often the organization was a necessary part of the

address and therefore it constituted a fifth line. Finally, if both address lines were completed, it could never be ascertained which address the respondent desired listed in the directory.

c. Foreign Address Identification

The authorization form was designed to accommodate the American respondent with an address in the United States; however, 102 respondents resided in foreign countries. Frequently, it was extremely difficult to determine the full and proper address of these individuals to insure receipt of correspondence and the directory itself.

d. Area of Expertise Codes

The invitations for listing in the first directory contained 83 two digit codes (figure 4) to indicate the individual's areas of expertise. These two digit codes were quickly recognized as inadequate and therefore a new code sheet containing 64 three digit area of expertise codes to be cross referenced with 52 three digit occupation codes (figure 5) was developed and included in the directory for future respondents. These revised codes also proved inadequate. There were 1809 respondents for the first revision to the directory, of these, 313 provided either an occupation and/or area of expertise which was not codified, thereby reducing the value of these individuals being listed in the directory.

e. Area of Interest Codes

The authorization form contained four blocks identified as areas of interest and coded A, B, C, D. These blocks, when checked

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Code sheet for OTUMS Directory of Persons Interested in
TECHNOLOGY UTILIZATION and MOVEMENT

AREAS OF INTEREST

Code 10   Where and how to find available technology.
Code 20   Examples and cases of new uses for existing technology.
Code 30   Research activity concerning methods of increasing the use of technology.
Code 40   Research activity concerning technology movement, dissemination, and/or transfer.

- - -- - - - - - - - -- -
AREAS OF EXPERTISE (Two digit SIC Code)

AGRICULTURE, FORESTRY, and FISHING
01   Agricultural production-crops
02   Agricultural production-livestock
07   Agricultural services
08   Forestry
09   Fishing, hunting, and trapping
MINING
10   Metal mining
11   Anthracite mining
12   Bituminous coal and lignite mining
13   Oil and gas extraction
14   Nonmetallic minerals, except fuels
CONSTRUCTION
15   General building contractors
16   Heavy construction contractors
17   Special trade contractors
MANUFACTURING
20   Food and kindred products
21   Tobacco manufactures
22   Textile mill products
23   Apparel and other textile products
24   Lumber and wood products
25   Furniture and fixtures
26   Paper and allied products
27   Printing and publishing
28   Chemicals and allied products
29   Petroleum and coal products
30   Rubber and misc. plastics products
31   Leather and leather products
32   Stone, clay, and glass products
33   Primary metal industries
34   Fabricated metal products
35   Machinery, except electrical
36   Electric and electronic equipment
37   Transportation equipment
38   Instruments and related products
39   Miscellaneous manufacturing industries
TRANSPORTATION AND PUBLIC UTILITIES
40   Railroad transportation
41   Local and interurban passenger transit
42   Trucking and warehousing
43   U.S. Postal service
44   Water transportation
45   Transportation by air
46   Pipe lines, except natural gas
47   Transportation services
48   Communications
49   Electric, gas, and sanitary services

WHOLESALE TRADE
50   Wholesale trade-durable goods
51   Wholesale trade-nondurable goods
52   Building materials +garden supplies
53   General merchandise stores
54   Food stores
55   Automotive dealers + service stations
56   Apparel and accessory stores
57   Furniture and home furnishing stores
58   Eating and drinking places
59   Miscellaneous retail
FINANCE, INSURANCE, and REAL ESTATE
60   Banking
61   Credit agencies other than banks
62   Security, commodity brokers + services
63   Insurance carriers
64   Insurance agents, brokers + service
65   Real estate
66   Combined real estate, insurance, etc.
67   Holding and other investment offices
SERVICES
70   Hotels and other lodging places
72   Personal services
73   Business services
75   Auto repair, services, and garages
76   Miscellaneous repair services
78   Motion pictures
79   Amusement + recreation services
80   Health services
81   Legal services
82   Educational services
83   Social services
84   Museums, botanical, zoological gardens
86   Membership organizations
88   Private households
89   Miscellaneous services
PUBLIC ADMINISTRATION
91   Executive, legislative, and general
92   Justice, public order, and safety
93   Finance, taxation + monetary policy
94   Administration of human resources
95   Environmental quality and housing
96   Administration of economic programs
97   National security and intl. affairs

Figure 4.   Two Digit Area of Expertise Codes

CODE SHEET

AREAS OF INTEREST

Code A   Where and how to find available technology.
Code B   Examples and cases of new uses for existing technology.
Code C   Research activity concerning methods of increasing the use of technology.
Code D   Research activity concerning technology movement, dissemination, and/or transfer

Please select the number(s) from the list below to describe your areas of expertise and occupation. For example, if you are a Public Relations Executive of an Insurance Company you select 778 as your expertise area and 309 to identify your occupation. Please note that it may be appropriate to select only one number, as for example 345 (Composer) or 450 (Physician).

AREAS OF EXPERTISE

703	ADVERTISING/PUBLIC RELATIONS
706	AGRICULTURE
	ASSOCIATIONS/INSTITUTIONS/FOUNDATIONS
709	Charitable
712	Educational
715	Labor
718	Political
721	Professional/Trade
724	Religious
727	Social
730	ATHLETICS
733	BUILDING/CONSTRUCTION
	COMMUNICATIONS
736	Films
739	Publishing
742	Radio/Television Broadcasting
745	Telephone/Telegraph
748	COMPUTER/DATA PROCESSING
751	CONSERVATION
	FINANCIAL
754	Banks/Trust Companies
757	Credit Agencies/Savings & Loan Institutions
760	Investment Companies
763	Securities and Commodity Brokers/Exchanges/ Dealers
766	FORESTRY
769	GOVERNMENT, DOMESTIC
772	GOVERNMENT, FOREIGN
775	HOTEL
778	INSURANCE
781	LEASING
	MANUFACTURING
784	Aircraft/Spacecraft/Missiles
787	Apparel/Textile Products
790	Automotive
793	Chemicals/Plastics/Allied Products
796	Diversified Industry
799	Electrical/Electronic/Mechanical Products and Appliances
802	Food/Related Products
805	Furniture/Fixtures
808	Graphic Arts
811	Heavy Machinery/Equipment
814	Metals
817	Ordnance
820	Paper/Allied Products
823	Petroleum Refining/Related Industries
826	Photographic/Optical/Sound Equipment
829	Railroad Equipment
832	Rubber Products
835	Shipbuilding
838	Stone/Clay/Glass/Lumber Products
841	Tobacco/Related Products
844	MEDICAL/HEALTH SERVICES
847	MINING
850	PERFORMING ARTS
853	PERSONAL SERVICES
856	REAL ESTATE
859	RECREATION
862	RESEARCH COMPANY/INSTITUTION
865	RESTAURANT/FOOD SERVICES
868	RETAIL TRADE
871	STORAGE/WAREHOUSING
	TRANSPORTATION SERVICES
874	Aviation
877	Motor
880	Pipeline
883	Railroad
886	Shipping
889	UTILITIES
892	WHOLESALE TRADE
899	OTHER (Please Specify)_____

OCCUPATION

303	ACCOUNTANT/AUDITOR
306	ADMINISTRATOR
309	ADVERTISING/PUBLIC RELATIONS EXECUTIVE
312	ARCHITECT
315	ARTIST
318	ATHLETE
321	ATTORNEY
324	AUTHOR
327	BROKER
330	CHIROPRACTOR
333	CIVIC WORKER
336	CLERGYMAN
339	CLUBMAN/CLUBWOMAN
342	COMMERCIAL ART EXECUTIVE
345	COMPOSER
348	CONSULTANT
351	CONTRACTOR
354	CORPORATE EXECUTIVE
357	CORPORATE OFFICER
360	CURATOR/MUSEUM OFFICIAL
363	DATA PROCESSOR
366	DENTIST
369	DESIGNER
372	DIRECTOR (CORPORATE)
375	DIRECTOR (PERFORMING ARTS)
378	EDITOR
	EDUCATIONAL ADMINISTRATOR
381	College/University
384	Elementary/Secondary Schools
	EDUCATOR
387	College/University
390	Elementary/Secondary Schools
393	ENGINEER
396	FARMER/RANCHER
402	FINANCIAL EXECUTIVE
405	GOVERNMENT OFFICIAL
408	HOME ECONOMIST/DIETICIAN
411	INTERIOR DECORATOR
414	JOURNALIST
417	JUDGE
420	LABOR, INDUSTRIAL RELATIONS EXECUTIVE
423	LIBRARIAN
426	MARKETING/SALES EXECUTIVE
429	MILITARY OFFICER
432	OPTOMETRIST
435	OWNER/PROPRIETOR/PARTNER
441	PERFORMING ARTIST
444	PERSONNEL EXECUTIVE
447	PHOTOGRAPHER
450	PHYSICIAN
453	POLITICAL PARTY OFFICIAL
456	PRODUCER (PERFORMING ARTS)
459	PURCHASING EXECUTIVE
	SCIENTIST
462	Life Sciences
465	Mathematics
468	Physical Sciences
474	SOCIAL SCIENTIST
477	SOCIAL WORKER
480	STATISTICIAN/ACTUARY
483	THERAPIST
489	VETERINARIAN
499	OTHER (Please Specify)_____

Figure 5. Three Digit Occupation Codes

by the respondent, were to indicate to those who read the directory

which areas of the technology transfer process the individual was most

interested in, e.g.:

        A.   Where and how to find available technology.

        B.   Examples and cases of new uses for existing technology.

        C.   Research activity concerning methods of increasing
             the use of technology.

        D.   Research activity concerning technology movement,
             dissemination and/or transfer.

The value of this information was questionable as 58% of the respondents

checked three or more blocks and 2% checked none. Furthermore,

16.8% of the respondents used the area of interest blocks to provide

additional area of expertise codes.

      f.   Authorization Receipt Date

      One of the more significant deficiencies with the authoriza-

tion form was the absence of a date block. Compounding this deficiency

was the fact that no procedure was employed to either date stamp the

authorizations upon receipt or utilize a first-in, first-out system for

keypunching the responses. Due to the length of time from distribution

of the invitations to the printing of the directory, several respondents

submitted revised authorization forms with new information. Since

the authorization forms were neither dated nor keypunched as received,

it was almost impossible to determine the most current information if

two authorizations were submitted.

B. COMPUTER PROGRAM LIMITATIONS

The original system utilized two magnetic tapes and six computer

programs:

PROGRAM	PURPOSE
1	Transfer data base to NPS tape 490.
2	Sort by state from NPS tape 490 to NPS tape 494.
3	Sort by job occupation from NPS tape 490 to NPS tape 494.
4	Print alphabetical listing from NPS tape 490.
5	Print alphabetical listing grouped by state from NPS tape 494.
6	Print alphabetical listing grouped by job occupation from NPS tape 494.

These programs were the basis for transfering the data base from key-

punched cards to magnetic tape and for eventually producing the manu-

script for printing the directory. In analyzing the programs, several

deficiencies were found.

1. Computer Language

All of the programs were written in the FORTRAN computer

language which deals primarily with scientific programming and is

designed for use with small data inputs and numerous mathematical

calculations. The data base for the directory is just the opposite in

that it has a large data input and requires no mathematical calculations.

For this reason alone, FORTRAN is an inefficient language in terms

of program run time and data manipulation required by the directory's data base. Furthermore, FORTRAN is not easily adapted to data input verification such as alpha/numeric field checks which are essential for the directory's data base. In addition, FORTRAN does not have an internal sort capability, thereby requiring utilization of excessive magnetic tapes and external sort programs. Finally, it is a non-narrative language and therefore is difficult to de-bug if new programs were to be added to the system.

2. Program Logic

These programs were only print programs. There was no logic employed in the programs to detect errors such as: out of sequence data input cards (three cards per record are required), duplicate records, missing data input cards, missing data fields, incorrect data or relationship errors.

3. Program Description

The computer programs were written to accommodate data submitted by individuals residing in the United States. Consequently, only a city and two digit state code field, a five digit zip code field and a ten digit telephone number field were employed. This created numerous problems in printing a proper address and telephone number for foreign residents. Since there are no universally recognized two digit codes for countries, as there are for states, it was necessary to create them in order to utilize program 2. These two digit country codes

would eventually be printed in the directory and on mailing labels and of themselves might not be recognized as the country they represented, e.g., IS for Israel, SZ for Switzerland or BE for Brussels. Furthermore, the number of characters reserved for the city did not always allow for the inclusion of the foreign country's state, province, county, etc. Therefore, an address would appear as FREDERICTON, CN as opposed to the correct address format: FREDERICTON, NEW BRUNSWICK, CANADA.

Zip codes created similar problems. Many countries, in addition to the United States, utilize a zip code and some contain more digits than the five used in the U.S., e.g., Canada uses a six digit zip code. Resultantly, only five of the six digits would be printed due to the length of the field allocated for it.

Telephone numbers around the world vastly differ in the number of digits utilized. However, the computer programs were structured to print the telephone number in the format employed in the United States, e.g., brackets around the area code and a hyphen between the three digit exchange and the last four digits. As a result, many of the foreign telephone numbers are not printed in their recognized format.

4. Program Capabilities

Although programs 2 and 3 sort alphabetically by state and job occupation for eventual printing by programs 5 and 6, there was no alphabetic sort program prior to printing by program number 4.

The printing for the alphabetical listing was performed in the exact sequence that the keypunched cards were manually filed. This was an extremely time consuming and error prone operation. The 1977 directory contained 64 duplicate names and 76 names out of alphabetical sequence as a result of this manual filing procedure.

The information printed by programs 5 and 6 (alphabetical listings by state and job occupation respectively) was a duplicate of the information printed in the straight alphabetical listing. Consequently, an additional 137 pages were required to be printed with no additional information, resulting in higher printing costs.

Programs 4, 5 and 6 are utilized in the preparation of the directory manuscript. These are continuous print programs thereby requiring excessive cutting and pasting to not only obtain the proper size manuscript but also to provide spacing, headings and page numbers.

5. <u>Programs Required</u>

The data base itself is the principal source of the basic mailing list for invitations to be listed in the directory. Unfortunately, there was no existing program to produce printed mailing labels from the data base, thereby necessitating the manual addressing of each invitation.

C. SYSTEM LIMITATIONS

The system was structured only to accept and print data in the card sequence provided. The simplicity of the system caused it to be

inefficient for its intended purpose: maintaining a data base for the eventual preparation of a directory manuscript. In this respect, numerous system deficiencies were responsible for incorrect data entering the data base and eventually the directory, the employment of an inordinate amount of manual procedures and the incurrence of an excessive amount of labor and machine costs. The following is a representation of these significant system deficiencies:

1. The system contained no editing procedures thereby requiring a manual screening of all data input.

2. No master record count or transaction input count procedures were employed to allow determination of the data base size at any time.

3. No data extraction capability was designed into the existing system. Without this capability, historical data could not be extracted nor could special listings be provided.

4. The system had no single transaction capability. This was the most serious and costly of all the deficiencies. Because of this, the total card data base (in excess of 6000 cards) had to be read into the system for each correction, addition or deletion, either for individual records or the entire data base. Furthermore, the lack of a unique record identifier prevented the retention of historical data, by each directory, and required the rekeypunching of all three data cards for individuals previously listed.

5. There was no external reports procedure therefore, no individual run statistics, no exception reports and no total directory processing statistics could be provided.

6. There was no expansion capability contained in the master record. Future changes to the master record data fields would require a total program rewrite.

D. DOCUMENTATION

Section III indicated that the first Technology Transfer Directory of People was produced by students at the Naval Postgraduate School based on a system developed in 1975. It was not until January of 1977 that the data base for the directory was updated by other students at the Postgraduate School and in June of 1977 the authors of this thesis assumed responsibility for the completion of this project and the printing of the 1977 Directory. In each of the last two instances, the absence of documented procedures greatly hampered the efficiency of the project. In the first instance, it was a complete relearning process and in the second, only minimal verbal directions were provided.

After the identification of the original system's deficiencies and an analysis of their effects on data accuracy and production efficiency, the necessary methodology was developed to improve the system in these areas.

V. DEVELOPMENT OF AN AUTOMATED TECHNOLOGY TRANSFER SYSTEM

A. DESIGN PARAMETERS AND GOALS

Upon evaluation of the problems discussed in the preceding section, it was recognized that a series of new computer programs, integrated into a fully automated system would not only eliminate these problems, but also provide a system designed to minimize the clerical effort required for the production of a directory on a timely basis.

In the development of this new system, considerable effort was directed toward identifying those design parameters and goals, which in addition to providing specific solutions, would also incorporate system enhancements increasing both the utility and maintenance of the directory data base.

These design parameters and goals were identified as follows:

1. To develop a data collection form (Invitation Authorization Form) which would both identify specific data fields and provide corresponding data formats.

2. To develop a unique method of identifying each master record by establishing a key field on current and future master records.

3. To develop a method of converting the current master data file into an expanded master file incorporating additional data fields and providing a capability for future record expansion.

4. To minimize the volume of keypunching required for data base input and maintenance.

5. To eliminate all manual sorting or merging of data input.

6. To develop a method of maintaining and extracting historical data from the master file.

7. To develop a master file edit and update program which will validate all input data and provide a means of changing data fields on the master file by utilizing single input transactions.

8. To provide input data and update exception error reports with appropriate messages, defining the transaction in error and the reason for rejection.

9. To provide printed output reports in a format to facilitate directory manuscript preparation and reduces the number of required pages.

10. To provide occupational and state cross-reference computer output reports.

11. To reformat the alphabetical directory listing to include a title field and to correct the zip code, telephone number and area of interest fields.

12. To develop a computer master print program, controlled by a single control card, which can specify the printing of directory year groups from the master file.

13. To develop a computer program that will ensure all input data is screened to prevent duplicate records from entering the master file.

14. To provide a means of deleting records off the master file by utilizing single transaction input records.

15. To provide a method to produce an addendum for specific directories.

16. To provide data base maintenance statistics to identify all activity applied to the master file after each computer run.

17. To provide a users guide to define how the system functions including input and output procedures.

18.   To develop a computer program which will ensure that required data fields are complete, and input data cards, which comprise the master record, are in the proper sequence.

19.   To develop a computer program which will produce address labels from the master file.

20.   To develop and test all programs utilizing COBOL as the computer language.

These goals and design parameters were incorporated into the seven computer programs comprising the Automated Technology Transfer System (ATTS) and are presented in the computer program section of this thesis. The users guide (Appendix C), which contains expanded occupation codes, area of expertise codes, system output reports, and a revised Invitation Authorization Form, included as a result of this design effort.

B.   SYSTEM DESCRIPTION AND DEVELOPMENT

A system flow chart (Appendix D) depicts the structure of the ATTS system. The system consists of data base maintenance and report generation sub-systems. The production of a directory commences with the execution of the label address program and the mailing of the Invitation Authorization Forms. The development of the Invitation Form focused on providing defined data element fields with completion instructions contained on the form. In addition, the data requested on the form should be in a sequence which facilitates data input, since the form is also to serve as the source keypunch document.

The completed form illustrates these design considerations by providing specific spaces, in the proper sequence, for each data element. Thus, the problem of determining which address, the organization's or individual's, to be utilized in the data base was eliminated. Also, a separate field was established for foreign respondents which allowed for the inclusion of additional address elements such as province or country. Furthermore, the zip code field was expanded to six digits to accommodate foreign responses. A title or position field was provided to increase the information presented in the alphabetical listing of the directory. A future use field was incorporated, as well as pre-printed data to facilitate keypunching of the form. Finally, a signature and data field were included to solve the problem of multiple responses and to comply with the Freedom of Information Act.

When the authorization forms are returned, via the return address pre-printed on the opposite side, they are screened for completeness and assignment of a key. This key serves as the unique identifier for each respondent and is assigned to each response in the nine space key field, located on the form at block zero. This key field was developed to solve the problem of uniquely identifying each individual on the master file other than by last name. This key provides the means of computer sorting and merging of all transactions for updating the master file, which is also organized in key sequence. In addition, the development of a key provided the mechanism for computer duplicate

checking, as well as providing the basis for directory year group

extraction by the master print control program. This key consists

of the following four elements:

1. A three digit Julian date indicating the day which the response was received.

2. A two digit record number which identifies the response within Julian day.

3. A two digit year field indicating the year which the response was received.

4. A two digit field indicating the directory number which is to be produced.

The two digit directory number field was developed to provide the

capability to organize responses into specific year groups based on

the number of previously published directories. For example, all

individuals listed in the 1977 directory have directory numbers of '02'

assigned and coded in their directory key field. Thus all individuals

to be listed in the next printing of a new directory would be assigned

a directory number of '03', which indicates a third edition and print-

ing of the directory. This key element was also developed to reduce

the keypunch requirement for responses received from individuals

previously listed on the master file. This reduction is accomplished

by the submission of a change transaction to the directory number

field of the respondents master record, rather than keypunching all

231 characters contained on the response form and required for a

new master record. Thus a net savings of 229 key strokes, per

response received from individuals carried on the master file is achieved provided all other data fields remain the same. This element of the key provides the authorization to include an individual in a specific directory by utilizing the directory number as the control element of the control card for the master print program.

The design of the elements of the key field provided the structure and function of the computer programs comprising the ATTS system.

After the assignment of the appropriate key to each returned invitation authorization form, the data from each form is keypunched onto three eighty column standard keypunch cards. These input cards are batched for ease of handling and submitted as input for execution by the validate and update program. This action initiates the data base maintenance sub-system of the ATTS system.

The validate and update program is the largest (over 1000 instructions) and most complex of the seven programs developed for the ATTS system. It was designed to solve all the problems concerning invalid, incomplete or duplicate data entering the directory data base. This program is the focal point for all new 'Add' records, change records, or delete transactions, and is exclusively used for data base maintenace, sequence checking and for updating the master file. All other programs of the ATTS system utilize the results of the master file magnetic tape created as output from this program. The validate module of this program screens all input transactions for completeness and accuracy

and performs twenty-nine different edit and validate checks. Trans-actions failing these checks are printed on a validation error report with error messages indicating the cause of the edit failure. These error transactions are not allowed to update the master file until they are corrected and pass all edits during the next program cycle.

The update module performs three update checks on the validated transactions received from the validate module. It then sorts all the valid transactions into key sequence and applies them to the master file, ensuring that the proper key sequence is maintained. The up-date module also ensures that duplicate records are not applied and produces an update error report for those transactions failing any update screens. Upon completion of transaction processing, the master file is updated and a master file activity report is produced which provides program processing statistics, indicating final record and transaction counts. This provides the basis for ensuring that all input is processed and maintains a record of all transactions applied to the master file.

Following completion of the validate and update program, the second and last program of the data base maintenance sub-system (the name-key cross-reference program), is executed. It was designed to rename the old and new master files utilized by the validate and up-date program which is required in order to reduce the requirement for the establishment of generation data sets that would complicate

the system.   The name-key program also provides a report consisting

of the names, in alphabetical order, of all individuals comprising the

master file and their respective keys.   This report is used by clerical

personnel to determine if responses are from individuals previously

listed and determines if any change transactions other than the directory

number is required.

The report generation sub-system is executed after an individual

batch of input data or the entire data base has been processed by the

data base maintenance sub-system.   This sub-system provides clerical

personnel with the first look at the data inputed to the validate and up-

date program.   This sub-system is comprised of the following four

print programs:

1.   The master print control program.

2.   The state cross-reference program.

3.   The occupation cross-reference program.

4.   The Address Label program.

All of these print programs were designed to produce printed

reports to facilitate directory manuscript preparation.   This is ac-

complished by providing appropriate page headings, offset spacing and

page breaks which allow for cutting to the correct manuscript size.

In addition all reports contain, as the last page, a numerical count

of all individuals listed, in order to ensure that each individual appears

on all three reports, comprising the completed manuscript.

C. THE MASTER PRINT PROGRAM

The master print program of this sub-system is designed to provide the option of printing a specific directory from the master file by selectively pulling records matching the directory year group indicated on the directory print control card provided as input to this program. The input phase of the ATTS system is designed so that each new directory printing will contain directory numbers incremented each year and coded in the key field when inputed to the validate and update program. Thus for the next directory (after the 1977 directory) all key fields of responses received will contain a directory number of '03' coded in the directory number field of their respective keys. The master print program will not execute if the control card is not present or does not contain a numeric, two digit, directory number.

The master print program functions as the control program for this sub-system by providing as output, the input magnetic tape to the State cross-reference, Occupation cross-reference and Address Label programs. However, by modifying the input tape specified in the Job Control Language of any of these print programs, the entire contents of the master file can be printed, if so designated as the input tape. The master print control program also prints the alphabetical listing for the first report contained in the directory after sorting, on temporary storage, the input tape into alphabetical sequence. This sort is an internal sort and eliminates the requirement for a separate sort program and a separate magnetic tape.

D. THE STATE CROSS-REFERENCE PROGRAM

The state cross-reference program was designed to provide a report of those individuals appearing on the alphabetical listing, by last name, in state or foreign country sequence. The name of the state or country is designed to print each time a break occurs due to a new state code used in the sort sequence. This report comprises the second section of the directory; however, by designing the report format to print three columns across the page, a two-thirds reduction of the number of individuals listed in the alphabetical section is achieved. A card input deck of state names and codes is utilized to build a computer generated internal table for providing the state names appearing on the report. Master records whose state codes differ from the codes contained in this table will be rejected and printed on an error report. To correct these errors, change transactions will have to be submitted to the state code field of the corresponding master record for processing by the validate-update program.

The State Cross-reference program was also designed to sort the input tape, in state code sequence, before processing begins in order to eliminate the requirement for an additional external sort program.

E. THE OCCUPATION CROSS-REFERENCE PROGRAM

The Occupation cross-reference listing was designed in the same format as the State cross-reference listing and also achieved a two-thirds reduction in the number of required print pages. However,

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the input tape is internally sorted by this program, alphabetically by last name, within occupational code sequence. This also eliminated an external sort program and an additional magnetic tape.

The report produced is intended to provide a listing of individuals sharing the same occupation code and by refering back to the alphabetical listing produced by the master print program, additional information can be ascertained for these individuals.

F. THE ADDRESS LABEL PROGRAM

The Address Label program was designed to provide a method of extracting the name and address information from the master file and producing output on special label forms. The alignment module of this program produces forty-five test addresses for label alignment by the computer operator. The program incorporates logic which provides for printing variable address lines required by foreign respondents or for multiple address lines resulting from the incorporation of the organization address in some master records. The program is also structured to prevent the printing of blank lines due to missing data elements. The address label program sorts the input tape into zip code and then alphabetical sequence within zip code sequence to reduce bulk mailing costs.

G. CONVERSION AND TESTING PROCEDURES

The original master file consisted of 1809 master records of 179 characters each. After determining the new data fields required by

the ATTS system, a conversion computer program was developed which converted the old master records into the new format of 231 characters each. The program reserved blank spaces within the new master record for the new data elements as well as changing the sequence of existing fields to facilitate the edit and validate functions of the validate and update program. In addition, this program computed and constructed keys for each master record, incrementing for each record number and changing the Julian day assigned after each group of 95 records was processed. All converted master records were assigned directory numbers of '02' indicating that these records comprised the 1977 directory which was the second one published. This completed the conversion phase as no existing programs could be converted from FORTRAN into COBAL computer language and no existing programs utilized in the old system could meet any of the design parameters established for the new system.

The next phase in the development of the ATTS system consisted of writing the seven programs discussed above and the creation of a test program to ensure system compliance. The initial test phase began with the validate and update program and included the submission of test batches of input data designed to check all elements of the program's logic and error report formats. Upon completion of this phase, the print programs were developed and tested. A final test of the entire system was accomplished utilizing the revised Invitation Authorization

Form and the ATTS system user's guide which had just been completed. Clerical personnel processed and keypunched all input data which included change and delete transactions as well as 106 new responses. The results of this test validated the system and produced an addendum (Appendix E) to the 1977 directory presented in the new format, including a title field to be utilized for all future directories.

VI. CONCLUSIONS AND RECOMMENDATIONS

A. SYSTEM VALUE

The system developed to accumulate information, maintain a data base and produce a directory has an application broader than the facilitation of the linker function in the technology transfer process. The system was so designed that it could, with minor modifications, be utilized as the basis for any information gathering and display system. The computer programs, which are the foundation of the system, greatly minimize the clerical functions associated with gathering, inputing and maintaining a data base and significantly increase the validity and utilization of this data base through the report generation sub-systems. Unlike the original system which simply accepted data in the sequence provided and displayed it through print programs, the newly developed system has provided the ability to selectively extract specific data for historical and functional purposes. This feature has been utilized several times in responding to outside requests for specific portions of the data base and mailing labels by categories such as zip codes or occupation codes to facilitate inviting persons to symposiums and con-ferences, distribute materials or contact groups of individuals for various purposes. Therefore, it is the conclusion of the authors of this thesis that the system developed could be of significant aid to not

only other organizations, but also to other students doing thesis research in their efforts to accumulate, store and eventually display their data.

B. DIRECTORY VALUE

The analysis performed by Professors Creighton and Jolly and the subsequently expanded analysis performed by Steidle and Green on the benefit and interest in the Directory supported its continued publication at the time. However, a closer examination and comparison of the 1975 Directory with the 1977 Directory and its Addendum might lead to the conclusion that the interest in the Directory may not have been as intense as originally anticipated. The 1975 Directory contained 1799 names. Published two years later, the 1977 Directory contained only an additional 10 names and the Addendum another 106. However, the problem is not one of lack of interest, but rather one of a static data base and lack of aggressive marketing procedures. The expansion of the Directory's mailing list is mainly dependent on those already listed through submission of additional names of individuals interested in being included in the directory. The submissions have not been as numerous as expected. Furthermore, there is some evidence that indicates the Directory is becoming a Who's Who in the technology transfer field and is missing the field and bench personnel who are actually conducting research on new technology and therefore need to be included. It is suspected that the administrators and managers

of the companies and organizations listed in the Directory are not making the "working" level personnel aware of its existence and thereby depriving them of the opportunity to be listed therein [Montanarelli, 1978].

C. RECOMMENDATIONS

1. Expansion of Data Base

The problem of a static data base and lack of aggressive marketing procedures are critical and need to be resolved if the directory is to facilitate the linker function in the technology transfer process. Therefore, the following recommendations for expansion of the data base and generation of increased interest in the directory are provided:

a. Identify all the federal laboratories, academic institutions, private organizations and commercial companies engaged in developing new technology.

b. Provide these laboratories, institutions, organizations and companies with copies of the current directory to be placed in lounges, lunch rooms, libraries and other areas where employees are most likely to read them.

c. Prepare and distribute a promotion package which should include, as a minimum, a poster explaining the intended function of the directory and copies of the invitation form.

d. Encourage current listees in the directory, thru the inclusion of a form in the directory itself, to submit names of individuals they know to be interested in the technology transfer process.

The foregoing could be accomplished by students in a Technology Transfer course as a special project.

2. Future Enhancements for Increased Directory Utilization

The following recommendations for future system enhancements which will facilitate directory utilization are provided:

a. The Directory must be published at least annually.

b. Utilize the publication of a quarterly Addendum to update the information in the directory and add new names.

c. Incorporate figure 12 of Appendix C as a means of correcting and updating the directory data base.

d. Improve the quality of printing in the Directory.

e. Continually update the occupation and area of expertise codes used in the Directory.

f. Periodically purge the data base of individuals who have not responded to an invitation for at least two years. This will insure that the master file remains at a reasonable size.

g. When more working level technicians are incorporated in the directory, provide a cross reference section to major laboratories, organizations, institutions, etc.

h.   Perform periodic analysis on the usefulness of data elements other than name/address and expand/delete as necessary.

i.   Investigate the possibility of standardizing the occupation and area of expertise codes with those used in other publications.

j.   Investigate the possibility of identifying, obtaining and publishing in the Directory, a listing of technology transfer accomplishments that were a direct result of utilization of the Directory.

VII. <u>INDEX TO THE APPENDIX</u>

Appendix

Analysis of the Benefit and Interest in: The
1975 Technology Transfer Directory of People

by

James A. Jolly
J. Wally Creighton

January 1977

Center for Research and Management Services
California State University Sacramento Foundation
Sacramento, California 95819

Analysis of the Benefit and Interest in: The
1975 Technology Transfer Directory of People

James A. Jolly
J. Wally Creighton

Introduction

In 1975 the Naval Postgraduate School, Monterey, California, in co-
operation with the National Science Foundation, completed and issued a
directory of persons interested in the process of technology transfer. It
was the intent that the directory be of substantial benefit to both the public
and private sectors of our economy by fostering communications between
and among individuals interested in the processes, concepts, framework
and methodology of technology dissemination, transfer and utilization.

Market

The first edition contained the names, addresses and areas of interest
and areas of expertise of 2000 persons. Copies of the directory were dis-
tributed to the 2000 persons in the directory. In addition copies of the direc-
tory were sent to over 1000 persons who either wrote or made a telephone
request for a copy. The total distribution was 3200 copies.

Objective

A questionnaire was included within each copy of the directory. The
reason for including the questionnaire within the directory was to deter-
mine the value of the directory and to obtain suggestions for improvements
in the directory when the second edition was prepared.

This report is an analysis of the questionnaire responses and other
direct communications related to the directory.

Methodology

(1) One hundred questionnaires were selected at random from the sev-
eral hundred completed and returned questionnaires that were returned by
the persons who had received a copy of the first edition of the directory.
The questionnaire data were tabulated and analyzed.

(2) Letters concerning the directory were analyzed.

Discussion of the Analysis

The first question concerning the merits of the directory was: How
would you rate the general value of the information provided by the
directory?

```
75
                        (63)
50                      ┌───┐
                        │   │
25   (16)               │   │   (18)
     ┌───┐              │   │   ┌───┐
 0   │   │              │   │   │   │        (2)
─────┴───┴──────────────┴───┴───┴───┴───────┌──┐──
   Excellent        Good        Fair        Poor
```
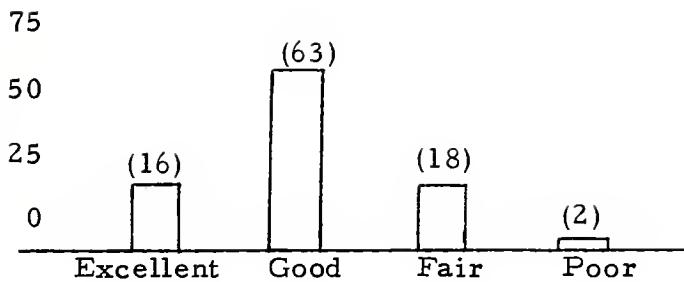
General rating of value of information in directory (n=99, one non-
response)

It is clear that the value of the directory was rated as worthwhile.
If the excellent and good are combined together, then 79 of the respond-
ents felt that the directory supplied information of worthwhile value.

The next question of interest was: Will the information in the direc-
tory be of assistance in administering your program? The response was:

```
75
     (59)
50   ┌───┐
     │   │   (37)
25   │   │   ┌───┐
     │   │   │   │           (4)
 0   │   │   │   │           ┌─┐
─────┴───┴───┴───┴───────────┴─┴────
     Yes     yes         No
             with
          reservations
```
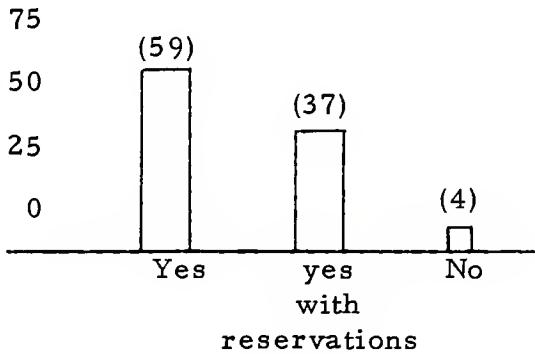
Value of directory to a program (n=100)

There were two reservations that were most often expressed. The
first was that more time was needed in order to make an accurate deter-
mination and the second was that future issues of the directory should be
cross indexed to enhance the value of the directory.

The next question was included to determine the mission areas served
by the directory and the extent of value in each mission area.
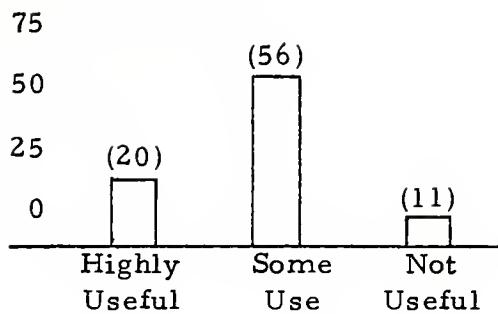
Value to new research and development (n=87, 13 nonresponses)
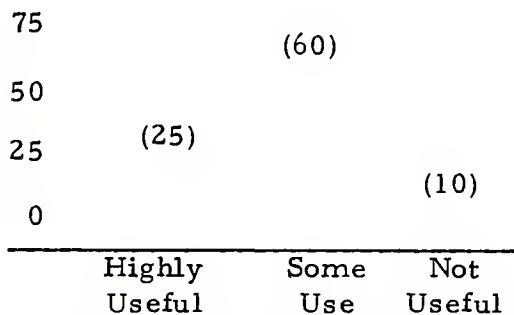
Value to existing research and development (n=95, 5 nonresponses)
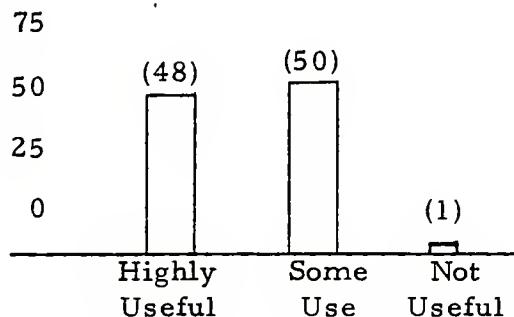
Value for technology dissemination, transfer and utilization (n=99, one nonresponse)

Technology dissemination, transfer and utilization received the most support. As can be seen this was nearly unanimous. There was slightly less support for research and development. Ninety five respondents indicated that the directory had a use in terms of existing research and development and 76 respondents found the directory useful in terms of new research and development.

The question concerning changes in the directory was open ended and thus required the respondent to make a written comment. The written comments, when tabulated, indicated the importance of the proposed changes.

```
75

50                                              (44)
                                   (28)
25    (15)        (20)
 0    ┌──┐        ┌──┐        ┌──┐        ┌──┐
   ───┘  └────────┘  └────────┘  └────────┘  └────────
      Add          Add          Add          Add
   Telephone    Geographic   Interest     Expertise
    Numbers       Index        Index        Index
```
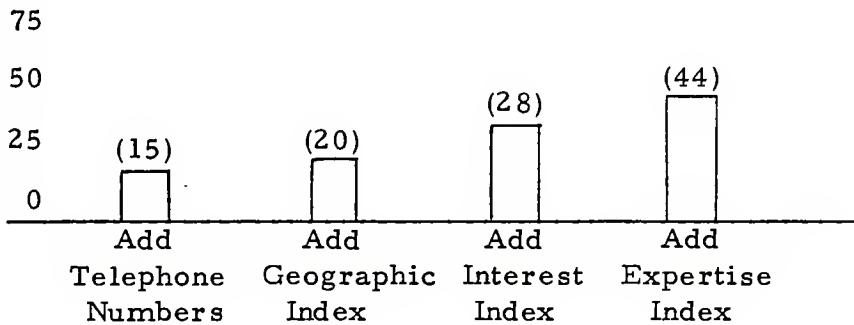
Changes in the directory suggested by written comment (Several comments could come from one respondent.)

Several suggestions were made in addition to those shown above, those mentioned two or more times were as follows: Index by job title; by occupation, and by corporate name. A number of respondents felt that energy should be added to the categories of area of expertise.

The respondents were asked: Do you desire a copy of the first revision to this directory which will be published in 1976? All of the respondents requested a copy of the revised edition.

The directory respondents were analyzed in terms of their geographic location. The random sample of 100 was divided as follows: 31 different states of the U.S.A., Canada, New Zealand and West Germany were represented. There were five respondents living in Canada.

Direct Correspondence

The following organizations requested, obtained and used a set of address labels of the persons listed in the directory.

(1) Technology Transfer Society
     11720 West Pico Blvd.
     Los Angeles, CA 90064

     Use: (a.) Invitations to the 1st. Annual Meeting and
                  Symposium June 25, 1975.
             (b.) Invitations to persons listed in the directory to
                  become members of the Technology Transfer
                  Society

(2) World Fair for Technology Exchange
P. O. Box 1748
Ormand Beach, FL 32078

Uses: (a.) Invitations to the 76 World Fair for Technology Exchange
(b.) Invitations to the 77 World Fair for Technology Exchange

(3) University of Massachusetts
Amherst, MA 01002

Use: Invitations to the Symposium on Technology Today

(4) Naval Postgraduate School
Monterey, CA 93940

Uses: (a.) Invitations to the Symposium on Science, Technology and Public Policy sponsored by the Naval Research Laboratory, Washington, D. C.
(b.) Distribution of the book Technology Transfer in Research and Development. Printing sponsored by the Naval Material Command, Washington, D. C.

(5) University of California
Berkeley, CA 94720

Use: Invitations to a Seminar on Technology Transfer

(6) Benwill Publishing Corp.
167 Corey Road
Brookline, MA 02146

Use: Distribute advance copies of a new publication called; Technology Transfer Times.

Conclusions

The responses received on 100 randomly selected questionnaires concerning the perceived benefit of the 1975 Technology Transfer Directory of People, were analyzed. The analysis showed that:

(1) The Directory was rated either excellent, good, or fair by 97 out of the sample of 100.

(2) The information in the Directory would be of assistance in administering programs to 96 out of the sample of 100.

(3) All three of the missions investigated were perceived to be beneficial to some segment of the sample. Technology dissemination, transfer and utilization received the strongest vote with 98 out of a possible 99 rating the Directory as highly useful or somewhat useful.

(4) The most popular revision of the Directory was to add a cross index by area of expertise (44 out of a possible 100 votes). The other three possible revisions, cross index by interest area, cross index by geographic area and add telephone numbers received considerable support.

(5) The Directory enjoys a wide geographical interest and distribution. The random sample of 100 questionnaires came from 31 different states of the U.S.A. and from three foreign countries.

(6) Six organizations used a complete printing of all of the names in the Directory as a mailing list to invite persons to symposia and conferences, to distribute material of special interest, and to invite people to join a technology transfer society.

The evidence presented strongly supports the argument that the Directory is useful to scientists, engineers and managers. The evidence presented further supports the argument that a new issue of the Directory, expanded to include cross indexing and telephone numbers, would greatly enhance its value.

Analysis of the Benefit and Interest in the 1975 Technology
Transfer Directory of People

The 1975 directory listed 1800 persons. Each person received a
copy and was requested to fill out and return a document acknowledge-
ment form (Appendix A). A total of 328 forms or 18.2% of the ack-
nowledgement forms were returned. Following are summaries of the
results.

Question.   How would you rate the general value of the information
             provided in the directory?

Figure 1 depicts graphically the responses to this question. It indicates
that 253 of the 328 respondees (77%) rated the value of the information as
good to excellent with 23% rating it as excellent.

```
200                        (180)(56%)        N - 328, 10 No Responses

150


100
           (73)(23%)

                                      (55)(17%)
 50
                                                      (10)(3%)

No. of
Responses    Excellent     Good        Fair           Poor
```
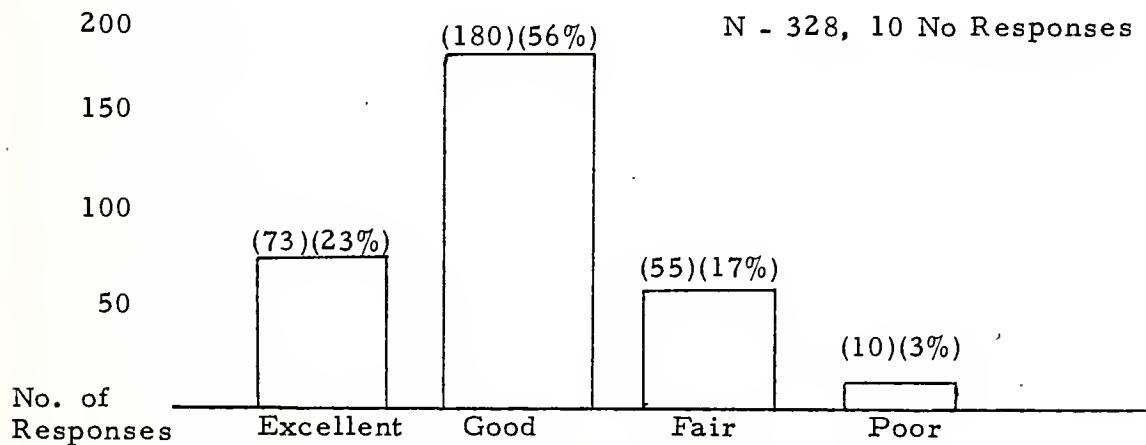
Figure 1. Value of the directory information

Question.   Will the information in the directory be of assistance to
             you in administering your programs?

Figure 2 shows the responses to this question. It indicates that the
information in the directory would be of assistance in administering
programs in 294 responses or 93%. Only 22 responded negatively with
a general comment that it was too early to evaluate its worth.
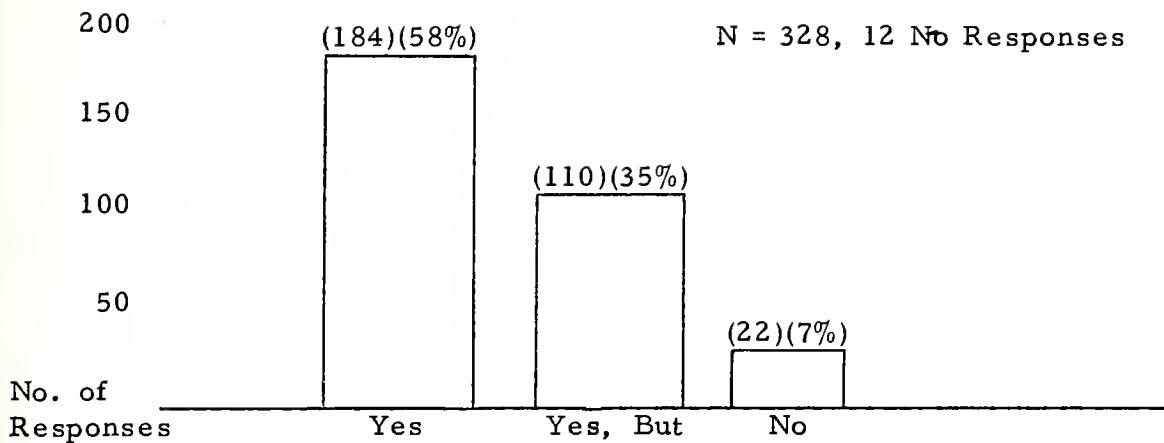
Figure 2. Value of the Information in Administering Your Programs.

Question. To what extent can this directory be useful in terms of getting information on (a) New research and development (R & D) management mechanisms, (b) Existing research and development (R & D) and (c) Technology dissemination, transfer and utilization?

Figure 3a graphically displays that a majority of those people responding consider the value of the directory information to new research and development is highly useful or somewhat useful.
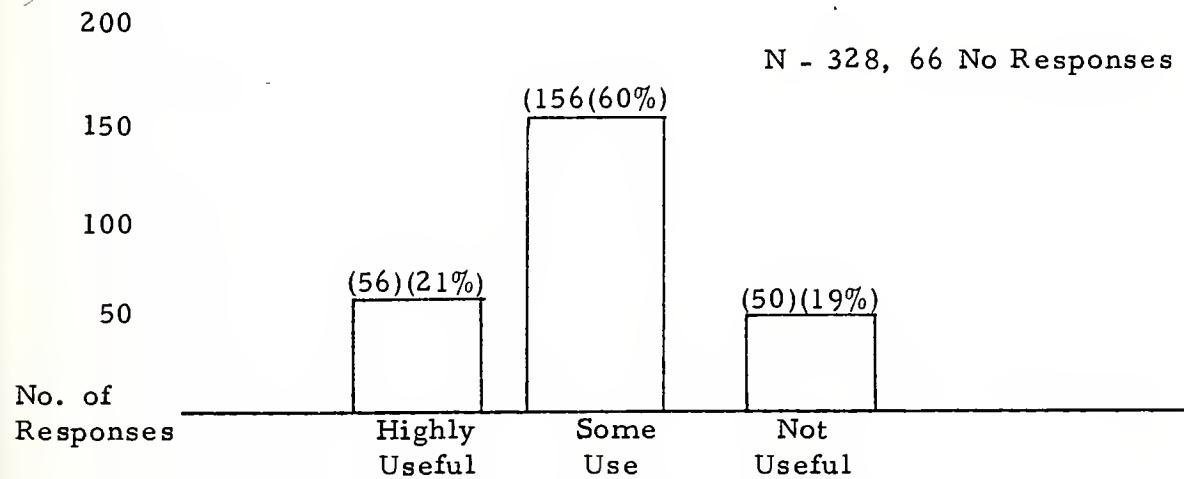
Figure 3a. Value to New Research and Development

Figure 3b reflects the respondees rating of the directory information
in relation to its value to existing research and development.
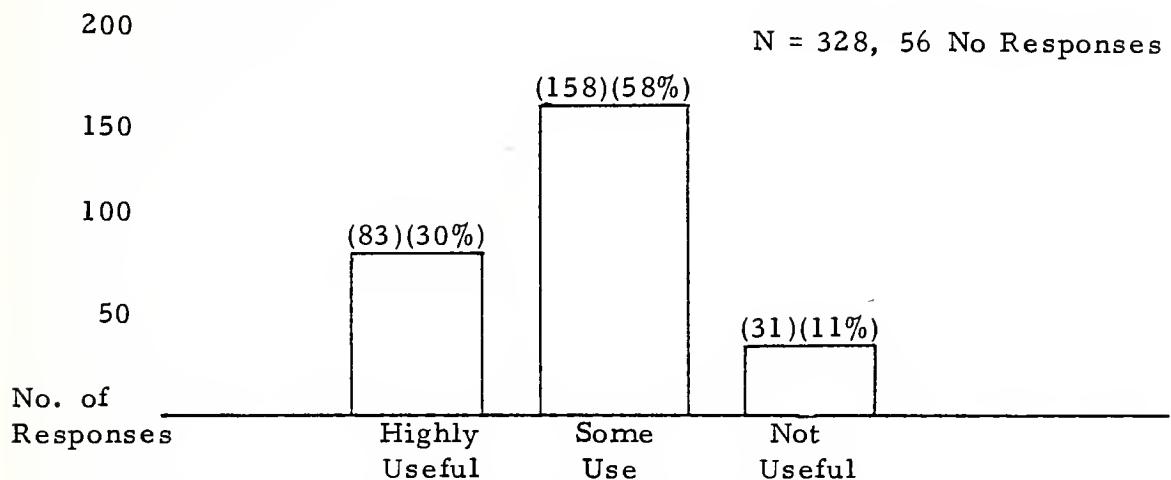
Figure 3b.   Value to Existing Research and Development.

Figure 3c graphically displays an overwhelming favorable support for the
directory's value for technology dissemination, transfer and utilization.
A total of 276 out of 289 responses or 95% considered the information
highly useful or somewhat useful.
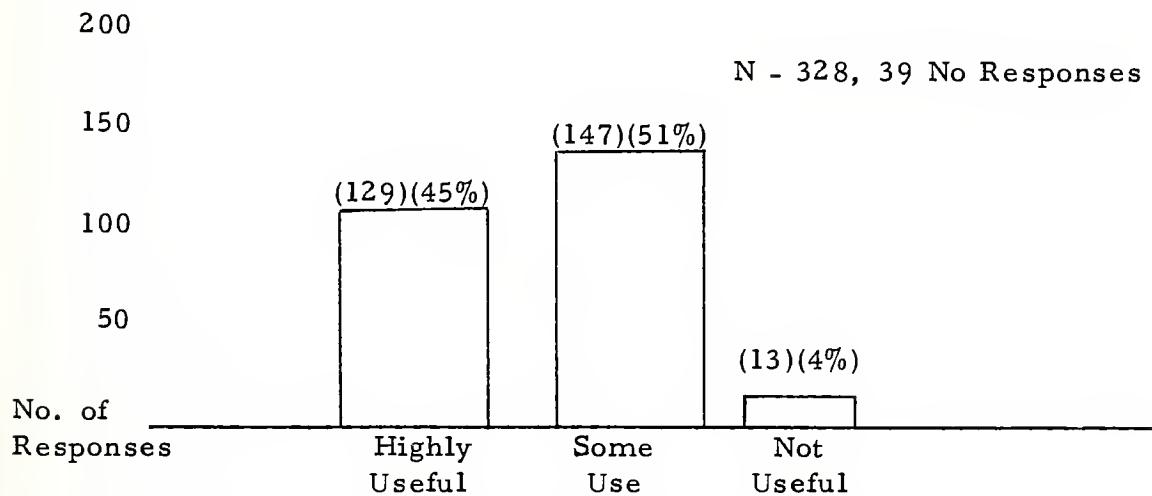
Figure 3c.   Value for Technology Dissemination, Transfer and Utilization.

Question: What changes would you recommend for improving this
              directory?

The most desired revisions to the directory format was to add cross
indexes for areas of expertise, areas of interest, a geographical index
and the addition of telephone numbers.

The new directory format (Appendix B) will contain an alphabetical list-
ing of persons with addresses in the United States followed by an inter-
national listing.   Telephone numbers with area codes have been included
when submitted.   A geographical listing by state is provided along with
a new occupational code index including international participants.

Question.   Do you desire a copy?   Yes   No

              100% of the respondees desired a copy.

AUTOMATED
TECHNOLOGY
TRANSFER
SYSTEM

USERS MANUAL

TABLE OF CONTENTS

LIST OF FIGURES, TABLES AND REPORTS

I. INTRODUCTION

A. PURPOSE OF THE USERS GUIDE

The purpose of this manual is to provide the information and procedures necessary to execute the Automated Technology Transfer System (ATTS). This system was designed to facilitate the maintenance of the directory data base and provide the computer produced manuscript for the printing of the Technology Transfer Directory.

The data input key punch transaction format is discussed in section one. The Invitation Authorization Form (figure 4) has been designed as the input data source document for all new (Add) transactions. Methods of either changing or deleting data from the master data base file are discussed in sections two and three respectively.

Sections two through five pertain to methods and procedures necessary for data preparation and system input. Sections six through nine pertain to the ATTS program execution phase and therefore, are of a more technical nature.

II. SYSTEM OVERVIEW

A. DATA BASE MAINTENANCE SUB-SECTION

The ATTS system is comprised of two major sections, a data base
maintenance section and a report generation section. The core of the
data base maintenance section is a computer validate and update program
which sorts, merges and processes all input (Add), change and delete
record transactions. These transactions function to update a master
file containing the records of all individuals listed in the data base of
the Technology Transfer Directory. A validation module of this program
screens all input transactions for completeness and accuracy by perform-
ing a series of thirty-two edit and validation checks. Transactions fail-
ing any of these edit screens are printed out on a validation and error
report, see report 1. These error transactions are not allowed to update
the master file until they have been corrected and pass all edits during
the next program cycle. An update module of this program applies only
validated records to the master file, after sorting, and ensures that
duplicate records do not update the master file. This module also pro-
duces an error report with corresponding messages for those records
failing update screens. See report 2.

Following completion of this program, the Name-key cross-refer-
ence program is executed. This program provides an updated listing,

in alphabetical sequence, containing the corresponding assigned key (record identifier) and last name. This report was designed to provide a means of determining the status of the invitation form as either a new (Add) transaction or a change transaction.

B. REPORT GENERATION SUB-SECTION

The remaining phase of the ATTS system, consists of executing the three manuscript producing print programs, designed to facilitate data base extraction and to ease the preparation of the manuscript. This sub-system also contains an address label program which extracts the name and address of individuals selected by the control card of the master print program, which are then sorted in zip code sequence, and printed on special label forms. The ATTS System Flow Charts (figures 1, 2, and 3), depict the fully integrated system in its final form. These flow charts illustrate the complete process of producing the Technology Transfer Directory of People.
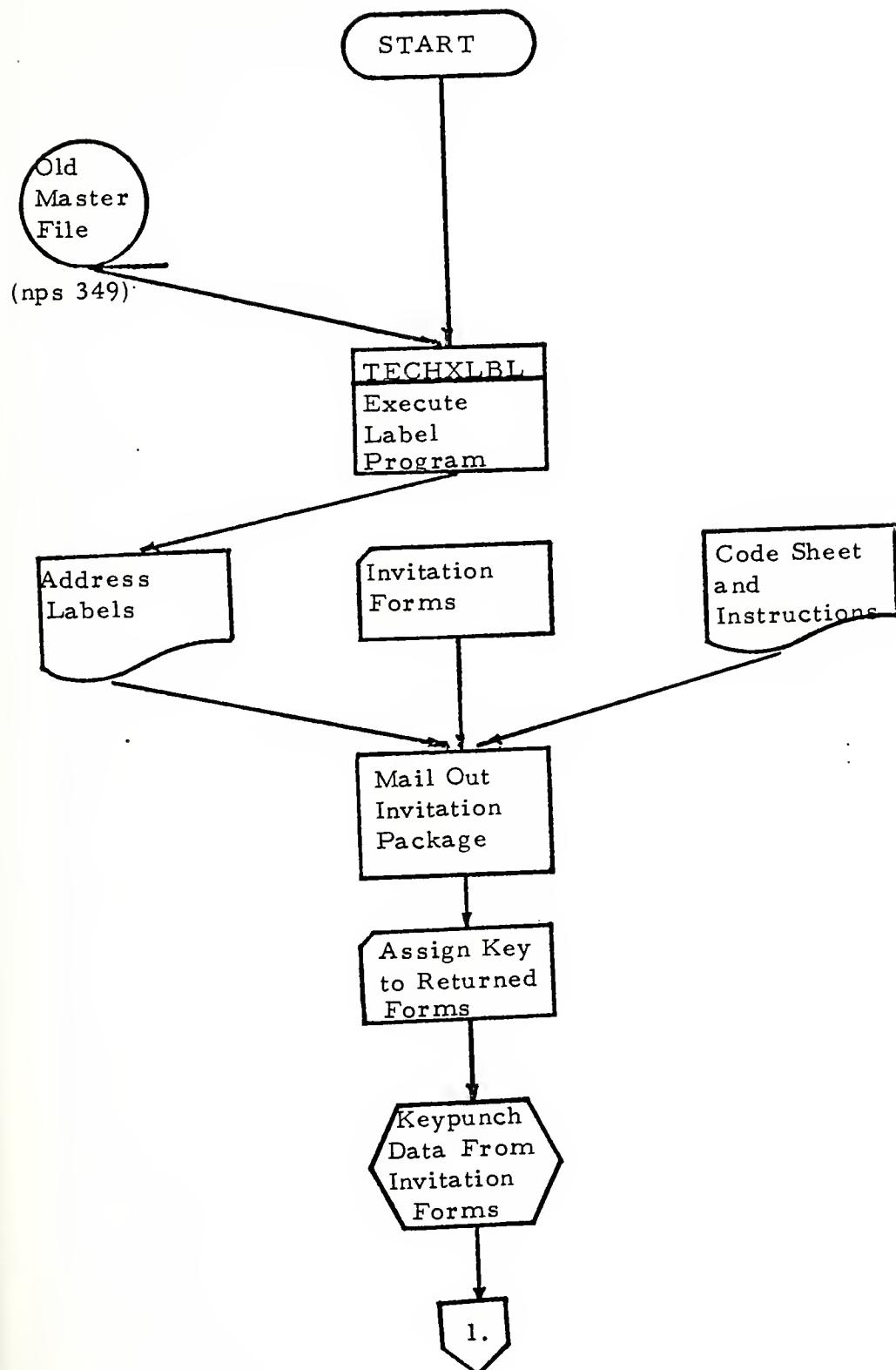
Figure 1. System Flow Chart One, Prepare, Mail and Keypunch Invitation Authorization Form Data

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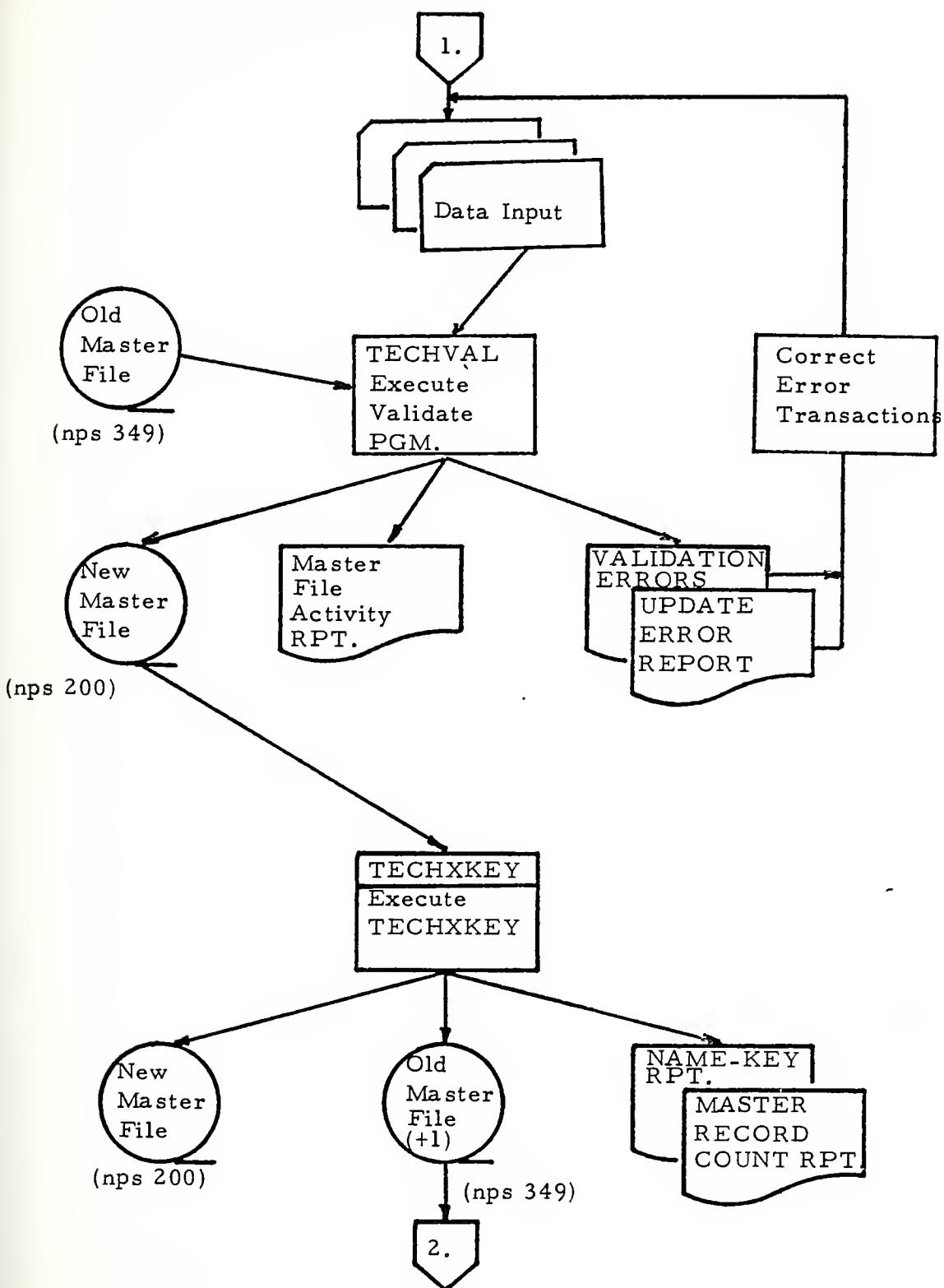
Figure 2. System Flow Chart Two, Data Base Maintenance
Sub-System.

```
                    ┌──────┐
                    │  2.  │
                    └──────┘

  ╭────────╮              ┌──────────────┐
  │  Old   │              │ Directory    │
  │ Master │              │ Print        │
  │ File   │              │ Control card │
  ╰────────╯              └──────────────┘
(nps 349)

                ┌─────────────┐
                │ TECHXFER    │
                │ EXECUTE     │
                │ Master      │
                │ Print Pgm.  │
                └─────────────┘
```

| ALPHA SEQ. Directory Print out | Master Print Tape | Old Master File | Total Name Count Report |

(nps 490)   (nps 349).

| TECHXOCP | TECHLBL | TEXSTATE |
| Execute Occup-xref Program | Execute Label Program | Execute State-Xref Program |

| Occupation Directory Report | Address Directory Labels | State/Country Rpt |

State Code Error Report

| Prepare Manuscript for Printing | Correct Any State Codes in Error |

END

Figure 3. System Flow Chart Three, Report Generation
Sub-System.

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III. NEW DATA INPUT

A. THE INVITATION AUTHORIZATION FORM

The Invitation Authorization Form, reproduced as figure 4, is a preprinted input source document utilized by individuals expressing a desire to be listed in the Technology Transfer Directory of People. The form was designed to facilitate keypunching and provides the source of information for all new (Add) transactions to the directory data base.

This form should be mailed approximately 90 days before the production of a new directory. The invitation preparation flow chart (figure 1) depicts the preparation of invitations which initiate the first phase of the data base maintenance sub-system, by providing new input to the ATTS system. Upon return of this form, it must be examined for a signature, required by the Freedom of Information Act.

This invitation form, consists of thirteen fields (spaces for data) commencing with block zero and ending with block number twelve. The invitation form is actually three 80 card column keypunch cards, laid out continuously, with the end of each eighty card columns indicated by the three preprinted numbers '1', '2', and '3' respectively. The number '1', preprinted at the end of the second line of the form, indicates the end of the first eighty columns on the form and corresponds to the first of three keypunched cards necessary to contain all the

Figure 4. Invitation Authorization Form

information on the form.   Moreover, the number '2' preprinted at the
end of line five, indicates the end of the second set of eighty columns.
The preprinted number '3', at the end of the last line of the form, in-
dicates the end of the last set of eighty columns.

Each space on the form represents a space on a keypunch card and
the numbered blocks on the form identify specific elements of informa-
tion, as well as, the maximum number of spaces allowed for each block
of information.   Thus, the form is designed to provide for direct key-
punching, with the concomitant requirement that each data field remain
in the sequence provided on the form and in accordance with the card
column format for new (Add) transactions listed on figure 5.

It is essential that the three cards, keypunched from this form,
are maintained in the order specified by the form.   This means that
card number one, indicated by the number one in card column eighty,
is followed by card number two, and it by card number three, when
assembled into the input card deck (A batch) for processing.   If this
is not accomplished, the validate module will detect an out of sequence
condition and reject the transaction.

B.   THE ADD TRANSACTION

The three keypunched cards comprising all the information from
the invitation form, are referred to as an Add transaction.   The letter
'A', preprinted in space number ten of the first line, indicates an Add
transaction to the system, rather than a change or delete transaction.

C. THE KEY

In order to facilitate computer processing and to establish a unique means of identifying each individual on the master file, other than name, a nine space key titled field was developed, consisting of four elements. This key must be keypunched on all transactions, and is to be coded on the invitation form in block zero, upon return receipt of the form. The first element of the key is the Julian day that the form was received in the mail. The second element of the key consists of two spaces and indicates the record number of this invitation. Thus, if the invitation was the tenth one received on fifteen January, '015' would be coded in the Julian day field and '10' in the record number element of the key. The third element of the key is a two space year field. The year 1978 would be coded as '78' in this field. The last element of the key is the directory number and consists of two spaces. The 1977 directory has been assigned directory number two, thus, '02' has been coded in the directory number field of all individuals compris- ing that directory. In order to differentiate each directory, this field is incremented by one digit for each new directory. Thus, for the next directory, to be printed after the 1977 directory, all returned invitations must have directory numbers of '03' coded in their key fields. This directory number field provides the means whereby the master print program can select a specific directory year group off the master file and constitutes a major design feature of the ATTS system.

D. ADD TRANSACTION KEYPUNCH INSTRUCTIONS

Table 1, lists the appropriate occupation codes for block three of the invitation form. Code and keypunch three zeros if this field is not complete. Table 2, lists the appropriate two digit State or Foreign country codes for block number seven. Code and keypunch 'YY' if blank or 'ZZ' if the foreign country does not appear on table 2. Section seven explains the method of providing new codes to the system. For the telephone field, block ten, code and keypunch the telephone number of all U.S.A. invitation responses without dashes. If an extension number is provided, leave a blank after the telephone number and precede the extension code with the letter X. The number 405-455-7337 extension 5555, would be keypunched as follows 4054537337 X5555. Code foreign response telephone numbers exactly as provided on the form. Note that block number eleven of the form, the Area of Expertise Field, consists of nine spaces for up to three expertise codes. Table 3, contains the revised list of these codes.

Invitation (Add) Transaction
Key Punch Format and Instructions
(These Three Cards are Key Punched
Directly From the Invitation Form)

KEY PUNCH CARD NO.	FORM DATA ELEMENT	CARD COLUMN	LENGTH	REQUIRED FIELD	INVITATION BLOCK NO.	EDIT/ VALUE
1	KEY:	1-9	9	YES	0	NUMERIC
	Julian Day	1-3	3	YES	0	NUMERIC
	Record No.	4-5	2	YES	0	NUMERIC
	Julian Year	6-7	2	YES	0	NUMERIC
	Directory No.	8-9	2	YES	0	NUMERIC
	TXN-CODE	10	1	YES	0(Pre-Pr.)	'A'
	NAME	11-38	28	YES	1	ALPHA-NUM
	ORGANIZATION	39-73	35	NO	2	ALPHA-NUM
	OCCUP. CODE	74-76	3	YES	3	NUMERIC
	OFFICE USE	77-79	3	N/A	Pre-Print	N/A
	CARD NO.	80	1	YES	Pre-Print	'1'
2	ADDRESS LINE-1	1-29	29	NO	4	ALPHA-NUM
	STREET	30-53	24	NO	5	ALPHA-NUM
	CITY	54-69	16	YES	6	ALPHA
	STATE	70-71	2	YES	7	ALPHA
	ZIP	72-77	6	NO	8	ALPHA-NUM
	OFFICE USE	78-79	2	N/A	Pre-Print	N/A
	CARD NO.	80	1	YES	Pre-Print	'2'
3	FOREIGN USE	1-20	20	NO	9	ALPHA-NUM
	TELEPHONE	21-36	16	NO	10	ALPHA-NUM
	AREA OF EXP.	37-45	9	NO	11	NUMERIC
	TITLE	46-73	28	NO	12	ALPHA-NUM
	FUTURE USE	74-79	6	N/A	Pre-Print	N/A
	CARD NO.	80	1	YES	Pre-Print	'3'

Figure 5. Add Transaction Key Punch Format

Code	Occupation		
100	ACCOUNTANT/AUDITOR	192	Local
103	ACTUARY	195	State
106	ADMINISTRATOR	198	Federal
109	AGRICULTURIST	201	HEALTH OCCUPATIONIST
111	ANALYST	204	INDUSTRIALIST
114	ARCHITECT	207	INSPECTOR
117	ARTIST	210	INVENTOR
120	ATTORNEY	213	INVESTIGATOR
123	AUTHOR	216	JOURNALIST
126	BANKER	219	JUDGE
129	BOOKKEEPER	222	LAW ENFORCEMENT
132	BROKER	225	LAWYER
135	BUYER	228	LIBRARIAN
138	CIVIC WORKER	231	MANAGER
141	CLERGY	234	MILITARY OFFICER
144	COMPTROLLER	237	ORGANIZATIONAL OFFICIAL
147	COMPUTER SPECIALIST	240	PHARMACIST
150	CONSERVATIONIST	243	PHOTOGRAPHER
153	CONSULTANT	246	PHYSICIAN
156	CONTRACTOR	249	PLANNER
159	COUNSELOR	252	POLITICAL OFFICIAL
162	CURATOR/MUSEUM OFFICIAL	255	POLITICIAN
165	DATA PROCESSOR	258	PROPRIETOR
167	DENTIST	261	RESEARCHER
168	DESIGNER	264	SALES PERSON
171	DEVELOPER		SCIENTIST
174	DIRECTOR	267	Life Sciences
177	DRAFTER	270	Mathematics
180	EDITOR	273	Physical Sciences
183	EDUCATOR	276	Environmental Science
186	ENGINEER	278	SOCIAL WORKER
189	EXECUTIVE	280	STATISTICIAN
	GOVERNMENT OFFICIAL	282	STUDENT

Table 1. Occupation Codes

284   SUPERVISOR

286   SURVEYOR

288   SYSTEMS ANALYST

290   TECHNICIAN

292   THERAPIST

294   VETERINARIAN

296   OTHER

000   NOT SPECIFIED

Table 1.   Occupation Codes (continued)

State/Country	Code	State/Country	Code	State/Country	Code
Alabama	AL	Iowa	IA	North Dakota	ND
Alaska	AK	Ireland	IR	Ohio	OH
Australia	AS	Israel	IS	Oklahoma	OK
Arizona	AZ	Italy	IT	Oregon	OR
Arkansas	AR	Kansas	KS	Pennsylvania	PA
Belgium	BE	Kentucky	KY	Rhode Island	RI
California	CA	Louisiana	LA	South Carolina	SC
Chile	CH	Japan	JA	South Dakota	SD
Columbia	CL	Maine	ME	Scotland	SL
Canada	CN	Maryland	MD	Spain	SP
Colorado	CO	Massachusetts	MA	Sweden	SW
Connecticut	CT	Michigan	MI	Switzerland	SZ
Delaware	DE	Minnesota	MN	Tennessee	TN
Dist. of Col.	DC	Mississippi	MS	Texas	TX
Florida	FL	Missouri	MO	England	UK
Finland	FN	Montana	MT	Utah	UT
France	FR	Nebraska	NE	Virgin Islands	VI
Georgia	GA	Norway	NO	Vermont	VT
Germany	GE	Nevada	NV	Virginia	VA
Guam	GU	New Hampshire	NH	Washington	WA
Hawaii	HI	New Jersey	NJ	West Virginia	WV
Idaho	ID	New Mexico	NM	Wisconsin	WI
India	II	New York	NY	Wyoming	WY
Illinois	IL	New Zealand	NZ	Not Specified	YY
Indiana	IN	North Carolina	NC	Other Foreign Country	ZZ

Table 2. State/Country Codes

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300	ACOUSTICS	445	DISASTER CONTROL
305	ADVERTISING	460	ENERGY
310	AGRICULTURE	465	ENGINEERING
315	ARTS	470	EXPLOSIVES
320	ASSOCIATIONS/INSTITUTIONS	475	EXPORTS
325	Charitable	480	FACILITIES MANAGEMENT
330	Educational	485	FINANCE
335	Labor	490	FORESTRY
340	Political	495	GOVERNMENT (DOMESTIC)
345	Professional/Trade	500	GOVERNMENT (FOREIGN)
350	Religious	505	HUMAN RESOURCES
355	Social	510	IMPORTS
360	AUTOMOTIVE	515	INDUSTRY
365	AVIATION	520	INFORMATION SERVICES
370	BIONICS	525	INVENTORY CONTROL
375	BUILDING MATERIALS	530	INTERNATIONAL AFFAIRS
380	BUSINESS	535	INVESTMENTS
385	COMMUNICATION	540	LABOR
390	Films	545	LASER TECHNOLOGY
395	Microwave	550	LAW
400	Publishing	555	LAW ENFORCEMENT
405	Radio/Television	560	LICENSING
410	Telephone/Telegraph	565	MANAGEMENT INFORMATION
415	COMMUNITY RELATIONS	570	MANUFACTURING
420	COMPUTERS	575	AIRCRAFT/SPACECRAFT/MISSILES
425	CONSERVATION	580	APPAREL/TEXTILES
430	CONSTRUCTION	585	AUTOMOTIVE
435	CYBERNETICS	590	CHEMICAL/PLASTICS/ ALLIED PRODUCTS
440	DATA PROCESSING		

Table 3. Area of Expertise Codes

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595	DIVERSIFIED INDUSTRY	735	POLITICS
600	ELECTRICAL/ELECTRONIC/ MECHANICAL PRODUCTS	740	POLLUTION CONTROL
605	APPLIANCES	745	PRINTING
610	FOOD/RELATED PRODUCTS	750	PROCUREMENT
615	FURNITURE/FIXTURES	755	PROJECTS/PROGRAMS
620	GRAPHIC ARTS	760	PROPELLANTS
625	HEAVY MACHINERY/ EQUIPMENT	765	PROPULSION SYSTEMS
630	METALS	770	QUALITY CONTROL
635	ORDNANCE	775	REAL ESTATE
640	PAPER/ALLIED PRODUCTS	780	RECREATION
645	PETROLEUM REFINING/ RELATED INDUSTRIES	785	REHABILITATION
650	PHOTOGRAPHIC/OPTICAL/ SOUND EQUIPMENT	790	RECYCLING
655	RAILROAD EQUIPMENT	795	RESEARCH
660	RUBBER PRODUCTS	800	RETAIL TRADE
665	SHIPBUILDING	805	SAFETY
670	STONE/CLAY/CLASS/ LUMBER PRODUCTS	810	SANITATION
675	TOBACCO/RELATED PRODUCTS	815	SECURITIES/COMMODITIES
680	MARKETING	820	SECURITY SYSTEMS
685	MATERIALS	825	SOCIAL SERVICES
690	MEDICAL/HEALTH SERVICES	830	SOIL EROSION
695	MERCHANDISING	835	SOLAR ENERGY
700	METEOROLOGY	840	STORAGE/WAREHOUSING
705	MINING	845	SYSTEMS ANALYSIS
710	NUCLEAR TECHNOLOGY	850	SYNTHETICS
715	OCEANOGRAPHY	855	TECHNOLOGY TRANSFER
720	OPERATIONS RESEARCH	860	TOOLING
725	PATENTS	865	TRAINING
730	PERSONAL SERVICES	870	TRANSPORTATION
		875	Aviation
		880	Motor
		885	Pipeline
		890	Rail
		895	Water

Table 3. Area of Expertise Codes (continued)

900   URBAN DEVELOPMENT

905   UTILITIES

910   WASTE MATTER

915   WHOLESALE TRADE

999   OTHER (PLEASE SPECIFY)

Table 3. Area of Expertise Codes (continued)

IV. CHANGING DATA ON THE MASTER FILE

A. THE CHANGE TRANSACTION

As discussed in section three, when invitation forms are received, a determination utilizing the Name-key cross reference listing is made. This identifies the response as either an Add transaction, if the individual is not listed, or a change transaction if the individual is listed on the cross-reference report. The change transaction was designed to allow changes to be made to individual master records of the directory master file and to reduce the key punch requirements for those individuals maintained on the master file from previous directory printings and who are responding to a subsequent invitation request.

The following procedures are recommended for completing change transactions:

1. Determine the key for completing the invitation form by utilizing the Name-key cross-reference listing. This is accomplished by scanning the report, which is in alphabetical sequence, until a match is made with the name provided on the invitation form. See report 3.

2. Determine the change required to update the master file of this individual, by comparing the contents of the invitation form with the data listed for this individual on the Alphabetical listing of the latest computer print out of the first section of the Technology Directory (report 4).

3. Code the information which has changed, utilizing the appropriate change transaction form (figure 12). On this form, code in the key identified from the Name-key cross-reference report and any changed data in accordance with the change transaction format provided by figure 6.

If an invitation response is received containing no changes from the latest directory printout, then the directory number of the key field will be the only required change. This is accomplished by incrementing the directory number of the individuals existing key by one digit, to match the directory number corresponding to the new directory being developed. This change transaction requires only nine key punch strokes rather than the 231 key punch strokes required for a new (Add) transaction and is a major design feature of the ATTS system.

B. CHANGES TO ERRORS DISCOVERED IN THE DATA BASE

The change transaction was also developed to provide a mechanism to correct any errors found in master file records. However, this means that a change transaction can only be applied to an existing master file record and requires that an Add transaction must have been previously accepted by the system, for the specific master file record in error, or requiring a change. The system will reject any change transaction submitted with a key which is not contained in a master record on the file and produces an appropriate error message on the update error report.

The ATTS system has been designed to allow changes to be applied to all data fields of a master record except the first three elements of the key field. In order to change these elements, the entire master record must be deleted. Section five explains this procedure; however, there should be no reason to ever change these elements of the key unless an initial keypunch error has occurred.

C. CHANGE TRANSACTION EDITS

All change transactions are edited in the same manner as Add transactions by the validate and update program. Change transactions may be submitted alone or with other Add or delete transactions and no sorting is required. Change transactions are identified to the system by their transaction code which is the letter 'C' rather than an 'A' for Add transactions or a 'D' reserved for delete transactions.

Change transactions failing any edit checks will be rejected by the validate and update program and print on the respective error report with error messages describing the edit failure. These rejected transactions will have to be manually corrected and provided as input to the next program cycle along with any other input data.

D. CHANGE TRANSACTION KEY PUNCH INSTRUCTIONS

There are a total of thirteen data fields which may be changed by this transaction. The change transaction subcode identifies, to the system, which data elements of the master record are to be changed. The sub-code is a two digit field on each change transaction and can have four possible values: '01', '02', '03' and '04'. The change card format provided by figure 12, identifies the corresponding data elements associated with these four codes. The key, coded exactly as found on the Name-key cross-reference listing, must be present on each change transaction which are single data card (eighty columns) transactions.

The change transaction code, the letter 'C', is keypunched in card column ten in accordance with the change transaction formats. The change transaction sub-code is also coded and keypunched in card columns eleven and twelve respectively.

To change information on the master file, keypunch the new information from the appropriate data field, as listed by the respective change keypunch format (figure 12), and the ATTS system will replace the corresponding data field of the master record having the same key, if all edit checks are passed.

TXN SUB-CODE	CHANGE ELEMENT DATA FIELD	CARD COLUMNS	FIELD LENGTH	EDIT VALUE	ERROR MESSAGE NUMBER	NOTES
01	KEY	1-9	9	N	22	MUST BE PRESENT
	TXN CODE	10	1	'C'	4	MUST BE 'C'
	SUB-CODE	11-12	2	'01'	5	MUST BE '01'
	NAME	13-40	28	A	7	CHANGE FIELD
	ORGANIZATION	41-75	35	A/N	8	CHANGE FIELD
	OCCUP. CODE	76-78	3	N	16	CHANGE FIELD
	DIRECTORY NO.	79-80	2	N	13	CHANGE FIELD
02	KEY	1-9	9	N	22	MUST BE PRESENT
	TXN CODE	10	1	'C'	4	MUST BE 'C'
	SUB-CODE	11-12	2	'02'	5	MUST BE '02'
	ADDRESS LINE-1	13-41	29	A/N	9	CHANGE FIELD
	STREET	42-65	24	A/N	10	CHANGE FIELD
	STATE	66-67	2	A	11	CHANGE FIELD
	ZIP	68-73	6	A/N	12	CHANGE FIELD
	BLANK	74-80	7	BLANK	N/A	BLANK
03	KEY	1-9	9	N	22	MUST BE PRESENT
	TXN CODE	10	1	'C'	4	MUST BE 'C'
	SUB-CODE	11-12	2	'03'	5	MUST BE '03'
	CITY	13-28	16	A	14	CHANGE FIELD
	FOREIGN USE	29-48	20	A/N	30	CHANGE FIELD
	TELEPHONE	49-64	16	A/N	15	CHANGE FIELD
	AREA OF EXP.	65-73	9	A	17	CHANGE FIELD
	FUTURE USE	74-79	6	N/A	N/A	BLANK
	BLANK	80	1	N/A	N/A	BLANK
04	KEY	1-9	9	N	22	MUST BE PRESENT
	TXN-CODE	10	1	'C'	4	MUST BE 'C'
	SUB-CODE	11-12	2	'04'	5	MUST BE '04'
	TITLE	13-40	28	A/N	N/A	CHANGE FIELD
	BLANK	41-80	40	N/A	N/A	BLANK

A = ALPHA FIELD   N = NUMERIC FIELD
A/N = ALPHA NUMERIC   N/A = NOT APPLICABLE

Figure 6. Change Transaction Key Punch Formats

DATA BASE CHANGE REQUEST FORM

Use this form to indicate any corrections or changes to your master record as listed in the Directory.

Data field or fields to be changed:

Key (Office use)   Change sub-code (Office use)

| | | | | | | | | | |
|C|0|1|
10

Name (Last, First, M.I.)

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
13

Company/Agency/Organization

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
41

Occupation code

| | | |
76

Directory number

| | |
79

Key (Office use)   Change sub-code (Office use)

| | | | | | | | | | |
1 |C|0|2|
                 10

Address (Line One)

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
13

Street, P.O. BOX, APT. NO., RM. NO.

| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
42

State code

| | |
66

Zip code

| | | | | | |
68

- -

Key (Office use)   Change sub-code (Office use)

| | | | | | | | | | |
1 |C|0|3|
                 10

City

| | | | | | | | | | | | | | | | | | |
13

Figure 12. Change Request Form

Foreign Address Line

|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|
29

Telephone Number

|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|
49

Area of Expertise codes

|_|_|_|_|_|_|_|_|
65
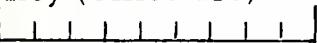
Key (Office use)   Change sub-code (Office use)

|_|_|_|_|_|_|_|_|_|_| |C|0|4|
1

Title/Position

|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|
13

_____   _____
Signature   Date

V. DELETING RECORDS FROM THE MASTER FILE

A. THE DELETE TRANSACTION

The delete transaction provides the means of deleting entire records from the master file. The delete transaction will cause the validate and update program to delete the record having the corresponding key of the master file. The input transaction consists of only the key, obtained from the Name-key cross-reference listing, and the delete transaction code indicated by the letter 'D' coded in columns one through ten respectively. Thus to delete a record, determine the key of the record to be deleted, and keypunch this key in spaces one through nine, in accordance with table 4, and the transaction code in card column ten.

This transaction, after key punching, can be inserted in the input deck along with other Add or change transactions. It must be recognized, that this transaction will delete the entire master record from the master file, including its corresponding key. The edit module of the validation program will reject the delete transaction if any data fields are keypunched after card column ten and will produce an error message on the update error report. The system must also find the record on the master file indicated by the input key, keypunched on the delete transaction. Therefore, the system requires that a record must be on file before accepting the delete transaction.

Data Element	Card Columns	Length	Value
Key	1-9	9	Numeric
Txn-Code	10	1	'D'
Filler	11-80	70	Must Be Blank

Table 4. Delete Transaction Keypunch Format

VI. DATA BASE CORRECTION PROCEDURES

A. VALIDATE AND UPDATE ERROR REPORT CORRECTION PROCEDURES

As discussed in section three, input transactions which fail edit and update screens, are printed out in transaction number sequence on either the Validation Error Listing (report 1) or the Update Error Listing (report #2) by the Validation and Update Program (TECHVAL).

1. Validation Error Report

This report consists of three sections: the Transaction Number (TXN-Number), the Input Transaction Image Area (Card-Image), and the Error Message Area (Error Message). The TXN-Number identifies the specific transaction in error, by its sequence number in the input transaction keypunched card deck. The transaction in error is further identified in the Card Image Area where it is reproduced (1st 80 characters) and printed exactly as inputed to the Validation and Update Program.

The Error Message Area prints one of the thirty-two error messages listed on figure 7. These error messages explain the reason and identify the data field causing the transaction to fail the edit check. The purpose of these edit checks is to prevent erroneous data from updating the Master File.

Report #1 is an example of all the possible transaction failure conditions, as well as the transactions causing the error.

2. Validation Correction Procedures

To correct the transactions listed on the Validation Error Report, utilizing the TXN-Number, extract this transaction from the input keypunch deck. Note that 'Add' Transactions consist of three cards and are listed as one transaction. Change transactions are all one card transactions. Utilizing the corresponding listed error message, identify, correct and re-keypunch these transactions. The Transaction Keypunch Formats (figures 5 and 6) provide additional information explaining transaction failures. The Edit/Value column of these formats identify either the specific value or the type edit allowed and performed by the validation module on the corresponding data element. Furthermore, the error message column of these formats list the controlling error message number which is cross referenced to figure 7, which lists the corresponding error message. The 'Note' column of the Change Transaction Formats, also provide specific values which the validation module utilizes in its edit screens.

Insertion of these corrected transactions into the next input card deck to the Validation and Update Program (see figure 2) completes the correction cycle.

3. The Update Error Report

Transactions appearing on this report are caused either by attempting to introduce (Add) a transaction having the same key field

(a duplicate) as an existing record on the Master File or by attempting to change a record (by a change TXN) which does not exist on the Master File.

This report consists of three sections: (1) the record number of the master record on the Master File (Record Number) Section refers to the record number which the input transaction is attempting to modify. (2) The Card Image Area (Card Image), contains the contents of the key-field of the input transaction. (3) The Error Message Area, prints out error message number 24 or 32 cross referenced on figure 7.

4.   Update Correction Procedures

To correct transactions appearing on this report, utilize the Name Key Listing, report 3, to determine the correct key for change transactions. This list will also provide the key to which the input 'Add' Transaction is a duplicate of. Assignment of a different key to the 'Add' transaction will correct this condition. Re-keypunch these transactions with the correct key and insert these Transactions into the next input deck to the Validation and Update Program Cycle (See System Flow Chart Two).

B.   BATCHING THE DATA INPUT

Batching data input refers to the process of combining data input (keypunched cards) into batches, usually of a specific number, for future data processing by a computer.

The ATTS System is a batch process system, however, its input data decks can be of any size. Normally, the transaction input data decks should be limited to a reasonable size (50 to 500 transactions) to facilitate any validation or update corrections. The ATTS System is designed for validation and update errors to be corrected and inputed to the next program cycle; however, this is not a system requirement.

C. FILING PROCESSED INPUT TRANSACTIONS

Those transactions not rejected by the ATTS System, should be placed in the Processed Input Data File (Boxes), maintained by the Technology Transfer Secretary. This will provide an 'Audit Trail' and a Data Base Maintenance Record. The recommended filing procedure for processed transaction, includes placing a rubber band around the processed input data batch with the process date written on the front of the first card in the batch. These batches may be discarded when the corresponding Technology Transfer Directory is produced from the data base by the ATTS Print Programs.

VII. MASTER FILE RETENTION PROCEDURES

A. DATA BASE EXTENSION DATES

1. Project Number Extensions

The project number required and assigned by the Computer Center expires each June. Project Number 0813 has been assigned to the Technology Transfer Project and is utilized by the ATTS System. This project number must be revalidated each June by completing a Project Request Form (use copy on file in Computer Center as a guide) which is then signed by Professor Creighton and returned to the Computer Project Assignment Office.

2. Master Tape File Expiration Dates

The following three tape files required by the ATTS System must have their expiration dates extended each year in order to prevent the Computer Center from 'scratching' the data. A master list of all NPS tapes is maintained behind the counter in the Computer Output Printer Room. Prior to 1 January each year, request that the expiration dates be extended on this list for an additional year for the following tapes:

DATA SET NAME	VOL SER NUMBER	EXPIRATION DATE
Fo973. CONV. MAST	NPS 349	1 JAN 79
Fo973. ORIG. NAME	NPS 490	1 JAN 79
Fo973. STATE. NAME	NPS 200	1 JAN 79

These three tapes are listed on the NPS Master Tape List as follows:

TAPE NUMBER	USER	PROJECT NUMBER	COST CENTER CODE
NPS 349	CREIGHTON	0663	54CF
NPS 490	CREIGHTON	0663	54CF
NPS 200	CREIGHTON	0663	54CF

VIII. ATTS SYSTEM EXECUTION

A. EXECUTING THE PROGRAMS OF THE ATTS SYSTEM

All six ATTS Program card decks, with JCL included, and program listings, are maintained in the file cabinet located in the Technology Transfer Office.

The system flow charts starting on page 73 depict the sequence and structure of the ATTS System. All input and output data sets are also listed. Note that by changing the input data sets to any of the print programs, all individuals maintained on the Master File (NPS 349) can be printed. For specific directory year groups, the appropriate directory year (last two digits of the key field) control card is inserted behind the //IN1* JCL Card of the TECHXFER Print Program.

Note that for all the print programs, except the Label Program, use the Job Card specifying bond paper for actual directory printing preparation.

1. Print Label Program

    Program Parameters:

    a. JCL Job Name: TECHXLBL

    b. PGM-ID: PRINT-LABEL

    c. Sort sequence - Zip Code

    Special Instructions:

This program requires that the computer operator mount the labels, which we provide, and set the print control for six lines per inch. This information is listed on the special instruction card which must be removed from the program deck before 'loading' the program, via the card reader, into the system. After loading the program, re-place the special instruction card, and provide the program deck and box of labels to the computer operator. The Job is run at night because of the special handling required and should be ready for pick up the following morning. Note that the program prints forty-five alignment labels for the operator and that by changing the input data set to NPS 490, labels for the directory year selected by the print program will be produced.

2. Process and Validate Input Data Program

    a. JCL Job Name: TECHVAL

    b. PGM-ID: UPDATE

Special Instructions:

The old and new Master Input Files to this program are in key sequence. The Key Punch Input Transactions (Add and Change) are sorted by the program in transaction code sequence (minor field) within key sequence (major sort field). The data deck is placed behind the //IN1* JCL card, located as the last card of the TECHVAL Program, before program execution. In order to reduce the requirement for Generation Data Sets, the old and new Master Tapes are renamed by

the TECHXKEY Program, which must be executed after the TECHVAL

PGM completes execution. This is critical, because, unless this is

accomplished, the input transactions will not update the Master File.

The TECHVAL Program merges validated input transactions,

in key sequence, onto the Master file. Delete transactions are proces-

sed by not moving them to the Master Output File, thus, a new Master

File is created each program cycle. The Master File Activity Report

provides processing data and should be checked each run. Validation

and update errors should be worked off their respective reports and

inputed to the next cycle. Note that the sort file is a variable length

file consisting of six variable length records. Also, the Validation

Module screens all Add (new) transactions to ensure that the three input

cards required for one new transaction are present. This module also

validates all fields on each transaction, even after detecting a field in

error. This is to produce an error listing containing all errors on each

transaction at one time and to reduce repeated rejection of a multiple

error transaction. The program contains an error message table with

error number (29) reserved for expansion.

3.   Name Key Cross Reference Listing Program

a.   JCL Job Name: TECHXKEY

b.   PGM-ID: LIST KEY

Special Instructions:

The input and output tapes are in key sequence. The cross

reference listing is in last name sequence. This program accomplishes

two tasks. First, it renames the old and new Master Files for the TECHVAL Program discussed in number 2 above. Secondly, it provides a listing of every individual on the master file, utilized for determining the appropriate key for Change Transaction assignment and provides a means of identifying new transactions. Its total name report, printed on the last page, should be cross referenced to the Master File Activity Report produced by the TECHVAL Program. Specifically, the 'total Master File output count' of the TECHVAL Program, should be equal to the 'total number records on file number' listed by the TECHX-KEY Program. This provides a system processing check and validates proper input tape assignment.

4. Alpha Directory Print Program

Program Parameters:

a. JCL Job Name: TECXFER

b. PGM-ID: PRINT-DIRECTORY

Special Instructions:

This program is the Master Print Program of the ATTS System. It is designed to provide the option of printing a specific directory from the Master File by 'pulling' records matching the directory year indicated on the Directory Print Control Card (figure 8) provided as input to the program. Thus, to select the 1977 Directory, code '02' in card column 13 and 14 of the control card. Each new directory printing will contain directory numbers incremented each year and coded in the key

field when inputed to the system. Thus, for the next directory (after the 1977 Directory) all key fields will contain '03' in the directory number field. To print that directory, code '03' in card column 13 and 14 of the control card of the TECXFER Program. Note that the system will edit this card for numerics in card columns 13 and 14. The TECX-FER PGM will not execute if the control card is not present or does not contain a numeric, two digit, directory number.

The TECXFER Program functions as the Master Print Program by providing as output, the input tape to the State, Occupational and Label Programs (see System Flow Chart Three).

The program also produces the Alphabetical Listing for the first section of the directory. Due to the fact that each entry on the report requires five print lines, the total printed output will be greater than 6000 lines. Therefore, it will not be printed until the operator 'dumps' the hold queue. This is a Computer Center imposed requirement.

5. Occupation Cross-Reference Program

Program Parameters:

a. JCL Job Name: TECHXOCP

b. PGM-ID OCCPXREF

General comments:

This program sorts as input, the tape (NPS 490) provided by the TECXFER Program, in occupational code sequence. It then prints last names in alphabetical sequence which have the same occupation

codes. Input transactions with blank occupational codes are coded as '00' which forces them to the 'top' of the file, where they will be printed under the "not specified" heading. The total names number printed on the last page of the Occupational Cross Reference Listing, is provided as a system check to ensure that all names have been printed, and match the number contained on the input tape produced by the TECXFER Program.

6. State/Foreign Cross-Reference Program

   Program Parameters:

   a. JCL Job Name: TEXSTATE

   b. PGM-ID: STATE-XREF

   Special Instructions:

   This program sorts as input, the tape (NPS 490) provided by the TECXFER Program in state code sequence. It then prints those individuals by last name sequence having the same state code. The program utilizes a card input deck of state names and codes to build an internal table for generating the state name appearing on the State Cross Reference Report. Table 2, lists all codes comprising the data deck used to build this table. New foreign country codes and names should be added to this deck when input responses contain countries not listed on this table. The two digit code is keypunched in card columns 1 and 2. The corresponding country is keypunched in card columns 3-24. The program also edits the state code field on the input tape against this table. Master records whose state codes differ from the

codes built in the table will be rejected and printed on an Error Report

(figure 9). The names on this report indicate those Master records

which have invalid state/country codes. Submit change transactions to

the state field for each of these individuals as input to the Techval pro-

gram. Re-run the Techxfer program to provide the input tape containing

these corrections for execution by the Texstate program.

```
****************************************************************
                ERROR MESSAGE TABLE                          *
****************************************************************
    10 C-ERR-MSG-TBL.
      15 ERR-1                    PIC X(40),
         VALUE 'FIRST ADD CARD MISSING FROM INPUT   '.
      15 ERR-2                    PIC X(40),
         VALUE 'SECOND ADD CARD MISSING FROM INPUT '.
      15 ERR-3                    PIC X(40),
         VALUE 'THIRD ADD CARD MISSING FROM INPUT   '.
      15 ERR-4                    PIC X(40),
         VALUE 'TRANSACTION CODE IS NOT A,C,OR D '.
      15 ERR-5                    PIC X(40),
         VALUE 'TRANSACTION CHANGE SUB-CODE IS INVALID '.
      15 ERR-6                    PIC X(40),
         VALUE 'ALL DATA FIELDS BLANK ON INPUT CARD '.
      15 ERR-7                    PIC X(40),
         VALUE 'NAME FIELD NOT ALPHA-NUMERIC '.
      15 ERR-8                    PIC X(40),
         VALUE 'ORGANIZATION IS NOT ALPHA-NUMERIC '.
      15 ERR-9                    PIC X(40),
         VALUE '1ST ADDRESS LINE IS NOT ALPHA-NUMERIC '.
      15 ERR-10                   PIC X(40),
         VALUE 'STREET FIELD IS NOT ALPHA-NUMERIC '.
      15 ERR-11                   PIC X(40),
         VALUE 'STATE FIELD IS NOT ALPHABETIC '.
      15 ERR-12                   PIC X(40),
         VALUE 'ZIP CODE IS NOT ALPHA-NUMERIC '.
      15 ERR-13                   PIC X(40),
         VALUE 'DIRECTORY NUM CHANGE NOT NUMERIC '.
      15 ERR-14                   PIC X(40),
         VALUE 'CITY FIELD NOT ALPHABETIC '.
      15 ERR-15                   PIC X(40),
         VALUE 'PHONE NUMBER NOT ALPHA-NUMERIC '.
      15 ERR-16                   PIC X(40),
         VALUE 'OCCUPATION CODE NOT NUMERIC '.
      15 ERR-17                   PIC X(40),
         VALUE 'AREA OF EXPERTISE NOT NUMERIC '.
      15 ERR-18                   PIC X(40),
         VALUE 'INVALID STATE CODE '.
      15 ERR-19                   PIC X(40),
         VALUE 'DATA FIELDS NOT BLANK ON DELETE TXN '.
      15 ERR-20                   PIC X(40),
         VALUE '2ND ADD CARD FAILED DUE TO CARD 1 ERR '.
      15 ERR-21                   PIC X(40),
         VALUE '3RD ADD CARD FAILED DUE TO CARD 1 OR 2 '.
      15 ERR-22                   PIC X(40),
         VALUE 'TRANSACTION KEY IS NOT NUMERIC '.
      15 ERR-23                   PIC X(40),
         VALUE 'NAME FLD BLANK '.
      15 ERR-24                   PIC X(40),
         VALUE 'ATTEMP CHG TO RECORD NOT ON FILE '.
      15 ERR-25                   PIC X(40),
         VALUE 'INPUT CARD IS OUT OF SEQUENCE '.
      15 ERR-26                   PIC X(40),
         VALUE 'STREET FIELD BLANK '.
      15 ERR-27                   PIC X(40),
         VALUE 'CITY FIELD IS BLANK '.
      15 ERR-28                   PIC X(40),
         VALUE 'STATE/COUNTRY CODE FIELD IS BLANK '.
      15 ERR-29                   PIC X(40),
         VALUE 'FOR FUTURE USE '.
      15 ERR-30                   PIC X(40),
         VALUE 'FOREIGN USE FIELD NOT ALPHA-NUMERIC '.
      15 ERR-31                   PIC X(40),
         VALUE 'OCCUPATION FIELD IS BLANK '.
      15 ERR-32                   PIC X(40),
         VALUE 'ADD-TXN INVALID FOR REC-ON FILE '.
    10 C-ERR-MSGS REDEFINES C-ERR-MSG-TBL.
      15 ERR-ENT                  PIC X(40),
                                  OCCURS 32 TIMES,
                                  INDEXED BY ERR-INDEX.
```

Figure 7. TECHXVAL Error Message Table

DATA ELEMENT	CARD COLUMN	LENGTH	VALUE
Card Name	1-13	13	'Control Card' or May Be Blank
Directory #	14-15	2	The Two Digit Directory year group desired
Filler	15-80	65	Spaces

Figure 8.   TECHXFER Master Print Control Card

STATE/COUNTRY ERROR CODE REPORT

NAME	KEY FIELD	INVALID STATE CODE
PEARSE, DR. J. F.	282817702	AU

Figure 9.   State Code Error Report Produced by the
TEXSTATE Computer Program.

IX. CONVERTING COMPUTER REPORTS INTO THE DIRECTORY

A. MANUSCRIPT PREPARATION

The Technology Transfer Directory is primarily composed of the alphabetical, occupation cross reference and state/country cross reference computer produced reports.

The following flow chart depicts the procedures necessary to convert these three reports to a manuscript, to be reduced and printed, either by the School Print Shop or an outside printer. Note that the template used for providing the dimensions for cutting the computer generated reports, also provides the exact manuscript size for the reports to be reduced and printed on 8-1/2 by 11" standard stock paper. Also, Room E515 on the fifth floor of Herrmann Hall contains the template, examples, and the facilities for preparing the computer output for printing.

B. PRODUCING AN ADDENDUM

Approximately ninety days after printing the Directory, an Addendum should be produced which includes any requested changes to information included in the latest Directory and late responses received after the directory printing cut-off date.

The procedures necessary for the production of an addendum are the same as those required for the production of a directory. However,

the TECHXFER Master Print Program will have to be temporarily modified to select only those individuals to be listed in the Addendum. Late responses and change transactions are inputed to the TECHVAL Program in the normal manner; however, a record of the 'Keys' of all change records should be maintained because the Key Field provides the means of selecting these records by the TECHXFER Program.

1. Modifying the TECHXFER Program

As discussed above, the TECHXFER Program will have to be modified to select only those records to be listed on the Addendum. The Key Field of these records provides the means of identifying the records to be 'pulled' from the Master File. A combination of the Julian Day, Julian Year or Directory Number Fields of the Keys of these records, with a corresponding "Literal Constant," provides the bases of the logic which will have to be changed in the record selection routine (paragraph Validate-P0019) of the TECHXFER Program. For example, the Addendum to the 1977 Directory was produced by modifying the Validate-P0019 paragraph, at line number 193 of the Techxfer computer program. Ensure that this temporary program code is removed after program execution and that the original program code is replaced starting at line 193. To include specific individuals who have changes to their master records, insert their respective keys as hard coded numeric literals for the compare logic statement. For example, if individuals who have master records with key numbers 300017703 and 300087704, which had been

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corrected since the last directory printing, then the following code will extract these records: "if New-Key equal to '300017703' or equal to '300087704',". This code would also be inserted in the Validate-P0019 paragraph after the Addendum extraction code. Figure 11, provides an example of these changes and was the actual temporary code added to the Techxfer program for the production of the Addendum to the 1977 directory. Note that eight records were hard coded for extraction and that the Julian year of '77' and the directory number fields of the key field were utilized to specify the extraction code necessary to provide the addendum master tape. This tape was utilized by the remaining print programs for the printing of the State and Occupation cross-reference programs.
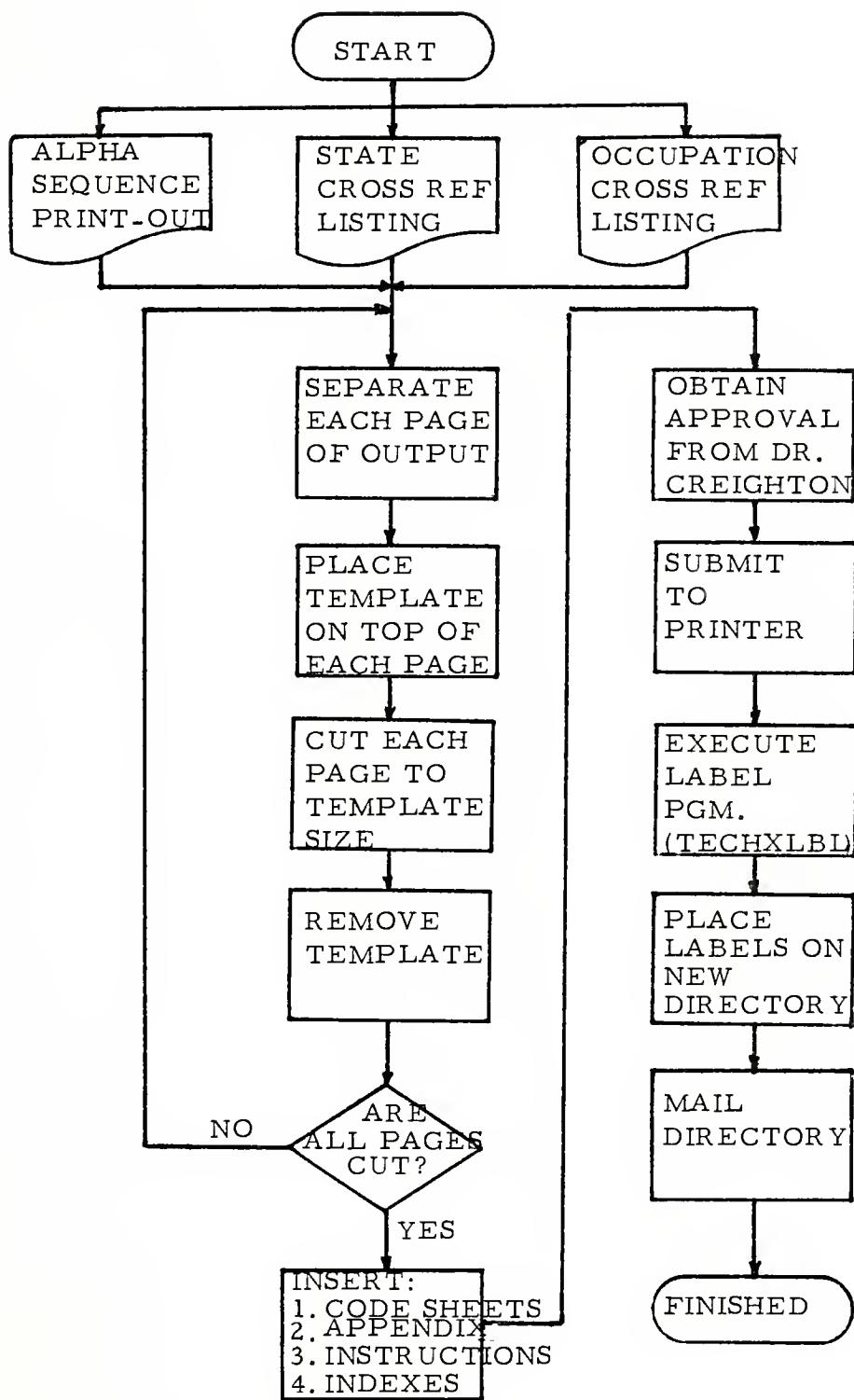
Figure 10. Manuscript Preparation Flow Chart

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```
PROCEDURE DIVISION.
MAIN-LINE SECTION.
    SORT SORT-FILE,
    ASCENDING KEY OLD-NAME
    INPUT  PROCEDURE IS VALIDATE,
    OUTPUT PROCEDURE IS UPDATE.
MAIN-P0025.
    MOVE +0 TO RETURN-CODE.
    GOBACK.
VALIDATE SECTION.
    OPEN INPUT TRANSACTION-FILE,
        OUTPUT PRINT-FILE.
VALIDATE-P0010.
    READ TRANSACTION-FILE,
    AT END GO TO VALIDATE-P0015.
VALIDATE-P0012.
    IF CNT-DIR-NUM EQUAL TO SPACES,
     GO TO VALIDATE-P0020.
    IF CNT-DIR-NUM NOT NUMERIC,
    GO TO VALIDATE-P0022.
    MOVE CNT-DIR-NUM TO DIR-HOLD.
VALIDATE-P0015.
    CLOSE TRANSACTION-FILE.
VALIDATE-P0018.
    OPEN INPUT MASTER-FILE.
VALIDATE-P0019.
    READ MASTER-FILE, AT END GO TO VALIDATE-END.
    IF NEW-JUL-YR > THAN '77' AND NEW-DIR-NUM = '02',
    OR    NEW-KEY = '300017703',
    OR    NEW-KEY = '300087704',
    OR    NEW-KEY = '287187702',
    OR    NEW-KEY = '279187702',
    OR    NEW-KEY = '271537702',
    OR    NEW-KEY = '278537702',
    OR    NEW-KEY = '270347702',
    OR    NEW-KEY = '275417702',
    MOVE MASTER-CARD TO NEW-SORT-RECORD,
    RELEASE NEW-SORT-RECORD.
    GO TO VALIDATE-P0019.
VALIDATE-P0020.
    MOVE SPACES TO PRINT-LINE
    MOVE ERR-1 TO ERR-MESSAGE.
    WRITE PRINT-LINE FROM ERR-HDR-1 AFTER POSITIONING 0 LINES.
    CLOSE TRANSACTION-FILE.
    CLOSE PRINT-FILE.
    GO TO MAIN-P0025.
VALIDATE-P0022.
    MOVE SPACES TO PRINT-LINE
    MOVE ERR-2 TO ERR-MESSAGE.
    WRITE PRINT-LINE FROM ERR-HDR-1 AFTER POSITIONING 0 LINES.
    CLOSE TRANSACTION-FILE.
    CLOSE PRINT-FILE.
    GO TO MAIN-P0025.
VALIDATE-END.
    CLOSE MASTER-FILE.
```

Figure 11.   TECHXFER Program Addendum Code Additions

ATTS SYSTEM COMPUTER PRODUCED REPORTS

VALIDATION ERROR REPORT.

TXN NUM	CARD IMAGE				ERROR MSG
		CARD IMAGE			
1	3DCD47703AMIKE HENCERSON	USMC	306		FIRST ADD CARD MISSING FROM INPUT
1					2ND ADD CARD FAILED DUE TO CARD 1 ERR
1					3RD ADD CARD FAILED DUE TO CARD 1 OR 2
2	300C47833 MIKE HENDERSON		306	1	TRANSACTION CODE IS NCT A,C,OR D
3	NPGS TEST KEYCKETTS RD MONTEREY		CA9394D	2	INPUT CARD IS OUT OF SEQUENCE
4	3777237 CAPT			3	INPUT CARD IS CUT OF SEQUENCE
5	300D4)103AMIKE HENDERSON		3D6	1	TRANSACTION KEY IS NOT NUMERIC
6	30C017703CD5				TRANSACTION CHANGE SUB-CODE IS INVALID
7	300027703AMIKE HENDERSON	USMC	306	1	SECOND ADD CARD MISSING FROM INPUT
8	3757237 CAPT			3	INPUT CARD IS OUT OF SEQUENCE
9	30C0677D3AMIKE HENCERSON	USMC	306	1	THIRD ADD CARD MISSING FROM INPUT
1]	2888477C2D5AD JDHN				ALL DATA FIELCS BLANK ON INPUT CARD
12	288807702A				DATA FIELDS NOT BLANK ON DELETE TXN
13	30C017703AMIKE HENDERSON	USMC	3D6	1	NAME FLD BLANK
15				1	CITY FIELD IS BLANK
15					STATE/COUNTRY CCDE FIELD IS BLANK
15					OCCUPATION FIELC IS BLANK
15					OCCUPATION CODE NOT NUMERIC
16	3DDD877D3ADDE//JDHN	DEP"OF PLANS	336	1	NAME FIELD NOT ALPHA-NJMERIC
16					ORGANIZATICN IS NOT ALPHA-NUMERIC
16					1ST ADDRESS LINE IS NOT ALPHA-NUMERIC
16					STREET FIELD IS NOT ALPHA-NUMERIC
16					CITY FIELD NOT ALPHABETIC
16					STATE FIELD IS NOT ALPHABETIC
16					ZIP CODE IS NOT ALPHA-NUMERIC
16					FOREIGN USE FIELD NOT ALPHA-NUMERIC
16					AREA CF EXPERTISE NOT NUMERIC
17	200D97703A		3D6	1	NAME FLD BLANK
18	3D0DI77D3CD1			D?	DIRECTORY NUM CHANGE NOT NUMERIC
19	3D004)1D3D				TRANSACTION KEY IS NOT NUMERIC

Report 1. Validation Error Report

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UPDATE-ERROR-RPT.

REC NUM   CARD IMAGE   ERROR MSG

1976   288807702A   ADD-TXN INVALID FOR REC-GN FILE
1981   350037703C   ATTEMP CHG TO RECORD NOT ON FILE

Report 2.   Update Error Report

NAME	KEY	ORGANIZATION
ANTINUCCI,JOSEPH D.	269327702	DEPARTMENT CF THE NAVY
ANUSKIEWICZ, TODD	269347702	INFORMATICS INFORMATION SYSTEMS CO.
ANYOS, DR TOM	269357702	STANFORD RESEARCH INSTITUTE
APP, JAMES L.	269367702	1038 MC CARTY HALL — IFAS
APPLE, JOHN J. CCL., USAF	269377702	ASST. FOR APPLICATIONS & SYSTEMS
APPLEBAUM, JAMES N.	269387702	J. APPLEBAUM MKTG. CCMMUNICATIONS
ARNOLO, SANDRA S.	269397702	CTR. FOR ECCNCMIC DEVELOPEMENT
ARNOLC, TOM	269407702	LICENSING LAW
ARNSTEIN, MRS. SHERRY R.	269417702	NATL CTR FOR HEALTH SER RES
ASBURY, HERBERT C.	269427702	WESRAC/USC
ASH, E. B.	269437702	ROCKWELL INTERNATIONAL
ASTOLFI, EDMUND G.	269447702	AMERICAN CAN COMPANY
ATCHISON, STERLING C.	269457702	HOQTRS. NAVAL MATL. CCMMANO
AUERBACH, ISAAC L.	269467702	AUERBACH PUBLISHERS INC.
AULT, LEONARD A.	269477702	NASA HEADQUARTERS (KT)
AUSTIN, THOMAS S.	269487702	ENVIRONMENTAL DATA SERVICE
AVEILHE, HEATHER	269497702	DEPT. OF HOLSING & URBAN DEV
AVERY, HARRY F.	269517702	BUREAU OF RECLAMATION
AYALA, HECTOR	348057802	UNIVERSIDAD DE LOS ANDES
AYALA, JOSE J.	269507702	N.B. DEPARTMENT CF FISHERIES
BABCCCK, OANIEL	269527702	DEPT OF ENGINEERING MGT.
BABIEL, J.R.	269537702	
BACKER, DR. THOMAS E.	269547702	HUMAN INTERACTION RES. INSTITLTE
BACKOFF, DR. ROBERT W.	269557712	COLLEGE OF AOMINISTRATIVE SCIENCE
BAER, JOHN LARRY	269567702	OFC OF MANUFACTURING TECHNOLOGY
BAGENT, JACK L.	269577702	LSU COOPERATIVE EXTENSION SERVICE
BAILEY, DAVID S.	269597702	L.S. ARMY NATICK R&D CCMMAND
BAILEY, RUSS E.	269587702	GENERAL ELECTRIC COMPANY
BAILL, MORDECAI	269607702	U.S. DEPARTMENT OF CCMMERCE
BAIRO, JOHN L.	269617702	FEA/CCE/BUILDING
BAKER, DALE B.	269637702	CHEMICAL ABSTRACTS SERVICE
BAKER, DR. ANDREW N.	269627702	DIRECTOR OF RESEARCH
BALTAZZI, EVAN S.	269647702	ADDRESSOGRAPH MULTIGRAPH CORP.
BANATHY, BELA H.	269657702	FAR WEST LABORATORY
BANG, ARNIE J.	269667702	OFC OF FREIGHT SYSTEMS (R&D)

Report 3.   Name-Key Cross-Reference Report

121

NAME/TITLE ORG/PHONE	ADDRESS	AREA OF EXPERTISE	OCCUPATION
ALDRICH, RICHARD J. DEPUTY DIR. COOP RESEARCH SCIENCE & EDUCATION ADMINISTRATION 202-447-4423	US DEPT AGRICULTURE WASHINGTON DC 20250	706	306
ANCELEVICZ, JACOB FUNCACAO GETULIO VARGAS 011-670436	AV. ANGELICA, 696 AP. 31 SAO PAULO 01228 BRAZIL	387 348	712
ANDERSON, BRUCE N. PRESIDENT TOTAL ENVIRONMENTAL ACTION INC. 603-827-3361	CHURCH HILL HARRISVILLE NH 03450	733 751 862	435
ANTIN, IRVING DIRECTOR OFC. OF RES. SUPPORT MARQUETTE UNIVERSITY 414-224-7200	1217 W. WISCONSIN AVE. MILWAUKEE WI 53233	499	000
AYALA, HECTOR PROFESSOR RESEARCHER UNIVERSIDAD DE LOS ANDES 2824066190	CARRERA 1E 8A 10 P.O. BOX 4976 BOGOTA COLOMBIA	712 706 865	474
BECKER, FABIO SUPERINTENDENT SPU SERVICOS DE PLANEJAMENTO SA 2553011	RVA BARATA RIBEIRO 383BC RIO DE JANEIRO BRAZIL	799	348
BEETH, GUNNAR PRESIDENT IMACONSULT S.A. 3226735992	AV O ITALIE 43 BTE 26 B 1050 BRUSSELS BELGIUM	899	348
BELLICHA, TERRY NATL CLEARINGHOUSE FOR ALCOHOL INFO 301-948-4450	P.O. BOX 2345 ROCKVILLE MD 20850	844	499
BENOIX, OR. SELINA ENVIRONMENTAL REVIEW OFFICER CITY & COUNTY OF SAN FRANCISCO 415-556-3056	DEPT. OF CITY PLANNING 100 LARKIN STREET SAN FRANCISCO CA 94102	751 769 844	000
BIGGY, M. VIRGINIA PRESIDENT COE DESIGNS FOR EDUCATION 617-369-7555	162 PARKLANE CONCORD MA 01742	712 742 371	336
BIRNBAUM, ABRAHAM H. NAVAL AIR DEV. CENTER 215-441-3167	JACKSONVILLE ST. WARMINSTER PA 18974		000
BRAKMAN, DONALD R. PRODUCT DEVELOPMENT MANAGER PROCTER AND GAMBLE COMPANY 513-874-8730	17 TWIN LAKES DR. FAIRFIELD OH 45014	793 862	393
BROWN, ELWOOD B. DIRECTOR SYSTEM DEVELOPMENT REXNORD INC. 414-643-2706	P.O. 2022 5101 WEST BELOIT RD MILWAUKEE WI 53201	871 799	393
CALL, DOUGLAS W. AEROSPACE PHYSIOLOGIST NATIONAL PARACHUTE TEST RANGE 714-353-2354	BIOMEDICAL DEPT. EL CENTRO CA 92243	844	462
CARVAJAL, JOSEPH J. FEDERAL ENERGY ADMINISTRATION 202-566-5452	RM 6532, FED. BLDG. WASHINGTON DC 20461	703 769	405
CHANDLER, GEORGE P. JR. CHIEF HEADQUARTERS INFO OFF NASA HEADQUARTERS 202-755-3548	CODE NST10 WASHINGTON DC 20546	745 748 784	405

Report 4. Alphabetical Name Directory Print Report

122

***BELGIUM ***
BEETH, GUNNAR

BRAZIL *
BECKER, FABIO

***CALIFORNIA ***
BENDIX, DR. SELINA
CALL, DOUGLAS W.
DEUTSCH, WARREN A.
DIXON, THOMAS F.
DORDICK, HERBERT S.
HEINZ, WINFIELD G.
LATHROP, DOUGLASS S.
MALLICK, SUBHASH K.
MOLANDER, BLAIR L.
PARK, JACK
PILNICK, CARL
RIDER, BRENT T.
RIFAS, BERTRAM E.
WILKERSON, JACK M.
WOODSON, THOMAS T.

***COLUMBIA ***
AYALA, HECTOR
DAVILA CARLOS
JARAMILLO, LUIS JAVIER
SILVA, JAIME

***CANADA ***
ENG, DR. RALPH L.
GLANTZ, LESTER M.
JAMES, MRS. APRIL L.

***COLORADO ***
FLAHERTY, DAVID C.
WAGNER, BARBARA L.

***CONNECTICUT ***
HOSMER, BRUCE E.
KINDEL, STEPHEN

***DISTRICT OF COLUMBIA ***
ALDRICH, RICHARD J.
CARVAJAL, JOSEPH J.
CHANDLER, GEORGE P., JR.
DENNIS, BERNARD K.

SHARMA, K. D. ***

***KENTUCKY ***
TALLENT EUGENE W

***LOUISIANA ***
HILL, TOMMY F.
JENNINGS, LEE W.

***MASSACHUSETTS ***
BIGGY, M. VIRGINIA
GARTNER, JOSEPH
RAGAN, RALPH R.
SANFORD, GORDON S.

***MARYLAND ***
BELLICHA, TERRY
EBERHART, RUSSELL C.
SHELOR, E. GROGAN

***MAINE ***
LACASSE, JOHN A.

***MICHIGAN ***
PICKARD, WILLIAM F.
SWITZER, THOMAS JON

***MISSOURI ***
FULLER, RICHARD H.
HANNAH, ROBERT P.
SHARP, DEXTER B.
STEPHENS JOHN A.

***NORTH CAROLINA ***
HILMON, J. B.
NEES, MONICA R.
SCHROEDER, ODRIS K.

***NEW HAMPSHIRE ***
ANDERSON, BRUCE N.

***NEW YORK ***
HOSMER, BRUCE E.
KINDEL, STEPHEN
MCLINDEN, JAMES E.
MOHAN, RADHE
MOYER, ELMO E.
NOONE, THOMAS M.
SMITH, ARTHUR C.

***SWEDEN ***
HEDBERG, BERTIL

***TENNESSEE ***
JARED, DONALD W.

***TURKEY ***
KERSE, DR. AHMET

***VIRGINIA ***
NISENOFF, NORMAN
RCHRER, J. TIMOTHY

***VERMONT ***
DUCHACEK, HOWARD

***WASHINGTON ***
GUSS, LEONARD M.
NESS, ROBERT L.

***WISCONSIN ***
ANTIN, IRVING
BROWN, ELWOOD B.

Report 5.   State/Country Cross-Reference Report

123

OCCUPATION CODE 000
ANTIN, IRVING
BENOIX, DR. SELINA
BIRNBAUM, ABRAHAM H.
DENNIS, BERNARD K.
GOEDEKE, A. DONALD
GUSS, LEONARD M.
HALTERMAN, JERRY J.
JAPEC, DONALD W.
JUDET, PIERRE
MENDELL, JAY S.
PERRIN JACQUES
OCCUPATION CODE 306
ALDRICH, RICHARD J.
BIGGY, M. VIRGINIA
DIXON, THOMAS F.
HILMON, J. B.
JENNINGS, LEE W.
OCCUPATION CODE 309
SCHROEDER, CORIS K.
OCCUPATION CODE 321
HOSMER, BRUCE E.
KERSE, DR. AHMET
OCCUPATION CODE 335
WILKERSON, JACK M.
OCCUPATION CODE 348
BECKER, FABIO
BEETH, GUNNAR
GERMANN, RICHARD P.
HACKAMACK, LAWRENCE C.
MARTINEZ, VICTOR
POLANDER, BLAIR L.
MOYER, ELMO E.
ROONE, THOMAS M.
PARK, JACK
PILNICK, CARL
RIFAS, BERTRAM E.
OCCUPATION CODE 354
GLANTZ, LESTER M.

OCCUPATION CODE 393
BORNMAN, DONALD R.
BROWN, ELWOOD B.
DEUTSCH, WARREN A.
DUCHACEK, HOWARD
EBERHART, RUSSELL C.
ENG, DR. RALPH L.
FROST, PAUL O.
HUGHES, THOMAS W.
LACASSE, JOHN A.
MCLIHDEN, JAMES E.
NISEMOFF, NORMAN
OLLILA, RICHARD G.
PASTOP, GEORGE J.
RAGAN, RALPH R.
ROHRER, J. TIMOTHY
OCCUPATION CODE 402
RIDER, BRENT T.
OCCUPATION CODE 405
CARVAJAL, JOSEPH J.
CHANDLER, GEORGE P., JR.
HILL, TOMMY F.
HUNT, ROBERT A.
OWENS, JAMES M.
WEINSTEIN, RICHARD H.
WHITLOCK, LEIGH S.
OCCUPATION CODE 423
JAMES, MRS. APRIL L.
OCCUPATION CODE 426
WINSLOW, FRANCIS J.
OCCUPATION CODE 435
ANDERSON, BRUCE N.
HUMPHRIES, GEORGE E.
PICKARD, WILLIAM F.
OCCUPATION CODE 462
CALL, DOUGLAS W.
MALLICK, SUBHASH K.
VAN BRUGGEN, JOHN T. Ph.D.
OCCUPATION CODE 465

ANGELEVICZ, JACOB
OCCUPATION CODE 742
FULLER, RICHARD H.
OCCUPATION CODE 769
TOWNSEND, JOSEPH E.
OCCUPATION CODE 802
HANSON, AUSTIN M.
OCCUPATION CODE 862
ODENDAAL, PIETER E.
QURESHI, M. A.

Report 6.   Occupation Cross-Reference Report

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MASTER-FILE ACTIVITY REPORT

```
INPUT MASTER FILE RECORD COUNT      1981
TOTAL ADD (NEW) RECORD COUNT        0000
TOTAL DELETE TRANSACTION COUNT      0000
TOTAL MASTER FILE OUTPUT COUNT      1981

TOTAL TRANSACTION COUNT             0019
```

Report 7.   Master File Activity Report

125

TOTAL NUMBER RECORDS ON FILE   1981

Report 8.   TECHXFER Master Print Record Totals Report

VIII. INDEX TO THE COMPUTER PROGRAMS OF THE ATTS SYSTEM

Computer Programs

```
//HEND2338 JOB (0973,0813,MZ51,,30),'HEND2338',TIME=2
//    EXEC COBUCLG
//COB.SYSIN DD *
     IDENTIFICATION DIVISION.
     PROGRAM-ID. HEND04.
     AUTHOR. MIKE HENDERSON
     ENVIRONMENT DIVISION.
     CONFIGURATION SECTION.
     SOURCE-COMPUTER. IBM-360.
     OBJECT-COMPUTER. IBM-360.
     SPECIAL-NAMES.
         C01 IS TOP-PAGE.
     INPUT-OUTPUT SECTION.
     FILE-CONTROL.
         SELECT MASTER-FILE, ASSIGN TO UT-S-TAPEIN.
         SELECT NEW-FILE, ASSIGN TO UT-S-TAPOUT.
         SELECT PRINT-FILE, ASSIGN TO UR-S-PRINT.
     DATA DIVISION.
     FILE SECTION.
     FD  MASTER-FILE.
         RECORD CONTAINS 179 CHARACTERS
         LABEL RECORDS ARE STANDARD
         BLOCK CONTAINS 10 RECORDS
         DATA RECORD IS MASTER-CARD.
     01  MASTER-CARD.
         05 NAME-CD            PIC X(28).
         05 ADD-1              PIC X(35).
         05 AREA-INT           PIC X(8).
         05 AREA-EXP           PIC X(9).
         05 ADD-2              PIC X(29).
         05 STREET-ADD         PIC X(24).
         05 CITY               PIC X(16).
         05 STATE              PIC X(2).
         05 ZIP                PIC X(5).
         05 INT                PIC X(3).
         05 FILLER             PIC 9(16).
         05 PHONE              PIC X(3).
         05 OCCUP
     FD  NEW-FILE,
         RECORD CONTAINS 231 CHARACTERS
         LABEL RECORDS ARE STANDARD
         BLOCK CONTAINS 10 RECORDS
         DATA RECORD IS NEW-MAST.
```

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```cobol
01  NEW-MAST.
    05  NEW-KEY.
        07  M-JUL-NUM        PIC 999.
        07  M-RCD-NUM        PIC 99.
        07  M-JUL-YR         PIC 99.
    05  DIR-NUM              PIC 99.
    05  M-NAME-CD            PIC X(28).
    05  M-ORG                PIC X(35).
    05  M-OCCUP-CD           PIC 999.
    05  M-ADD-1              PIC X(29).
    05  M-ADD-2-STREET       PIC X(24).
    05  M-CITY               PIC X(16).
    05  M-STATE-CD           PIC X(2).
    05  M-ZIP                PIC X(6).
    05  M-FORIGN-ADD         PIC X(20).
    05  M-PHONE              PIC X(16).
    05  M-AREA-EXP           PIC X(9).
    05  M-TITLE              PIC X(28).
    05  M-FUTURE-USE         PIC X(6).
FD  PRINT-FILE
    LABEL RECORDS ARE OMMITED
    DATA RECORD IS PRINT-LINE.
01  PRINT-LINE               PIC X(133).
    EJECT
WORKING-STORAGE SECTION.
01  ACCUMULATORS.
    10  RCD-CTR              PIC 99      VALUE ZEROS.
    10  SEQ-NUM              PIC 999     VALUE ZEROS.
    10  OCCUP-ERR-CTR        PIC 999     VALUE ZEROS.
    10  NEW-MAST-CTR         PIC 9(4)    VALUE ZEROS.
01  NEW-MAST-PRINT.
    05  FILLER               PIC X.(7)   VALUE SPACES.
    05  MAST-KEY-PRT         PIC 9(7)    VALUE ZEROS.
    05  DIR-NUM-PRT          PIC 99      VALUE ZEROS.
    05  FILLER               PIC X(4)    VALUE SPACES.
    05  NAME-PRT             PIC X(28)   VALUE SPACES.
    05  FILLER               PIC X(5)    VALUE SPACES.
    05  STATE-CD-PRT         PIC X(2)    VALUE SPACES.
    05  FILLER               PIC 9(3)    VALUE ZEROS.
    05  OCCUP-CD-PRT         PIC 9(5)    VALUE ZEROS.
    05  FILLER               PIC X(5)    VALUE SPACES.
    05  ADD-1-PRT            PIC X(35)   VALUE SPACES.
    05  FILLER               PIC X(3)    VALUE SPACES.
    05  ZIP-PRT              PIC X(6)    VALUE SPACES.
    05  FILLER               PIC X(3)    VALUE SPACES.
    05  STREET-PRT           PIC X(24)   VALUE SPACES.
01  STAT-HDR-1.
    05  FILLER               PIC X.
```

```cobol
        05  FILLER                   PIC X(40)  VALUE SPACES.
        05  FILLER                   PIC X(53)  VALUE 'TECHXFER MASTER
    -   'RECORDCONVERSION PGM RUN STATISTICS:'.
        05  FILLER                   PIC X(39)  VALUE SPACES.
    01  STAT-HDR-2.
        05  FILLER                   PIC X.     VALUE SPACES.
        05  FILLER                   PIC X(40)  VALUE SPACES.
        05  FILLER                   PIC X(30)  VALUE 'NUMBER OCCUP COD
    -   'ES BLANK          '.
        05  FILLER                   PIC X(5)   VALUE SPACES.
        05  OCCUP-CTR-PR             PIC 99     VALUE ZEROS.
        05  FILLER                   PIC X(55)  VALUE SPACES.
    01  STAT-HDR-3.
        05  FILLER                   PIC X.     VALUE SPACES.
        05  FILLER                   PIC X(40)  VALUE 'NUMBER OCCUP COD
    -   'ES CORRECTED '.
        05  FILLER                   PIC X(30)  VALUE SPACES.
        05  OCCUP-CTR-COR            PIC 99     VALUE ZEROS.
        05  FILLER                   PIC X(55)  VALUE SPACES.
    01  STAT-HDR-4.
        05  FILLER                   PIC X.     VALUE SPACES.
        05  FILLER                   PIC X(40)  VALUE 'TOTAL NUMBER REC
    -   'ORDS CONVERTED'.
        05  FILLER                   PIC X(30)  VALUE SPACES.
        05  TOT-RCD-COUNT            PIC X(5)   VALUE SPACES.
        05  FILLER                   PIC 9(4)   VALUE ZEROS.
        05  FILLER                   PIC X(53)  VALUE SPACES.
    -
    EJECT
    PROCEDURE DIVISION.
    MAIN-LINE SECTION.
        OPEN INPUT MASTER-FILE
             OUTPUT PRINT-FILE
             OUTPUT NEW-FILE.
        MOVE '269' TO SEQ-NUM.
    PROCESS-RCC.
        PERFORM READ-MAST THRU READ-MAST-EXIT.
        PERFORM BLD-KEY THRU BLD-KEY-EXIT.
        PERFORM MOVE-OLD-MAST THRU MOVE-OLD-MAST-EXIT.
        PERFORM OCCUP-FIX THRU OCCUP-FIX-EXIT.
        PERFORM WRITE-MAST THRU WRITE-MAST-EXIT.
        PERFORM WRITE-PRINT-OUT THRU WRITE-PRINT-OUT-EXIT.
        GO TO PROCESS-RCD.
    MAIN-LINE-EXIT.
        EXIT.
    READ-MAST SECTION.
        READ MASTER-FILE, AT END GO TO END-OF-JOB.
    READ-MAST-EXIT.
```

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```
BLD-KEY SECTION.
    EXIT.
    IF RCD-CTR < 95,
    ADD +1 TO RCD-CTR,
    GO TO MOVE-SEQ.
    MOVE '01' TO RCD-CTR,
    ADD +1 TO SEQ-NUM.
MOVE-SEQ.
    MOVE SEQ-NUM TO M-JUL-NUM.
    MOVE RCD-CTR TO M-RCD-NUM,
    MOVE '02' TO DIR-NUM,
    MOVE '77' TO M-JUL-YR.
BLD-KEY-EXIT.
    EXIT.
MOVE-OLD-MAST SECTION.
    MOVE NAME-CD TO M-NAME-CD.
    MOVE ADD-1 TO M-ORG.
    MOVE AREA-EXP TO M-AREA-EXP.
    MOVE ADD-2 TO M-ADD-1.
    MOVE STREET-ADD TO M-ADD-2-STREET.
    MOVE CITY TO M-CITY.
    MOVE STATE TO M-STATE-CD.
    MOVE ZIP TO M-ZIP.
    MOVE PHONE TO M-PHONE.
    MOVE OCCUP TO M-OCCUP-CD.
    MOVE SPACES TO M-FUTURE-USE.
    MOVE SPACES TO M-TITLE.
    MOVE SPACES TO M-FORIGN-ADD.
MOVE-OLD-MAST-EXIT.
    EXIT.
OCCUP-FIX SECTION.
    IF OCCUP EQUAL TO SPACES,
    MOVE '000' TO M-OCCUP-CD,
    ADD +1 TO OCCUP-ERR-CTR.
OCCUP-FIX-EXIT.
    EXIT.
EJECT
WRITE-MAST SECTION.
    WRITE NEW-MAST.
    ADD +1 TO NEW-MAST-CTR.
WRITE-MAST-EXIT.
    EXIT.
WRITE-PRINT-OUT SECTION.
    MOVE SPACES TO PRINT-LINE, NEW-MAST-PRINT.
    MOVE NEW-KEY TO MAST-KEY-PRT
    MOVE DIR-NUM TO DIR-NUM-PRT
    MOVE M-NAME-CD TO NAME-PRT.
    MOVE M-ORG TO ADD-1-PRT
```

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```
    MOVE M-STATE-CD TO STATE-CD-PRT.
      MOVE M-OCCUP-CD TO OCCUP-CD-PRT
    MOVE M-ZIP TO ZIP-PRT.
    MOVE M-ADD-2-STREET TO STREET-PRT.
      WRITE-PRINT-LINE FROM NEW-MAST-PRINT AFTER 2.
WRITE-PRINT-OUT-EXIT.
    EXIT.
END-OF-JOB.
    MOVE SPACES TO PRINT-LINE.
      WRITE PRINT-LINE FROM STAT-HDR-1 AFTER TOP-PAGE.
    MOVE SPACES TO PRINT-LINE.
    MOVE OCCUP-ERR-CTR TO OCCUP-CTR-PR, OCCUP-CTR-CTR-CCR.
      WRITE PRINT-LINE FROM STAT-HDR-2 AFTER 3.
    MOVE SPACES TO PRINT-LINE.
      WRITE PRINT-LINE FROM STAT-HDR-3 AFTER 1.
    MOVE SPACES TO PRINT-LINE.
    MOVE NEW-MAST-CTR TO TOT-RCD-COUNT.
      WRITE PRINT-LINE FROM STAT-HDR-4 AFTER 3.
    CLOSE MASTER-FILE PRINT-FILE NEW-FILE.
    STOP RUN.
```

THE PRINT LABEL PROGRAM

```
//TECHXLBL  JOB (0973,0813,MZ51,,30),'TECHXFER',TIME=2,TYPRUN=HOLD
//  EXEC  COBUCLG
//COB.SYSIN DD *
        IDENTIFICATION DIVISION.
        PROGRAM-ID.  PRINT-LABEL.
        AUTHOR.  MIKE HENDERSON
        ENVIRONMENT DIVISION.
        INPUT-OUTPUT SECTION.
        FILE-CONTROL.
            SELECT MASTER-FILE, ASSIGN TO UT-S-TAPEIN.
            SELECT SORT-FILE, ASSIGN TO DA-S-ASRTFL.
            SELECT SORTED-FILE, ASSIGN TO DA-S-OUTFL.
            SELECT PRINT-FILE, ASSIGN TO UR-S-PRINT.
        DATA DIVISION.
        FILE SECTION.
        FD  MASTER-FILE.
            RECORD CONTAINS 231 CHARACTERS
            LABEL RECORDS ARE STANDARD
            BLOCK CONTAINS 10 RECORDS
            DATA RECORD IS MASTER-REC.
        01  MASTER-REC.                    PIC X(231).
        FD  SORTED-FILE
            RECORD CONTAINS 231 CHARACTERS
            LABEL RECORDS ARE STANDARD
            BLOCK CONTAINS 10 RECORDS
            DATA RECORD IS MASTER-CARD.
        01  MASTER-CARD.
            05  NEW-KEY.
                07  M-JUL-NUM              PIC 999.
                07  M-RCD-NUM              PIC 99.
                07  M-JUL-YR               PIC 99.
            05  DIR-NUM                    PIC 99.
            35  M-NAME-CD                  PIC X(28).
            05  M-ORG                      PIC X(35).
            05  M-OCCUP-CD                 PIC 999.
            05  M-ADD-1                    PIC X(29).
            05  M-ADD-2-STREET             PIC X(24).
            05  M-CITY                     PIC X(16).
            05  M-STATE-CD                 PIC X(2).
            05  M-ZIP                      PIC X(6).
            05  M-FORIGN-ADD               PIC X(2).
            05  M-PHONE                    PIC X(16).
            05  M-AREA-EXP                 PIC X(9).
```

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    05  M-TITLE                        PIC X(28).
    05  M-FUTURE-USE                   PIC X(6).
SD  SORT-FILE
    RECORD CONTAINS 231 CHARACTERS
    DATA RECORD IS SORT-RECORD.
01  SORT-RECORD.
    05  SORT-KEY                       PIC 9(9).
    05  SORT-NAME                      PIC X(28).
    05  FILLER                         PIC X(35).
    05  SORT-OCCUP-CD                  PIC X(3).
    05  FILLER                         PIC X(71).
    05  SORT-ZIP                       PIC X(6).
    05  FILLER                         PIC X(79).
FD  PRINT-FILE
    LABEL RECORDS ARE OMITTED,
    BLOCK CONTAINS 25 RECORDS
    DATA RECORD IS PRINT-LINE.
01  PRINT-LINE                         PIC X(36).
    EJECT
WORKING-STORAGE SECTION.
01  ACCUMULATORS.
    10  PRT-CTR                        PIC S9(4)  VALUE ZEROS COMP SYNC.
    10  LINE-CTR                       PIC S9(4)  VALUE ZEROS COMP SYNC.
01  ALIGN.
    05  FILLER                         PIC X(11)  VALUE IS '***ALIGN$$'.
    05  ALIGN-IT                       PIC X(24)  VALUE SPACES.
    05  FILLER
01  NAME.
    05  FILLER                         PIC X(28)  VALUE SPACES.
    05  NAME-PR                        PIC X(7)   VALUE SPACES.
    05  FILLER
01  ORG.
    05  FILLER                         PIC X(35)  VALUE SPACES.
    05  ORG-PR
01  FIRST-ADD.
    05  FILLER                         PIC X(35)  VALUES SPACES.
    05  FIRST-ADD-PR
01  SECOND-ADD.
    05  FILLER                         PIC X(29)  VALUES SPACES.
    05  SECOND-ADD-PR                  PIC X(6)   VALUE SPACES.
    05  FILLER
01  STREET.
    05  FILLER                         PIC X(24)  VALUE SPACES.
    05  STREET-PR                      PIC X(11)  VALUE SPACES.
    05  FILLER
01  LAST-LINE.
    05  FILLER                         PIC X(16)  VALUE SPACES.
    05  CITY-PR
```

```
        05  FILLER              PIC X(2)   VALUE SPACES.
        05  STATE-PR            PIC X(2)   VALUE SPACES.
        05  FILLER              PIC X(6)   VALUE SPACES.
        05  ZIP-PR              PIC X(6)   VALUE SPACES.
        05  FILLER              PIC X(3)   VALUE SPACES.
    01  FOREIGN-LINE.
        05  FILLER              PIC X(20)  VALUE SPACES.
        05  FOREIGN-PR          PIC X(15)  VALUE SPACES.
        05  FILLER
    EJECT
    PROCEDURE DIVISION.
    INITIAL-ROUTINE.
        SORT SORT-FILE
            ASCENDING KEY SORT-ZIP
            ASCENDING KEY SORT-NAME
            USING MASTER-FILE
            GIVING SORTED-FILE
        OPEN INPUT SORTED-FILE,
             OUTPUT PRINT-FILE.
    ALIGN-ROUTINE.
        PERFORM FIRST-LBL-ROUTINE THRU 010-EXIT 45 TIMES.
    READ-MASTER-ROUTINE.
        READ SORTED-FILE, AT END GO TO END-OF-JOB.
        MOVE ZEROS TO LINE-CTR.
    BLD-NAME-ROUTINE.
        MOVE SPACES TO PRINT-LINE, NAME-PR.
        MOVE M-NAME-CD TO NAME-PR.
        WRITE PRINT-LINE FROM NAME AFTER ADVANCING 4 LINES.
        ADD +1 TO LINE-CTR.
        IF DIR-NUM NOT EQUAL TO '02',
        GO TO CHECK-ADD-1.
        IF M-ORG EQUAL TO SPACES,
        GO TO CHECK-ADD-1.
        MOVE SPACES TO PRINT-LINE, ORG-PR.
        MOVE M-ORG TO ORG-PR.
        WRITE PRINT-LINE FROM ORG AFTER ADVANCING 1 LINES.
        ADD +1 TO LINE-CTR.
    CHECK-ADD-1.
        IF M-ADD-1 EQUAL SPACES,
        GO TO CHECK-STREET.
        MOVE SPACES TO PRINT-LINE, SECOND-ADD-PR.
        MOVE M-ADD-1 TO SECOND-ADD-PR.
        WRITE PRINT-LINE FROM SECOND-ADD AFTER ADVANCING 1 LINES.
        ADD +1 TO LINE-CTR.
    CHECK-STREET.
        IF M-ADD-2-STREET EQUAL TO SPACES,
        GO TO CHECK-FOREIGN.
        MOVE SPACES TO PRINT-LINE, STREET-PR.
```

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```
        MOVE M-ADD-2-STREET TO STREET-PR.
        WRITE PRINT-LINE FROM STREET AFTER ADVANCING 1 LINES.
        ADD +1 TO LINE-CTR.
    CHECK-FOREIGN.
        IF M-FORIGN-ADD EQUAL TO SPACES,
        GO TO CHECK-CITY.
        IF M-CITY EQUAL TO SPACES,
        GO TO PRINT-FOREIGN-LINE.
        MOVE SPACES TO PRINT-LINE, CITY-PR, STATE-PR, ZIP-PR.
        MOVE M-CITY TO CITY-PR.
        MOVE M-ZIP TO ZIP-PR.
        WRITE PRINT-LINE FROM LAST-LINE AFTER ADVANCING 1 LINES.
        ADD +1 TO LINE-CTR.
    PRINT-FOREIGN-LINE.
        MOVE SPACES TO PRINT-LINE, FOREIGN-PR.
        MOVE M-FORIGN-ADD TO FOREIGN-PR.
        WRITE PRINT-LINE FROM FOREIGN-LINE AFTER ADVANCING 1 LINES.
        ADD +1 TO LINE-CTR.
        GO TO CHECK-PRINT-LINES.
    CHECK-CITY.
        IF M-CITY EQUAL TO SPACES,
        GO TO CHECK-PRINT-LINES.
        MOVE SPACES TO PRINT-LINE, CITY-PR, STATE-PR, ZIP-PR.
        MOVE M-CITY TO CITY-PR.
        MOVE M-STATE-CD TO STATE-PR.
        MOVE M-ZIP TO ZIP-PR.
        WRITE PRINT-LINE FROM LAST-LINE AFTER ADVANCING 1 LINES.
        ADD +1 TO LINE-CTR.
    EJECT
    CHECK-PRINT-LINES.
        IF LINE-CTR EQUAL TO +1,
        MOVE SPACES TO PRINT-LINE,
        WRITE PRINT-LINE AFTER ADVANCING 5 LINES,
        GO TO LABEL-COUNT.
    CHECK-TWO.
        IF LINE-CTR EQUAL TO +2,
        MOVE SPACES TO PRINT-LINE,
        WRITE PRINT-LINE AFTER ADVANCING 4 LINES,
        GO TO LABEL-COUNT.
    CHECK-THRE.
        IF LINE-CTR EQUAL TO +3,
        MOVE SPACES TO PRINT-LINE,
        WRITE PRINT-LINE AFTER ADVANCING 3 LINES,
        GO TO LABEL-COUNT.
    CHECK-FOUR.
        IF LINE-CTR EQUAL TO +4,
        MOVE SPACES TO PRINT-LINE,
        WRITE PRINT-LINE AFTER ADVANCING 2 LINES,
```

```
        GO TO LABEL-COUNT.
    CHECK-FIVE.
        IF LINE-CTR EQUAL TO +5,
           MOVE SPACES TO PRINT-LINE,
           WRITE PRINT-LINE AFTER ADVANCING 1 LINES,
           GO TO LABEL-COUNT.
    LABEL-COUNT.
        ADD +1 TO PRT-CTR.
        GO TO READ-MASTER-ROUTINE.
    FIRST-LBL-ROUTINE.
        MOVE SPACES TO PRINT-LINE.
        WRITE PRINT-LINE FROM ALIGN AFTER ADVANCING 4 LINES.
        WRITE PRINT-LINE FROM ALIGN AFTER ADVANCING 1 LINES.
        WRITE PRINT-LINE FROM ALIGN AFTER ADVANCING 1 LINES.
        WRITE PRINT-LINE FROM ALIGN AFTER ADVANCING 1 LINES.
        WRITE PRINT-LINE FROM ALIGN AFTER ADVANCING 1 LINES.
        WRITE PRINT-LINE FROM ALIGN AFTER ADVANCING 1 LINES.
    010-EXIT.
        EXIT.
    END-OF-JOB.
        CLOSE SORTED-FILE, PRINT-FILE.
        STOP RUN.
//GO.SORTLIB  DD DSN=SYS1.SORTLIB,DISP=SHR
//GO.SORTWK01 DD UNIT=2314,VOL=SER=SPOOL2,SPACE=(TRK,(30,10),,CONTIG)
//GO.SORTWK02 DD UNIT=2314,VOL=SER=SPOOL2,SPACE=(TRK,(30,10),,CONTIG)
//GO.SORTWK03 DD UNIT=2314,VOL=SER=SPOOL2,SPACE=(TRK,(30,10),,CONTIG)
//GO.SORTWK04 DD UNIT=2314,VOL=SER=SPOOL2,SPACE=(TRK,(30,10),,CONTIG)
//GO.SCRTPR  DD SYSOUT=A
//GO.TAPEIN  DD DISP=(OLD,KEEP),UNIT=3400-3,LABEL=(1,SL),
//   VOL=SER=NPS349,DSNAME=F0973.CONV.MAST,
//   DCB=(RECFM=FB,LRECL=231,BLKSIZE=2310)
//GO.OUTFL   DD UNIT=SYSDA,SPACE=(TRK,(20,10)),
//   DCB=(RECFM=F,LRECL=231,BLKSIZE=231)
//GO.ASRTFL  DD UNIT=SYSDA,SPACE=(TRK,(20,10)),
//   DCB=(RECFM=F,LRECL=231,BLKSIZE=2310)
//GO.PRINT   DD UNIT=1403,DCB=(RECFM=FBA,LRECL=36,BLKSIZE=36)
```

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THE VALIDATE-UPDATE INPUT TRANSACTION PROGRAM

```
//TECHXVAL JOB (0973,0813,MZ51,,30),'TECHXVAL',TIME=2
//     EXEC COBUCLG
//COB.SYSIN DD *
       IDENTIFICATION DIVISION.
       PROGRAM-ID. UPDATE.
       AUTHOR.  MIKE HENDERSON
       REMARKS.
      *****************************************************************
      ** FUNCTION - THIS PROGRAM WILL FORMAT,VALIDATE AND SORT       **
      ** INPUT TRANSACTIONS WHICH WILL THEN BE APPLIED TO UPDATE THE **
      ** TECHXFER MASTER FILE. THE MAINLINE WILL UTILIZE A SORT      **
      ** STATEMENT FOR INTERNAL SORTING.                             **
      *****************************************************************
      **  INPUT- TRANSACTION FILE (CARD INPUT).                      **
      **       - MASTER INPUT FILE.                                  **
      **  OUTPUT- NEW MASTER FILE.                                   **
      **        - ERROR REPORTS.                                     **
      **                                                             **
      **  TABLES- MASTER FILE ACTIVITY REPORT.                       **
      **          ERROR MSG TABLE.                                   **
      ** SWITCHES- ERRCTR SWITCH                                     **
      **           INITIALIZED TO LOW VALUES.                        **
      **           SET TO HIGH VALUE WHEN ERROR CONDITION OCCURS.    **
      *****************************************************************
       ENVIRONMENT DIVISION.
       INPUT-OUTPUT SECTION.
       FILE-CONTROL.
           SELECT OLD-MASTER,   ASSIGN TO UT-S-TAPEIN.
           SELECT NEW-MASTER,   ASSIGN TO UT-S-TAPOUT.
           SELECT TRANSACTION-FILE, ASSIGN TO UR-S-IN1.
           SELECT SORT-FILE, ASSIGN TO CA-S-OUTFL.
           SELECT ERROR-REPORT, ASSIGN TO UR-S-ERROR.
           SELECT PRINT-FILE, ASSIGN TO UR-S-PRINT.
       DATA DIVISION.
       FILE SECTION.
       FD  OLD-MASTER.
           RECORD CONTAINS 231 CHARACTERS
           LABEL RECORDS ARE STANDARD
           BLOCK CONTAINS 10 RECORDS
           DATA RECORD IS OLD-MASTER-REC.
       01  OLD-MASTER-REC.
           05  OLD-KEY.
               07  OLD-JUL-DAY          PIC 999.
               07  OLD-RCD-NUM          PIC 99.
```

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        07  OLD-JUL-YR                PIC 99.
        07  OLD-DIR-NUM               PIC 99.
    05  OLD-NAME                      PIC X(28).
    05  OLD-ORG                       PIC 999.
    05  OLD-OCCUP-CD                  PIC X(29).
    05  OLD-ADD-2                     PIC X(24).
    05  OLD-STREET                    PIC X(16).
    05  OLD-CITY                      PIC X(2).
    05  OLD-STATE                     PIC X(6).
    05  OLD-ZIP                       PIC X(2).
    05  OLD-FORIGN-ADD                PIC X(16).
    05  OLD-PHONE                     PIC X(9).
    05  OLD-AREA-EXP                  PIC X(28).
    05  OLD-TITLE                     PIC X(6).
    05  OLD-FUTURE-USE
    EJECT
FD  NEW-MASTER,
    RECORD CONTAINS 231 CHARACTERS
    LABEL RECORDS ARE STANDARD
    BLOCK CONTAINS 10 RECORDS
    DATA RECORD IS NEW-MASTER-REC.
01  NEW-MASTER-REC.
    03  NEW-DATA-1.
        05  NEW-KEY.
            07  NEW-JUL-DAY           PIC 999.
            07  NEW-RCD-NUM           PIC 99.
            07  NEW-JUL-YR            PIC 99.
            07  NEW-DIR-NUM           PIC 99.
    03  NEW-DATA-1A.
        05  NEW-NAME                  PIC X(28).
        05  NEW-ORG                   PIC X(35).
        05  NEW-OCCUP                 PIC 999.
    03  NEW-DATA-2.
        05  NEW-ADD                   PIC X(29).
        05  NEW-STREET                PIC X(24).
        05  NEW-CITY                  PIC X(16).
        05  NEW-STATE                 PIC X(2).
        05  NEW-ZIP.
            07  FIRST-ZIP             PIC X.
            07  LAST-ZIP              PIC X(5).
    03  NEW-DATA-3.
        05  NEW-FORIGN                PIC X(20).
        05  NEW-PHONE                 PIC X(16).
        05  NEW-AREA-EXP              PIC X(9).
        05  NEW-TITLE                 PIC X(28).
        05  NEW-FUT-USE               PIC X(6).
SD  SORT-FILE,
    RECORDING MODE IS V,
```

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```
      RECORD CONTAINS 20 TO 232 CHARACTERS,
      DATA RECORDS ARE ADD-SORT-RECORD,
                       CHANGE-NAME-CRG-RECORD,
                       CHANGE-ADD-INT-RECORD,
                       CHANGE-CITY-REST-RECORD,
                       CHANGE-TITLE-RECORD,
                       DELETE-SORT-RECORD.

  01  ADD-SORT-RECORD.
      03  SORT-DATA-1.
          05  SORT-KEY-A              PIC  9(9).
          05  SORT-TXN-CODE-A         PIC  X.
          05  SORT-NAME-A             PIC  X(28).
          05  SORT-ORG-A              PIC  X(35).
          05  SORT-OCCUP-A            PIC  999.
      03  SORT-DATA-2.
          05  SORT-ADD-2-A            PIC  X(29).
          05  SORT-STREET-A           PIC  X(24).
          05  SORT-CITY-A             PIC  X(16).
          05  SORT-STATE-A            PIC  XX.
          05  SORT-ZIP-A              PIC  X(6).
      03  SORT-DATA-3.
          05  SORT-FORIGN-A           PIC  X(20).
          05  SORT-PHONE-A            PIC  X(16).
          05  SORT-AREA-EXP-A         PIC  X(9).
          05  SORT-TITLE              PIC  X(28).
          05  SORT-FUT-USE-A          PIC  X(6).
  EJECT
  01  CHANGE-NAME-CRG-RECORD.
      05  SORT-KEY-N                  PIC  9(9).
      05  TXN-CODE-N                  PIC  X.
      05  TXN-SUB-CODE-N              PIC  99.
      05  SORT-NAME-N                 PIC  X(28).
      05  SORT-ORG-N                  PIC  X(35).
      05  SORT-OCCUP-N                PIC  999.
      05  SORT-DIR-NUM-N              PIC  99.
  01  CHANGE-ADD-INT-RECORD.
      05  SORT-KEY-AI                 PIC  9(9).
      05  TXN-CODE-AI                 PIC  X.
      05  TXN-SUB-CODE-AI             PIC  99.
      05  SORT-ADD-2-AI               PIC  X(29).
      05  SORT-STREET-AI              PIC  X(24).
      05  SORT-STATE-AI               PIC  XX.
      05  SORT-ZIP-AI                 PIC  X(6).
  C1  CHANGE-CITY-REST-RECORD.
      05  SORT-KEY-CR                 PIC  9(9).
      05  TXN-CODE-CR                 PIC  X.
      05  TXN-SUB-CODE-CR             PIC  99.
      05  SORT-CITY-CR                PIC  X(16).
```

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```
    05  SORT-FORIGN-CR          PIC X(20).
    05  SORT-PHONE-CR           PIC X(16).
    05  SORT-AREA-EXP           PIC X(9).
01  DELETE-SORT-RECORD.
    05  SORT-FUT-USE-CR         PIC X(6).
    05  SORT-KEY-D              PIC 9(9).
    05  TXN-CODE-D              FIC X.
    05  FILLER                  PIC X(13).
01  CHANGE-TITLE-RECORD.
    05  SORT-KEY-T              PIC 9(9).
    05  TXN-CODE-T              PIC X.
    05  TXN-SUB-CODE-T          PIC 99.
    05  SORT-TITLE-T            PIC X(28).
FD  ERROR-REPORT, LABEL RECORDS ARE OMITTED,
    BLOCK CONTAINS 25 RECORDS
    DATA RECORD IS ERROR-RECORD.
01  ERROR-RECORD.
    05  ERR-CAR-CNT             PIC X.ZZ9.
    05  ERR-CD-NUM              PIC X(4).
    05  ERR-FILLER-1            PIC X(80).
    05  ERR-DATA                PIC X(4).
    05  ERR-FILLER-2            PIC X(40).
    05  ERR-MSG
FD  TRANSACTION-FILE, LABEL RECORDS ARE OMITTED,
    BLOCK CONTAINS 5 RECORDS
    DATA RECORD IS DATA-CARD.
01  DATA-CARD                   PIC X(80).
FD  PRINT-FILE, LABEL RECORDS ARE OMITTED,
    BLOCK CONTAINS 25 RECORDS
    DATA RECORD IS PRINT-LINE.
01  PRINT-LINE                  PIC X(133).
    EJECT
WORKING-STORAGE SECTION.
01  ACCUMULATORS.
    05  BINARY-FIELDS           COMP SYNC.
        10  A-LINE-COUNTER      PIC S9(4)   VALUE +55.
        10  A-PAGE-COUNTER      PIC S9(4)   VALUE ZEROS.
        10  A-TXN-COUNT         PIC S9(4)   VALUE ZEROS.
        10  A-MAST-INPUT-COUNT  PIC S9(4)   VALUE ZEROS.
        10  A-MAST-OUTPUT-COUNT PIC S9(4)   VALUE ZEROS.
        10  A-MAST-DELT-COUNT   PIC S9(4)   VALUE ZEROS.
        10  A-ADD-TXN-COUNT     PIC S9(4)   VALUE ZEROS.
    05  CHARACTER-FIELDS.
        10  W-ERR-SWITCH        PIC X       VALUE LOW-VALUES.
        10  W-TRANSFORM-AREA    PIC X(40).
```

```
    10  OUT-SEQ-INDEX              PIC X(9)      VALUE LOW-VALUES.
    10  W-MAST-INPUT-KEY           PIC X(9)      VALUE LOW-VALUES.
    10  W-MAST-OUTPUT-KEY          PIC X(9)      VALUE LOW-VALUES.
    10  W-TRX-KEY                  PIC X(9)      VALUE LOW-VALUES.
    10  W-UPDATE-IMAGE-AREA.
        15  TXN-KEY-UP             PIC 9(9).
        15  TXN-CODE-UP            PIC X.
        15  FILLER                 PIC X(70)     VALUE SPACES.
01  CONSTANTS.
    05  CHARACTER-CONSTANTS.
        10  C-HEX-F                PIC X(9)      VALUE HIGH-VALUES.
        10  C-ALPHANUM-TBL         PIC X(39)
            VALUE 'ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789.,&'.
        10  C-ALPHANUM-CHG-TBL     PIC X(37)
            VALUE 'ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789-'.
    10  C-ERR-HEADING-1.
        15  FILLER                 PIC X(48)     VALUE '1'.
        15  FILLER                 PIC X(24)     VALUE SPACES.
        15  E-TITLE                       VALUE 'VALIDATION ERROR REPORT'.
        15  FILLER                 PIC X(48)     VALUE SPACES.
        15  E-PAGE                 PIC X(5)      VALUE 'PAGE'.
        15  PAGE-NUM               PIC ZZZ9      VALUE '0000'.
        15  FILLER                 PIC X(3)      VALUE SPACES.
    10  C-ERR-HEADING-2.
        15  FILLER                 PIC X(8)      VALUE '1'.
        15  CD-NUM                 PIC X(25)     VALUE 'TXN NUM '.
        15  FILLER                 PIC X(10)     VALUE SPACES.
        15  CD-IMAGE               PIC X(63)     VALUE 'CARD IMAGE'.
        15  ERR-MSG-AREA           PIC X(9)      VALUE 'ERROR MSG'.
        15  FILLER                 PIC X(17)     VALUE SPACES.
    10  C-UPD-HEADING-1.
        15  FILLER                 PIC X(49)     VALUE '1'.
        15  FILLER                 PIC X(17)     VALUE SPACES.
        15  U-TITLE                       VALUE 'UPDATE-ERROR-RPT'.
        15  FILLER                 PIC X(54)     VALUE SPACES.
        15  U-PAGE                 PIC X(5)      VALUE 'PAGE'.
        15  PAGE-NUM-UP            PIC ZZZ9      VALUE '0000'.
        15  FILLER                 PIC X(3)      VALUE SPACES.
    10  STAT-HDR-1.
        15  FILLER                 PIC X(52)     VALUE '1'.
        15  FILLER                 PIC X(28)     VALUE SPACES.
        15  STAT-TITLE             PIC X(53)
            VALUE 'MASTER-FILE ACTIVITY REPORT'.
        15  FILLER                               VALUE SPACES.
EJECT
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       10  STAT-HDR-2.
           15  FILLER                  PIC X(9)         VALUE '1'.
           15  FILLER                  PIC X(35)        VALUE SPACES.
           15  MAST-IN-TITLE           PIC X(35) 'INPUT MASTER FILE RECORD COUNT '.
           15  MAST-INPUT-COUNT-PR     PIC X(4)         VALUE SPACES.
           15  FILLER                  PIC X(84)        VALUE SPACES.
       10  STAT-HDR-3.
           15  FILLER                  PIC X(9)         VALUE '1'.
           15  FILLER                  PIC X(35)        VALUE SPACES.
           15  ADD-TXN-TITLE           PIC X(35) 'TOTAL ADD (NEW) RECORD COUNT '.
           15  ADD-TXN-COUNT-PR        PIC X(4)         VALUE SPACES.
           15  FILLER                  PIC X(84)        VALUE SPACES.
       10  STAT-HDR-4.
           15  FILLER                  PIC X(9)         VALUE '1'.
           15  FILLER                  PIC X(35)        VALUE SPACES.
           15  DELT-TXN-TITLE          PIC X(35) 'TOTAL DELETE TRANSACTION COUNT '.
           15  DELT-COUNT-PR           PIC X(4)         VALUE SPACES.
           15  FILLER                  PIC X(84)        VALUE SPACES.
       10  STAT-HDR-5.
           15  FILLER                  PIC X(9)         VALUE '1'.
           15  FILLER                  PIC X(35)        VALUE SPACES.
           15  MAST-OUT-TITLE          PIC X(35) 'TOTAL MASTER FILE OUTPUT COUNT '.
           15  MAST-OUTPUT-COUNT-PR    PIC X(4)         VALUE SPACES.
           15  FILLER                  PIC X(84)        VALUE SPACES.
       10  STAT-HDR-6.
           15  FILLER                  PIC X(9)         VALUE '1'.
           15  FILLER                  PIC X(35)        VALUE SPACES.
           15  TXN-TITLE               PIC X(35) 'TOTAL TRANSACTION COUNT ',
           15  TXN-COUNT-PR            PIC X(4)         VALUE SPACES.
           15  FILLER                  PIC X(84)        VALUE SPACES.
      *EJECT
      ********************************************************************
      *                   ERROR MESSAGE TABLE                          *
      ********************************************************************
       10  C-ERR-MSG-TBL.
           15  ERR-1                   PIC X(40)  'FIRST ADD CARD MISSING FROM INPUT '.
           15  ERR-2                   PIC X(40)  'SECOND ADD CARD MISSING FROM INPUT '.
               VALUE
           15  ERR-3                   PIC X(40)  'THIRD ADD CARD MISSING FROM INPUT '.
               VALUE
           15  ERR-4                   PIC X(40)  'TRANSACTION CODE IS NOT A,C,OR D '.
               VALUE
```

```
15  ERR-5      PIC X(40).
    VALUE 'TRANSACTION CHANGE SUB-CODE IS INVALID '.
15  ERR-6      PIC X(40).
    VALUE 'ALL DATA FIELDS BLANK ON INPUT CARD '.
15  ERR-7      PIC X(40).
    VALUE 'NAME FIELD NOT ALPHA-NUMERIC '.
15  ERR-8      PIC X(40).
    VALUE 'ORGANIZATION IS NOT ALPHA-NUMERIC '.
15  ERR-9      PIC X(40).
    VALUE '1ST ADDRESS LINE IS NOT ALPHA-NUMERIC '.
15  ERR-10     PIC X(40).
    VALUE 'STREET FIELD IS NOT ALPHA-NUMERIC '.
15  ERR-11     PIC X(40).
    VALUE 'STATE FIELD IS NOT ALPHABETIC '.
15  ERR-12     PIC X(40).
    VALUE 'ZIP CODE IS NOT ALPHA-NUMERIC '.
15  ERR-13     PIC X(40).
    VALUE 'DIRECTORY NUM CHANGE NOT NUMERIC '.
15  ERR-14     PIC X(40).
    VALUE 'CITY FIELD NOT ALPHABETIC '.
15  ERR-15     PIC X(40).
    VALUE 'PHONE NUMBER NOT ALPHA-NUMERIC '.
15  ERR-16     PIC X(40).
    VALUE 'OCCUPATION CODE NOT NUMERIC '.
15  ERR-17     PIC X(40).
    VALUE 'AREA OF EXPERTISE NOT NUMERIC '.
15  ERR-18     PIC X(40).
    VALUE 'INVALID STATE CODE '.
15  ERR-19     PIC X(40).
    VALUE 'DATA FIELDS NOT BLANK ON DELETE TXN '.
15  ERR-20     PIC X(40).
    VALUE '2ND ADD CARD FAILED DUE TO CARD 1 ERR '.
15  ERR-21     PIC X(40).
    VALUE '3RD ADD CARD FAILED DUE TO CARD 1 OR 2 '.
15  ERR-22     PIC X(40).
    VALUE 'TRANSACTION KEY IS NOT NUMERIC '.
15  ERR-23     PIC X(40).
    VALUE 'NAME FLD BLANK '.
15  ERR-24     PIC X(40).
    VALUE 'ATTEMP CHG TO RECORD NOT ON FILE '.
15  ERR-25     PIC X(40).
    VALUE 'INPUT CARD IS OUT OF SEQUENCE '.
15  ERR-26     PIC X(40).
    VALUE 'STREET FIELD BLANK '.
15  ERR-27     PIC X(40).
    VALUE 'CITY FIELD IS BLANK '.
15  ERR-28     PIC X(40).
    VALUE 'STATE/COUNTRY CODE FIELD IS BLANK '.
```

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            15  ERR-29
                VALUE 'FOR FUTURE USE '  PIC X(40),
            15  ERR-30
                VALUE 'FOREIGN USE FIELD NOT ALPHA-NUMERIC '.  PIC X(40),
            15  ERR-31
                VALUE 'OCCUPATION FIELD IS BLANK '.  PIC X(40),
            15  ERR-32
                VALUE 'ADD-TXN INVALID FOR REC-CN FILE '.  PIC X(40),
        10  C-ERR-MSGS REDEFINES C-ERR-MSG-TBL.
            15  ERR-ENT        PIC X(40),  OCCURS 32 TIMES,
                               INDEXED BY ERR-INDEX.

    EJECT
01  CHANGE-WORK-1.
    03  CHG-KEY-DATA.
        05  CHG-KEY                 PIC 9(9).
        05  CHG-TXN-CODE            PIC X.
        05  CHG-TXN-SUB-CODE        PIC 99.
    03  CHG-REST.
        05  FILLER                  PIC X(68).
    03  CHG-NAME-ORG REDEFINES CHG-REST.
        04  CHG-NAME-GRP.
            05  CHG-NAME-INPUT      PIC X(28).
            05  CHG-ORG-INPUT       PIC X(35).
            05  CHG-OCCUP-INPUT     PIC 999.
            05  CHG-DIR-NUM-INPUT   PIC 99.
        04  CHG-ADD-INT REDEFINES CHG-NAME-ORG.
            05  CHG-ADD-2-GRP.
                05  CHG-ADD-2-INPUT     PIC X(29).
                05  CHG-STREET-INPUT    PIC X(24).
                05  CHG-STATE-INPUT     PIC XX.
                05  CHG-ZIP-INPUT       PIC X(6).
            04  CHG-ADD-2-END.
            05  FILLER
    03  CHG-CITY-REST REDEFINES CHG-ADD-INT.
        04  CHG-CITY-GRP.
            05  CHG-CITY-INPUT      PIC X(7).
            05  CHG-FORIGN-USE      PIC X(16).
            05  CHG-PHONE-INPUT     PIC X(20).
            05  CHG-AREA-EXP-INPUT  PIC X(16).
            05  CHG-FUT-USE-INPUT   PIC X(9).
        04  CHG-CITY-END.           PIC X(6).
    03  CHG-TITLE REDEFINES CHG-CITY-REST.
        05  FILLER                  PIC X.
        05  CHG-TITLE-INPUT         PIC X(28).
        05  FILLER                  PIC X(40).
    03  DELT-MASTER REDEFINES CHG-TITLE.
        05  DELT-ALL                PIC X(68).
```

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```
EJECT
01 BLD-MAST-AREA.
   02 CARD-DATA-1.
      03 FIRST-TXN-SET.
         05 TXN-KEY.
            07 TXN-JUL-DAY        PIC 999.
            07 TXN-RCD-NUM        PIC 99.
            07 TXN-JUL-YR         PIC 99.
            07 TXN-DIR-NUM        PIC 99.
         05 TXN-CODE              PIC X.
            88 TXN-ADD      VALUE 'A'.
            88 TXN-CHG      VALUE 'C'.
            88 TXN-DELT     VALUE 'D'.
         05 TXN-NAME              PIC X(28).
         05 TXN-ORG               PIC X(35).
         05 TXN-OCCUP             PIC 999.
      03 FIRST-TXN-END.
         05 FILLER                PIC X(3).
         05 TXN-CRD-1             PIC 9.
   02 CARD-DATA-2.
      03 SECOND-TXN-SET.
         05 TXN-ADD-2             PIC X(29).
         05 TXN-STREET            PIC X(24).
         05 TXN-CITY              PIC X(16).
         05 TXN-STATE             PIC X(2).
         05 TXN-ZIP               PIC X(6).
      03 SECOND-SET-END.
         05 FILLER                PIC XX.
         05 TXN-CRD-2             PIC 9.
   02 CARD-DATA-3.
      03 THIRD-TXN-SET.
         05 TXN-FORIGN-USE        PIC X(20).
         05 TXN-PHONE             PIC X(16).
         05 TXN-AREA-EXP.
            07 EXP-CODE-1         PIC X(3).
            07 EXP-CODE-2         PIC X(3).
            07 EXP-CODE-3         PIC X(3).
         05 TXN-TITLE             PIC X(28).
         05 TXN-FUT-USE           PIC X(6).
      03 THIRD-SET-END.
         05 TXN-CRD-3             PIC 9.
EJECT
PROCEDURE DIVISION.
MAINLINE SECTION.
    SORT SORT-FILE,
      ASCENDING KEY SORT-KEY-A,
      ASCENDING KEY IS SORT-TXN-CODE-A,
      INPUT PROCEDURE IS VALIDATE,
```

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```
            OUTPUT PROCEDURE IS UPDATE.
*****************************************************************
*     SET RETURN CODE AND RETURN TO OS.                         *
*****************************************************************
 MAIN-P0025.
     MOVE +0 TO RETURN-CODE.
     GOBACK.
*****************************************************************
*     THIS SECTION VALIDATES ALL THE INPUT TRANSACTIONS, BUILDS A *
*     MASTER RECORD FOR NEW ADD'S AND PRODUCES AN ERROR REPORT FOR *
*     THOSE RECORDS FAILING VALIDATION. RECORDS ARE RELEASED TO  *
*     A SORT ROUTINE FOR PROCESSING IN THE UPDATE SECTION.       *
*****************************************************************
 VALIDATE SECTION.
     OPEN INPUT TRANSACTION-FILE,
          OUTPUT ERROR-REPORT.

 VALIDATE-P0010.
     READ TRANSACTION-FILE,
     AT END GO TO VALIDATE-END.

 VALIDATE-P0012.
     MOVE SPACES TO BLD-MAST-AREA.
     MOVE DATA-CARD TO CARD-DATA-1, CHANGE-WORK-1.
     MOVE LOW-VALUES TO W-ERR-SWITCH.
     ADD +1 TO A-TXN-COUNT.

 VALIDATE-P0015.
     IF CARD-DATA-1 EQUAL TO SPACES
        SET ERR-INDEX TO 6,
        PERFORM ERROR-MESSAGE,
        GO TO VALIDATE-P0010.
     IF TXN-CHG AND CHG-TXN-SUB-CODE EQUAL TO '01',
        GO TO VALIDATE-P0017.
     IF TXN-CRD-1 EQUAL TO '2' OR EQUAL TO '3',
        SET ERR-INDEX TO 25,
        PERFORM ERROR-MESSAGE,
        GO TO VALIDATE-P0010.

 VALIDATE-P0017.
     IF TXN-KEY NOT NUMERIC,
        SET ERR-INDEX TO 22,
        PERFORM ERROR-MESSAGE.

 VALIDATE-P0018.
     IF TXN-CHG GO TO VALIDATE-P0040.
     IF TXN-DELT GO TO VALIDATE-P0077.
     IF TXN-ADD GO TO VALIDATE-P0083.
        SET ERR-INDEX TO 4,
        PERFORM ERROR-MESSAGE,
        GO TO VALIDATE-P0010.

     EJECT
 VALIDATE-P0040.
```

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```
****************************************************************
**   THIS ROUTINE WILL VALIDATE THE FOUR DIFFERENT INPUT     **
**   CHANGE TRANSACTIONS CARDS. CARD TYPE 01 IS FOR CHANGES TO**
**   NAME ORG, AND OCCUP FIELDS. TYPE 02 IS FOR ADDRESS CHANGES**
**   EXCEPT FOR THE CITY FIELD, WHICH IS ON TYPE 03 WITH THE  **
**   REMAINING FIELDS. TYPE 04 IS FOR TITLE FIELD ONLY.       **
****************************************************************
      IF CHG-TXN-SUB-CODE EQUAL '01' GO TO VALIDATE-P0041.
      IF CHG-TXN-SUB-CODE EQUAL '02' GO TO VALIDATE-P0048.
      IF CHG-TXN-SUB-CODE EQUAL '03' GO TO VALIDATE-P0062.
      IF CHG-TXN-SUB-CODE EQUAL '04' GO TO VALIDATE-P0076.
      SET ERR-INDEX TO 5;
      PERFORM ERROR-MESSAGE,
      GO TO VALIDATE-P0010.
  VALIDATE-P0041.
      IF CHG-NAME-GRP EQUAL TO SPACES,
      SET ERR-INDEX TO 6;
      PERFORM ERROR-MESSAGE,
      GO TO VALIDATE-P0045.
  VALIDATE-P0042.
      MOVE SPACES TO W-TRANSFORM-AREA.
      MOVE CHG-NAME-INPUT TO W-TRANSFORM-AREA.
      TRANSFORM W-TRANSFORM-AREA FROM C-ALPHANUM-TBL TO SPACES.
      IF W-TRANSFORM-AREA NOT EQUAL TO SPACES,
      SET ERR-INDEX TO 7;
      PERFORM ERROR-MESSAGE.
  VALIDATE-P0043.
      MOVE SPACES TO W-TRANSFORM-AREA.
      MOVE CHG-ORG-INPUT TO W-TRANSFORM-AREA.
      TRANSFORM W-TRANSFORM-AREA FROM C-ALPHANUM-TBL TO SPACES.
      IF W-TRANSFORM-AREA NOT EQUAL TO SPACES,
      SET ERR-INDEX TO 8;
      PERFORM ERROR-MESSAGE.
      IF CHG-DIR-NUM-INPUT EQUAL TO SPACES,
      GO TO VALIDATE-P0044.
      IF CHG-DIR-NUM-INPUT NOT NUMERIC,
      SET ERR-INDEX TO 13;
      PERFORM ERROR-MESSAGE.
  VALIDATE-P0044.
      IF CHG-OCCUP-INPUT EQUAL TO SPACES,
      GO TO VALIDATE-P0045.
      IF CHG-OCCUP-INPUT NOT NUMERIC,
      SET ERR-INDEX TO 16;
      PERFORM ERROR-MESSAGE.
  VALIDATE-P0045.
      IF W-ERR-SWITCH NOT EQUAL TO LOW-VALUES,
      GO TO VALIDATE-P0010.
  VALIDATE-P0046.
```

```
        MOVE CHG-KEY TO SORT-KEY-N.
        MOVE CHG-TXN-CODE TO TXN-CODE-N.
    VALIDATE-P0047.
        IF CHG-NAME-INPUT NOT EQUAL TO SPACES
        MOVE '05' TO TXN-SUB-CODE-N,
        MOVE CHG-NAME-INPUT TO SORT-NAME-N,
        RELEASE CHANGE-NAME-ORG-RECORD.
        IF CHG-ORG-INPUT NOT EQUAL TO SPACES,
        MOVE '06' TO TXN-SUB-CODE-N,
        MOVE CHG-ORG-INPUT TO SORT-ORG-N,
        RELEASE CHANGE-NAME-ORG-RECORD.
        IF CHG-DIR-NUM-INPUT NOT EQUAL TO SPACES,
        MOVE '11' TO TXN-SUB-CODE-N,
        MOVE CHG-DIR-NUM-INPUT TO SORT-DIR-NUM-N,
        RELEASE CHANGE-NAME-ORG-RECORD.
        IF CHG-OCCUP-INPUT NOT EQUAL TO SPACES,
        MOVE '14' TO TXN-SUB-CODE-N,
        MOVE CHG-OCCUP-INPUT TO SORT-OCCUP-N,
        RELEASE CHANGE-NAME-ORG-RECORD.
        GO TO VALIDATE-P0010.
    EJECT
    VALIDATE-P0048.
        IF CHG-ADD-2-GRP EQUAL TO SPACES
        SET ERR-INDEX TO 6;
        PERFORM ERROR-MESSAGE,
        GO TO VALIDATE-P0010.
    VALIDATE-P0049.
        MOVE SPACES TO W-TRANSFORM-AREA.
        MOVE CHG-ADD-2-INPUT TO W-TRANSFORM-AREA.
        TRANSFCRM W-TRANSFORM-AREA FROM C-ALPHANUM-TBL TO SPACES.
        IF W-TRANSFORM-AREA NOT EQUAL TO SPACES,
        SET ERR-INDEX TO 9;
        PERFORM ERROR-MESSAGE.
    VALIDATE-P0050.
        MOVE SPACES TO W-TRANSFORM-AREA.
        MOVE CHG-STREET-INPUT TO W-TRANSFORM-AREA.
        TRANSFORM W-TRANSFORM-AREA FROM C-ALPHANUM-TBL TO SPACES,
        IF W-TRANSFORM-AREA NOT EQUAL TO SPACES,
        SET ERR-INDEX TO 10;
        PERFORM ERROR-MESSAGE.
    VALIDATE-P0051.
        IF CHG-STATE-INPUT EQUAL TO SPACES,
        GO TO VALIDATE-P0053.
        IF CHG-STATE-INPUT NOT ALPHABETIC,
        SET ERR-INDEX TO 11;
        PERFORM ERROR-MESSAGE.
    VALIDATE-P0053.
        MOVE SPACES TO W-TRANSFORM-AREA.
```

```
          MOVE CHG-ZIP-INPUT TO W-TRANSFORM-AREA.
          TRANSFORM W-TRANSFORM-AREA FROM C-ALPHANUM-TBL TO SPACES.
          IF W-TRANSFORM-AREA NOT EQUAL TO SPACES,
             SET ERR-INDEX TO 12;
             PERFORM ERROR-MESSAGE.
      VALIDATE-P0055.
          IF W-ERR-SWITCH NOT EQUAL TO LOW-VALUE,
             GO TO VALIDATE-P0010.
      VALIDATE-P0056.
          MOVE CHG-KEY TO SORT-KEY-AI.
          MOVE CHG-TXN-CODE TO TXN-CODE-AI.
      VALIDATE-P0057.
          IF CHG-ADD-2-INPUT NOT EQUAL TO SPACES,
             MOVE 'C7' TO TXN-SUB-CODE-AI,
             MOVE CHG-ADD-2-INPUT TO SORT-ADD-2-AI,
             RELEASE CHANGE-ADD-INT-RECORD.
      VALIDATE-P0058.
          IF CHG-STREET-INPUT NOT EQUAL TO SPACES,
             MOVE '08' TO TXN-SUB-CODE-AI,
             MOVE CHG-STREET-INPUT TO SORT-STREET-AI,
             RELEASE CHANGE-ADD-INT-RECORD.
      VALIDATE-P0059.
          IF CHG-STATE-INPUT NOT EQUAL TO SPACES,
             MOVE '09' TO TXN-SUB-CODE-AI,
             MOVE CHG-STATE-INPUT TO SORT-STATE-AI,
             RELEASE CHANGE-ADD-INT-RECORD.
      VALIDATE-P0060.
          IF CHG-ZIP-INPUT NOT EQUAL TO SPACES,
             MOVE '10' TO TXN-SUB-CODE-AI,
             MOVE CHG-ZIP-INPUT TO SORT-ZIP-AI,
             RELEASE CHANGE-ADD-INT-RECORD.
          GO TO VALIDATE-P0010.
          EJECT
      VALIDATE-P0062.
          IF CHG-CITY-GRP        EQUAL TO SPACES,
             SET ERR-INDEX TO 6;
             PERFORM ERROR-MESSAGE,
             GO TO VALIDATE-P0010.
      VALIDATE-P0063.
          IF CHG-CITY-INPUT EQUAL TO SPACES,
             GO TO VALIDATE-P0064;
          IF CHG-CITY-INPUT NOT ALPHABETIC,
             SET ERR-INDEX TO 14;
             PERFORM ERROR-MESSAGE.
      VALIDATE-P0064.
          MOVE SPACES TO W-TRANSFORM-AREA.
          MOVE CHG-PHONE-INPUT TO W-TRANSFORM-AREA.
          TRANSFORM W-TRANSFORM-AREA FROM C-ALPHANUM-CHG-TBL TO SPACES.
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        IF W-TRANSFORM-AREA NOT EQUAL TO SPACES,
            SET ERR-INDEX TO 15,
            PERFORM ERROR-MESSAGE.
    VALIDATE-P0065.
        MOVE SPACES TO W-TRANSFORM-AREA.
        MOVE CHG-FORIGN-USE TO W-TRANSFORM-AREA.
        TRANSFORM W-TRANSFORM-AREA FROM C-ALPHANUM-TBL TO SPACES,
        IF W-TRANSFORM-AREA NOT EQUAL TO SPACES,
            SET ERR-INDEX TO 30,
            PERFORM ERROR-MESSAGE.
    VALIDATE-P0068.
        IF CHG-AREA-EXP-INPUT EQUAL TO SPACES,
            GO TO VALIDATE-P0069.
        IF CHG-AREA-EXP-INPUT NOT NUMERIC,
            SET ERR-INDEX TO 17,
            PERFORM ERROR-MESSAGE.
    VALIDATE-P0069.
        IF W-ERR-SWITCH NOT EQUAL TO LOW-VALUES,
            GO TO VALIDATE-P0010.
    VALIDATE-P0070.
        MOVE CHG-KEY TO SORT-KEY-CR.
        MOVE CHG-TXN-CODE TO TXN-CODE-CR.
        IF CHG-CITY-INPUT NOT EQUAL TO SPACES,
            MOVE '12' TO TXN-SUB-CODE-CR,
            MOVE CHG-CITY-INPUT TO SORT-CITY-CR,
            RELEASE CHANGE-CITY-REST-RECORD.
    VALIDATE-P0071.
        IF CHG-PHONE-INPUT NOT EQUAL TO SPACES,
            MOVE '13' TO TXN-SUB-CODE-CR,
            MOVE CHG-PHONE-INPUT TO SORT-PHONE-CR,
            RELEASE CHANGE-CITY-REST-RECORD.
    VALIDATE-P0074.
        IF CHG-AREA-EXP-INPUT NOT EQUAL TO SPACES,
            MOVE '15' TO TXN-SUB-CODE-CR,
            MOVE CHG-AREA-EXP-INPUT TO SORT-AREA-EXP,
            RELEASE CHANGE-CITY-REST-RECORD.
    VALIDATE-P0075.
        IF CHG-FORIGN-USE NOT EQUAL TO SPACES,
            MOVE '16' TO TXN-SUB-CODE-CR,
            MOVE CHG-FORIGN-USE TO SORT-FORIGN-CR,
            RELEASE CHANGE-CITY-REST-RECORD.
            GO TO VALIDATE-P0010.
        EJECT
    VALIDATE-P0076.
        MOVE CHG-KEY TO SORT-KEY-T.
        MOVE TXN-CODE TO TXN-CODE-T.
        IF CHG-TITLE-INPUT NOT EQUAL TO SPACES,
            MOVE '17' TO TXN-SUB-CODE-T,
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            MOVE CHG-TITLE-INPUT TO SORT-TITLE-T.
            RELEASE CHANGE-TITLE-RECORD.
            GO TO VALIDATE-P0010.
            SET ERR-INDEX TO 6.
            PERFORM ERROR-MESSAGE,
            GO TO VALIDATE-P0010.
       ****************************************************************
       *  THIS SECTION WILL VALIDATE A DELETE RECORD                 *
       ****************************************************************
        VALIDATE-P0077.
            IF DELT-ALL NOT EQUAL TO SPACES,
            SET ERR-INDEX TO 19,
            PERFORM ERROR-MESSAGE.
        VALIDATE-P0078.
            IF W-ERR-SWITCH NOT EQUAL TO LOW-VALUE,
            GO TO VALIDATE-P0010.
        VALIDATE-P0079.
            MOVE CHG-KEY TO SORT-KEY-D.
            MOVE CHG-TXN-CODE TO TXN-CODE-D.
            RELEASE DELETE-SCRT-RECORD.
            GO TO VALIDATE-P0010.
       ****************************************************************
       *  THIS SECTION WILL VALIDATE AND BUILD NEW MASTER RECORDS    *
       *  AND ENSURE THAT ALL THREE INPUT CARDS REQUIRED FOR A       *
       *  COMPLETE NEW (ADD) RECORD ARE PRESENT.                     *
       ****************************************************************
        VALIDATE-P0080.
            MOVE SPACES TO OUT-SEQ-INDEX.
            IF TXN-CRD-1 NOT EQUAL TO '1',
            SET ERR-INDEX TO 1,
            PERFORM ERROR-MESSAGE,
            MOVE '1' TO OUT-SEQ-INDEX.
            READ TRANSACTION-FILE,
            AT END GO TO VALIDATE-END.
            MOVE DATA-CARD TO CARD-DATA-2.
            IF TXN-CRD-2 EQUAL TO '2' AND OUT-SEQ-INDEX EQUAL TO '1',
            SET ERR-INDEX TO 20,
            PERFORM ERROR-MESSAGE.
            IF TXN-CRD-2 EQUAL TO '3' AND OUT-SEQ-INDEX EQUAL TO '1',
            SET ERR-INDEX TO 21,
            PERFORM ERROR-MESSAGE,
            GO TO VALIDATE-P0010.
            IF TXN-CRD-2 NOT EQUAL TO '2',
            SET ERR-INDEX TO 2,
            PERFORM ERROR-MESSAGE,
            GO TO VALIDATE-P0012.
        VALIDATE-P0082.
            READ TRANSACTION-FILE,
```

```
          AT END GO TO VALIDATE-END.
          MOVE DATA-CARD TO CARD-DATA-3.
          IF TXN-CRD-3 EQUAL TO '3' AND OUT-SEQ-INDEX EQUAL TO '1',
              SET ERR-INDEX TO 21,
              PERFORM ERROR-MESSAGE,
              GO TO VALIDATE-P0010.
          IF TXN-CRD-3 NOT EQUAL TO '3',
              SET ERR-INDEX TO 3,
              PERFORM ERROR-MESSAGE,
              GO TO VALIDATE-P0012.
      EJECT
     ******************************************************************
     **  AT THIS POINT WE HAVE ONE COMPLETE INPUT RECORD IN THE     **
     **  BUILD AREA AND ARE NOW READY TO VALIDATE IT.               **
     ******************************************************************
          IF TXN-NAME EQUAL TO SPACES,
              SET ERR-INDEX TO 23,
              PERFORM ERROR-MESSAGE,
              GO TO VALIDATE-P0083.
          MOVE SPACES TO W-TRANSFORM-AREA.
          MOVE TXN-NAME TO W-TRANSFORM-AREA.
          TRANSFORM W-TRANSFORM-AREA FROM C-ALPHANUM-TBL TO SPACES.
          IF W-TRANSFORM-AREA NOT EQUAL TO SPACES,
              SET ERR-INDEX TO 7,
              PERFORM ERROR-MESSAGE.
      VALIDATE-P0083.
          MOVE SPACES TO W-TRANSFORM-AREA.
          MOVE TXN-ORG TO W-TRANSFORM-AREA.
          TRANSFORM W-TRANSFORM-AREA FROM C-ALPHANUM-TBL TO SPACES.
          IF W-TRANSFORM-AREA NOT EQUAL TO SPACES,
              SET ERR-INDEX TO 8,
              PERFORM ERROR-MESSAGE.
      VALIDATE-P0084.
          MOVE SPACES TO W-TRANSFORM-AREA.
          MOVE TXN-ADD-2 TO W-TRANSFORM-AREA.
          TRANSFORM W-TRANSFORM-AREA FROM C-ALPHANUM-TBL TO SPACES.
          IF W-TRANSFORM-AREA NOT EQUAL TO SPACES,
              SET ERR-INDEX TO 9,
              PERFORM ERROR-MESSAGE.
          MOVE SPACES TO W-TRANSFORM-AREA.
          MOVE TXN-STREET TO W-TRANSFORM-AREA.
          TRANSFORM W-TRANSFORM-AREA FROM C-ALPHANUM-TBL TO SPACES.
          IF W-TRANSFORM-AREA NOT EQUAL TO SPACES,
              SET ERR-INDEX TO 10,
              PERFORM ERROR-MESSAGE.
      VALIDATE-P0085.
          IF TXN-CITY EQUAL TO SPACES,
              SET ERR-INDEX TO 27,
```

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        PERFORM ERROR-MESSAGE.
    IF TXN-CITY NOT ALPHABETIC,
        SET ERR-INDEX TO 14,
        PERFORM ERROR-MESSAGE.
    IF TXN-STATE EQUAL TO SPACES,
        SET ERR-INDEX TO 28,
        PERFORM ERROR-MESSAGE.
    IF TXN-STATE NOT ALPHABETIC,
        SET ERR-INDEX TO 11,
        PERFORM ERROR-MESSAGE.
    MOVE SPACES TO W-TRANSFORM-AREA.
    MOVE TXN-ZIP TO W-TRANSFORM-AREA.
    TRANSFORM W-TRANSFORM-AREA FROM C-ALPHANUM-TBL TO SPACES.
    IF W-TRANSFORM-AREA NOT EQUAL TO SPACES,
        SET ERR-INDEX TO 12,
        PERFCRM ERROR-MESSAGE.
VALIDATE-PJ086.
    IF TXN-FORIGN-USE NOT EQUAL TO SPACES,
        GO TO VALIDATE-P0087.
    MOVE SPACES TO W-TRANSFORM-AREA.
    MOVE TXN-PHONE TO W-TRANSFORM-AREA.
    TRANSFORM W-TRANSFORM-AREA FROM C-ALPHANUM-TBL TO SPACES.
    IF W-TRANSFORM-AREA NOT EQUAL TO SPACES,
        SET ERR-INDEX TO 15,
        PERFORM ERROR-MESSAGE.
VALIDATE-P0087.
    IF TXN-OCCUP EQUAL TO SPACES,
        SET ERR-INDEX TO 31,
        PERFCRM ERROR-MESSAGE.
    IF TXN-OCCUP NOT NUMERIC,
        SET ERR-INDEX TO 16,
        PERFORM ERROR-MESSAGE.
EJECT
    MOVE SPACES TO W-TRANSFORM-AREA.
    MOVE TXN-FORIGN-USE TO W-TRANSFORM-AREA.
    TRANSFORM W-TRANSFORM-AREA FROM C-ALPHANUM-TBL TO SPACES.
    IF W-TRANSFORM-AREA NOT EQUAL TO SPACES,
        SET ERR-INDEX TO 30,
        PERFORM ERROR-MESSAGE.
    IF TXN-AREA-EXP EQUAL TO SPACES,
        GO TO VALIDATE-P0088.
    IF EXP-CODE-1 NOT NUMERIC,
        SET ERR-INDEX TO 17,
        PERFCRM ERROR-MESSAGE.
VALIDATE-CODE-2.
    IF EXP-CODE-2 EQUAL TO SPACES,
        GO TO VALIDATE-CODE-3.
    IF EXP-CODE-2 NOT NUMERIC,
```

```
            SET ERR-INDEX TO 17,
            PERFCRM ERROR-MESSAGE.
        VALIDATE-CODE-3.
            IF EXP-CODE-3 EQUAL TO SPACES,
                GO TO VALIDATE-P0088.
            IF EXP-CODE-3 NOT NUMERIC,
                SET ERR-INDEX TO 17,
                PERFCRM ERROR-MESSAGE.
        VALIDATE-P0088.
            IF W-ERR-SWITCH NOT EQUAL TO LOW-VALUES,
                GO TO VALIDATE-P0010.
       *******************************************************
       *  THIS SECTION WILL BUILD THE VALIDATED NEW SCRT RECORD. *
       *******************************************************
        VALIDATE-PC089.
            MOVE FIRST-TXN-SET TO SORT-DATA-1.
            MOVE SECOND-TXN-SET TO SORT-DATA-2.
            MOVE THIRD-TXN-SET TO SORT-DATA-3.
            RELEASE ADD-SORT-RECORD.
            GO TO VALIDATE-P0010.
        VALIDATE-END.
            CLOSE TRANSACTION-FILE.
            EJECT
       *******************************************************
       *  THIS SECTION WILL PRINT ERR-MSG AND CARD-IMAGE IF REQUIRED *
       *******************************************************
        ERROR-MESSAGE SECTION.
            IF A-LINE-COUNTER GREATER THAN +38,
                MOVE +6 TO A-LINE-COUNTER, ERROR-RECCRD,
                MOVE ALL SPACES TO ERROR-RECCRD,
                ADD +1 TO A-PAGE-COUNTER TO PAGE-NUM,
                MOVE A-PAGE-COUNTER-1 TO ERROR-RECORD,
                MOVE C-ERROR-HEADING-1 TO ERROR-RECORD,
                WRITE ERROR-RECORD AFTER POSITIONING 0 LINES,
                MOVE ALL SPACES TO ERROR-RECORD,
                MOVE C-ERR-HEADING-2 TO ERROR-RECORD,
                WRITE ERROR-RECORD AFTER POSITIONING 3 LINES,
                MOVE ALL SPACES TO ERROR-RECORD.
            IF TXN-ADD AND W-ERR-SWITCH EQUAL TO LCW-VALUES,
                MOVE ALL SPACES TO ERROR-RECORD,
                MOVE CARD-DATA-1 TO ERR-DATA,
                GO TO MOVE-TXN-CNT.
            IF W-ERR-SWITCH EQUAL TO LOW-VALUES,
                MOVE ALL SPACES TO ERROR-RECORD,
                MOVE DATA-CARD TO ERR-DATA.
        MOVE-TXN-CNT.
            MOVE A-TXN-COUNT TO ERR-CD-NUM.
            MOVE ALL SPACES TO ERR-MSG.
```

```
          MOVE ERR-ENT (ERR-INDEX) TO ERR-MSG.
          WRITE ERROR-RECORD AFTER POSITIONING 2 LINES.
          ADD +1 TO A-LINE-COUNTER.
          MOVE ALL SPACES TO ERROR-RECORD.
          MOVE C-HEX-F TO W-ERR-SWITCH.
      ERROR-MESSAGE-EXIT.
          EXIT.
          EJECT
      ***************************************************************
      *     THIS SECTION WILL UPDATE THE SORTED, VALIDATED TRANSACTIONS *
      *     TO THE OLD MASTER FILE, THUS CREATING A NEW MASTER FILE.    *
      *     AN ERROR UPDATE REPORT WILL BE PRODUCED AND INVALID         *
      *     TRANSACTIONS WILL NOT BE UPDATED.                           *
      ***************************************************************
      UPDATE SECTION.
          OPEN INPUT OLD-MASTER,
               OUTPUT NEW-MASTER,
               OUTPUT PRINT-FILE.
          ADD +55 TO A-LINE-COUNTER.
          PERFORM GET-MASTER.
      UPDATE-P0010.
      UPDATE-P0020.
          RETURN SORT-FILE,
             AT END MOVE C-HEX-F TO W-TRX-KEY,
             GO TO UPDATE-P0025.
          MOVE SORT-KEY-A TO W-TRX-KEY.
      **************** COMPARE TXN AND MASTER INPUT KEYS ****************
      UPDATE-P0025.
          IF W-TRX-KEY GREATER THAN W-MAST-OUTPUT-KEY,
             ADD +1 TO A-MAST-OUTPUT-COUNT,
             WRITE NEW-MASTER-REC,
             PERFORM GET-MASTER-P0025.
             GO TO UPDATE-P0025.
      ***************************************************************
      *     THIS WILL APPLY VALIDATED CHG TXN TO THE MASTER FILE.       *
      ***************************************************************
          IF W-TRX-KEY NOT EQUAL TO W-MAST-OUTPUT-KEY,
             GO TO UPDATE-P0050.
          IF W-TRX-KEY EQUAL TO C-HEX-F,
             GO TO UPDATE-END.
          IF SORT-TXN-CODE-A EQUAL TO 'A',
             SET ERR-INDEX TO 32,
             PERFORM UPDATE-ERROR-MSG,
             GO TO UPDATE-P0020.
          IF TXN-CODE-N NOT EQUAL TO 'C',
             GO TO UPDATE-P0060.
```

```
      ****************************************************************
      *    CHECK FOR NAME, ORG, OCCUP OR DIRECTORY CHANGE           *
      ****************************************************************
           IF TXN-SUB-CODE-N EQUAL TO '05',
               MOVE SORT-NAME-N TO NEW-NAME,
               GO TO UPDATE-P0020.
           IF TXN-SUB-CODE-N EQUAL TO '06',
               MOVE SORT-ORG-N TO NEW-ORG,
               GO TO UPDATE-P0020.
           IF TXN-SUB-CODE-N EQUAL TO '14',
               MOVE SORT-OCCUP-N TO NEW-OCCUP,
               GO TO UPDATE-P0020.
           IF TXN-SUB-CODE-N EQUAL TO '11',
               MOVE SORT-DIR-NUM-N TO NEW-DIR-NUM,
               GO TO UPDATE-P0020.
      ****************************************************************
      *    CHECK FOR CHANGE TO ADDRESS EXCEPT CITY.                 *
      ****************************************************************
           IF TXN-SUB-CODE-AI EQUAL TO '07',
               MOVE SORT-ADD-2-AI TO NEW-ACC,
               GO TO UPDATE-P0020.
           IF TXN-SUB-CODE-AI EQUAL TO '08',
               MOVE SORT-STREET-AI TO NEW-STREET,
               GO TO UPDATE-P0020.
           IF TXN-SUB-CODE-AI EQUAL TO '09',
               MOVE SORT-STATE-AI TO NEW-STATE,
               GO TO UPDATE-P0020.
           IF TXN-SUB-CODE-AI EQUAL TO '10',
               MOVE SORT-ZIP-AI TO NEW-ZIP,
               GO TO UPDATE-P0020.
      EJECT
      ****************************************************************
      *  CHECK FOR CHANGE CITY AND REST TO FIELDS ON MASTER RECORD  *
      ****************************************************************
           IF TXN-SUB-CODE-CR EQUAL TO '12',
               MOVE SORT-CITY-CR TO NEW-CITY,
               GO TO UPDATE-P0020.
           IF TXN-SUB-CODE-CR EQUAL TO '13',
               MOVE SORT-PHONE-CR TO NEW-PHONE,
               GO TO UPDATE-P0020.
           IF TXN-SUB-CODE-CR EQUAL TO '15',
               MOVE SORT-AREA-EXP TO NEW-AREA-EXP,
               GO TO UPDATE-P0020.
           IF TXN-SUB-CODE-CR EQUAL TO '16',
               MOVE SORT-FORIGN-CR TO NEW-FORIGN,
               GO TO UPDATE-P0020.
           IF TXN-SUB-CODE-T EQUAL TO '17',
               MOVE SORT-TITLE-T TO NEW-TITLE,
```

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```
            GO TO UPDATE-P0020.
        SET ERR-INDEX TO 5,
        PERFORM ERROR-MESSAGE,
        GO TO UPDATE-P0020.
    UPDATE-P0060.
   ****************************************************************
   **  THIS SECTION WILL DELETE A MASTER RECORD BY NOT WRITING  **
   **  THE TXN TO THE OUTPUT MASTER TAPE.                       **
   ****************************************************************
        ADD +1 TO A-MAST-DELT-COUNT.
        GO TO UPDATE-P0J10.
    UPDATE-P0050.
   ****************************************************************
   **  THIS SECTION WILL ADD AN ADD TXN TO THE MASTER FILE      **
   **  AFTER ENSURING THAT THE TRANSACTION IS AN ADD.           **
   ****************************************************************
        IF SORT-TXN-CODE-A NOT EQUAL TO 'A',
        SET ERR-INDEX TO 24,
        PERFORM UPDATE-ERROR-MSG,
        GO TO UPDATE-P0020.
        ADD +1 TO A-ADD-TXN-COUNT.
        MOVE SORT-KEY-A TO NEW-KEY.
        MOVE SCRT-NAME-A TO NEW-NAME.
        MOVE SCRT-ORG-A TO NEW-ORG.
        MOVE SORT-OCCUP-A TO NEW-OCCUP.
        MOVE SORT-DATA-2 TO NEW-DATA-2.
        MOVE SORT-DATA-3 TO NEW-DATA-3.
        MOVE W-TRX-KEY TO W-MAST-OUTPUT-KEY.
        GO TO UPDATE-P0020.
    UPDATE-END.
        CLOSE ERROR-REPORT.
        CLOSE NEW-MASTER.
        MOVE SPACES TO PRINT-LINE.
        WRITE PRINT-LINE FROM STAT-HDR-1 AFTER POSITIONING 0 LINES.
        MOVE SPACES TO PRINT-LINE.
        MOVE A-TXN-COUNT TO TXN-COUNT-PR.
        MOVE A-MAST-INPUT-COUNT TO MAST-INPUT-CCUNT-PR.
        MOVE A-ADD-TXN-COUNT TO ADD-TXN-COUNT-PR.
        MOVE A-MAST-DELT-COUNT TO DELT-COUNT-PR.
        MOVE A-MAST-OUTPUT-COUNT TO MAST-OUTPUT-COUNT-PR.
        WRITE PRINT-LINE FROM STAT-HCR-2 AFTER POSITIONING 3 LINES.
        MOVE SPACES TO PRINT-LINE.
        WRITE PRINT-LINE FROM STAT-HCR-3 AFTER POSITIONING 1 LINES.
        MOVE SPACES TO PRINT-LINE.
        WRITE PRINT-LINE FROM STAT-HDR-4 AFTER POSITIONING 1 LINES.
        MOVE SPACES TO PRINT-LINE.
        WRITE PRINT-LINE FROM STAT-HCR-5 AFTER POSITIONING 1 LINES.
        MOVE SPACES TO PRINT-LINE.
```

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        WRITE PRINT-LINE FROM STAT-HDR-6 AFTER POSITIONING 3 LINES.
        CLOSE PRINT-FILE.
        EJECT
 ****************************************************************
 ** THIS WILL READ MAST RECORD WHEN REQ BY UPDATE ROUTINE     **
 ****************************************************************
 GET-MASTER SECTION.
        IF W-MAST-INPUT-KEY EQUAL TO C-HEX-F,
           GO TO UPDATE-P0014.
 UPDATE-P0011.
        IF W-MAST-INPUT-KEY NOT EQUAL TO W-MAST-OUTPUT-KEY,
           GO TO UPDATE-P0012.
        READ OLD-MASTER,
           AT END CLOSE OLD-MASTER,
           MOVE C-HEX-F TO W-MAST-INPUT-KEY,
           GO TO UPDATE-P0014.
        ADD +1 TO A-MAST-INPUT-COUNT.
        MOVE OLD-KEY TO W-MAST-INPUT-KEY.
 UPDATE-P0012.
        MOVE OLD-MASTER-REC TO NEW-MASTER-REC.
 UPDATE-P0014.
        MOVE W-MAST-INPUT-KEY TO W-MAST-OUTPUT-KEY.
 GET-MASTER-EXIT.
        EXIT.
 ****************************************************************
 ** THIS SECTION WILL PERFORM THE UPDATE ERROR ROUTINE        **
 ****************************************************************
 UPDATE-ERROR-MSG SECTION.
        IF A-LINE-COUNTER GREATER THAN +50,
           MOVE +6 TO A-LINE-COUNTER,
           MOVE ALL SPACES TO ERROR-RECORD,
           ADD +1 TO A-PAGE-COUNTER,
           MOVE A-PAGE-COUNTER TO PAGE-NUM-UP,
           MOVE C-UPD-HEADING-1 TO ERROR-RECORD,
           WRITE ERROR-RECORD AFTER POSITIONING 3 LINES,
           MOVE ALL SPACES TO ERROR-RECORD,
           MOVE 'REC NUM' TO CD-NUM,
           MOVE C-ERR-HEADING-2 TO ERROR-RECORD,
           WRITE ERROR-RECORD AFTER POSITIONING 3 LINES,
           MOVE ALL SPACES TO ERROR-RECORD.
        MOVE SORT-TXN-CODE-A TO TXN-CODE-UP.
        MOVE SORT-KEY-A TO TXN-KEY-UP.
        MOVE W-UPDATE-IMAGE-AREA TO ERR-DATA,
        MOVE A-MAST-INPUT-COUNT TO ERR-CD-NUM.
        MOVE ALL SPACES TO ERR-MSG.
        MOVE ERR-ENT (ERR-INDEX) TO ERR-MSG.
        WRITE ERROR-RECORD AFTER POSITIONING 2 LINES.
        MOVE ALL SPACES TO ERROR-RECORD.
```

```
          ADD +1 TO A-LINE-COUNTER.
   UPDATE-ERROR-MSG-EXIT.
      EXIT.
//GO.SORTLIB DD DSN=SYS1.SORTLIB,DISP=SHR
//GO.SORTPR DD SYSOUT=A
//GO.SORTWK01 DD UNIT=2314,VOL=SER=SPOOL2,SPACE=(TRK,(30,10),,CONTIG)
//GO.SORTWK02 DD UNIT=2314,VOL=SER=SPOOL2,SPACE=(TRK,(30,10),,CONTIG)
//GO.SORTWK03 DD UNIT=2314,VOL=SER=SPOOL2,SPACE=(TRK,(30,10),,CONTIG)
//GO.SORTWK04 DD UNIT=2314,VOL=SER=SPOOL2,SPACE=(TRK,(30,10),,CONTIG)
//GO.TAPEIN DD DISP=(OLD,KEEP),UNIT=3400-3,LABEL=(1,SL),
//     VOL=SER=NPS349,DSNAME=FO973.CONV.MAST,
//     DCB=(RECFM=FB,LRECL=231,BLKSIZE=2310)
//GO.TAPOUT DD DISP=(NEW,KEEP),UNIT=3400-3,LABEL=(1,SL),
//     VOL=SER=NPS200,DSNAME=FO973.STATE.NAME,
//     DCB=(RECFM=FB,LRECL=231,BLKSIZE=2310)
//GO.PRINT DD SYSOUT=A
//GO.ERROR DD SYSOUT=A
//GO.OUTFL DD UNIT=SYSDA,SPACE=(TRK,(30,10)),
//     DCB=(RECFM=V,LRECL=236,BLKSIZE=2364)
//IN1 DD *
```

THE NAME-KEY CROSS-REFERENCE PROGRAM

```
//TECHXKEY JOB (0973,0813,MZ51,,30),'TECHXKEY',TIME=2
//       EXEC COBUCLG
//COB.SYSIN DD *
       IDENTIFICATION DIVISION.
       PROGRAM-ID. LISTKEY.
       AUTHOR. MIKE HENDERSON
       ENVIRONMENT DIVISION.
       INPUT-OUTPUT SECTION.
       FILE-CONTROL.
           SELECT MASTER-FILE, ASSIGN TO UT-S-TAPEIN.
           SELECT NEW-FILE, ASSIGN TO UT-S-TAPOUT.
           SELECT SORT-FILE, ASSIGN TO DA-S-OUTFL.
           SELECT PRINT-FILE, ASSIGN TO UR-S-PRINT.
       DATA DIVISION.
       FILE SECTION.
       FD  MASTER-FILE.
           RECORD CONTAINS 231 CHARACTERS
           LABEL RECORDS ARE STANDARD
           BLOCK CONTAINS 10 RECORDS
           DATA RECORD IS MASTER-CARD.
       01  MASTER-CARD.
           05 NEW-KEY.
              07 NEW-JUL-DAY           PIC 999.
              07 NEW-RCD-NUM           PIC 99.
              07 NEW-JUL-YR            PIC 99.
              07 NEW-DIR-NUM           PIC 99.
           FILLER                      PIC X(222).
       SORT-FILE.
       SD  DATA RECORD IS NEW-SORT-RECORD.
       01  NEW-SORT-RECORD.
           05 OLD-KEY.
              07 OLD-JUL-DAY           PIC 999.
              07 OLD-RCD-NUM           PIC 99.
              07 OLD-JUL-YR            PIC 99.
              07 OLD-DIR-NUM           PIC 99.
           05 OLD-NAME                 PIC X(28).
           05 OLD-ORG                  PIC X(35).
           05 OLD-OCCUP-CD             PIC 999.
           05 OLD-ADD-2                PIC X(29).
           05 OLD-STREET               PIC X(24).
           05 OLD-CITY                 PIC X(16).
           05 OLD-STATE                PIC X(2).
           05 OLD-ZIP                  PIC X(6).
```

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    05  OLD-FORIGN-ADD              PIC  X(20).
    05  OLD-PHONE                   PIC  X(16).
    05  OLD-AREA-EXP                PIC  X(9).
    05  OLD-TITLE                   PIC  X(28).
    05  OLD-FUTURE-USE              PIC  X(6).
FD  NEW-FILE,
    RECORD CONTAINS 231 CHARACTERS
    LABEL RECORDS ARE STANDARD
    BLOCK CONTAINS 10 RECORDS
    DATA RECORD IS NEW-MAST.
01  NEW-MAST                        PIC  X(231).
FD  PRINT-FILE,
    LABEL RECORDS ARE OMITTED
    BLOCK CONTAINS 25 RECORDS
    DATA RECORD IS PRINT-LINE.
01  PRINT-LINE                      PIC  X(133).
    EJECT
WORKING-STORAGE SECTION.
01  ACCUMULATORS.
    05  R-LINE-COUNTER              PIC  S9(4) VALUE +50 COMP SYNC.
    05  NEW-MAST-CTR                PIC  9(4) VALUE ZEROS.
01  STAT-HDR-1.
    05  FILLER                      PIC  X(50) VALUE SPACES.
    05  FILLER                      PIC  X(32) VALUE 'MASTER FILE NAME AND KEY LISTING'.
    05  FILLER                      PIC  X(50) VALUE SPACES.
01  STAT-HDR-2.
    05  FILLER                      PIC  X(13) VALUE SPACES.
    05  FILLER                      PIC  X(4) VALUE 'NAME'.
    05  FILLER                      PIC  X(29) VALUE SPACES.
    05  FILLER                      PIC  X(3) VALUE 'KEY'.
    05  FILLER                      PIC  X(12) VALUE SPACES.
    05  FILLER                      VALUE 'ORGANIZATION'.
01  STAT-HDR-3.
    05  FILLER                      PIC  X(63) VALUE SPACES.
    05  FILLER                      PIC  X(11) VALUE SPACES.
    05  NAME-PR                     PIC  X(28) VALUE SPACES.
    05  FILLER                      PIC  X(5) VALUE ZEROS.
    05  KEY-PR                      PIC  X(9) VALUE SPACES.
    05  ORG-PR                      PIC  X(35) VALUE SPACES.
    05  FILLER                      PIC  X(40) VALUE SPACES.
01  STAT-HDR-4.
    05  FILLER                      PIC  X(40) VALUE SPACES.
```

```
        05  FILLER                    PIC X(30) VALUE 'TOTAL NUMBER REC
-   'ORDS ON FILE '.
        05  FILLER                    PIC X(5)  VALUE SPACES.
        05  TOT-RCD-COUNT             PIC 9(4)  VALUE ZEROS.
        05  FILLER                    PIC X(53) VALUE SPACES.
    EJECT
    PROCEDURE DIVISION.
    MAIN-LINE SECTION.
        SORT SORT-FILE,
            ASCENDING KEY OLD-NAME
            INPUT PROCEDURE IS VALIDATE,
            OUTPUT PROCEDURE IS UPDATE.
    MAIN-P0025.
        MOVE +0 TO RETURN-CODE.
        GOBACK.
    VALIDATE SECTION.
        OPEN INPUT MASTER-FILE
             OUTPUT NEW-FILE.
    VALIDATE-P0010.
        READ MASTER-FILE, AT END GO TO VALIDATE-END.
        MOVE MASTER-CARD TO NEW-MAST.
        WRITE NEW-MAST.
        ADD +1 TO NEW-MAST-CTR.
    VALIDATE-P0012.
        MOVE MASTER-CARD TO NEW-SORT-RECORD.
        RELEASE NEW-SORT-RECORD.
        GO TO VALIDATE-P0010.
    VALIDATE-END.
        CLOSE NEW-FILE.
        CLOSE MASTER-FILE.
    UPDATE SECTION.
        OPEN OUTPUT PRINT-FILE.
    UPDATE-P0010.
        RETURN SORT-FILE,
            AT END GO TO UPDATE-END.
    UPDATE-P0015.
        IF R-LINE-COUNTER GREATER THAN +38,
            PERFORM HDR-ROUTINE.
        MOVE OLD-NAME TO NAME-PR.
        MOVE OLD-KEY TO KEY-PR.
        MOVE OLD-ORG TO ORG-PR.
        MOVE SPACES TO PRINT-LINE.
        WRITE PRINT-LINE FROM STAT-HCR-3 AFTER POSITIONING 2 LINES.
        ADD +1 TO R-LINE-COUNTER.
        GO TO UPDATE-P0010.
    UPDATE-END.
        MOVE SPACES TO PRINT-LINE.
        MOVE NEW-MAST-CTR TO TOT-RCD-COUNT.
```

```
          WRITE PRINT-LINE FROM STAT-HDR-4 AFTER POSITICNING O LINES.
          CLOSE PRINT-FILE.
      HDR-ROUTINE SECTION.
          MOVE SPACES TO PRINT-LINE.
          WRITE PRINT-LINE FROM STAT-HDR-1 AFTER POSITIONING O LINES.
          MOVE SPACES TO PRINT-LINE.
          WRITE PRINT-LINE FROM STAT-HDR-2 AFTER POSITICNING 3 LINES.
          MOVE +4 TO R-LINE-COUNTER.
      HDR-ROUTINE-EXIT.
          EXIT.
//GO.TAPEIN DD  DISP=(OLD,KEEP),UNIT=3400-3,LABEL=(1,SL),
//    VOL=SER=NPS200,DSNAME=F0973.STATE.NAME,
//    CCB=(RECFM=FB,LRECL=231,BLKSIZE=2310)
//GO.SORTLIB DD  DSN=SYS1.SORTLIB,DISP=SHR
//GO.SORTPK DD  SYSOUT=A
//GO.SORTWK01 DD  UNIT=2314,VOL=SER=SPOOL2,SPACE=(TRK,(30,10),,CONTIG)
//GO.SORTWK02 DD  UNIT=2314,VOL=SER=SPOOL2,SPACE=(TRK,(30,10),,CONTIG)
//GO.SORTWK03 DD  UNIT=2314,VOL=SER=SPOOL2,SPACE=(TRK,(30,10),,CONTIG)
//GO.SORTWK04 DD  UNIT=2314,VOL=SER=SPCOL2,SPACE=(TRK,(30,10),,CONTIG)
//GO.OUTFL DD  UNIT=SYSDA,SPACE=(TRK,(70,10))
//    DCB=(RECFM=FB,LRECL=231,BLKSIZE=2310)
//GO.TAPOUT DD  DISP=(NEW,KEEP),UNIT=3400-3,LABEL=(1,SL),
//    VOL=SER=NPS349,DSNAME=F0973.CONV.MAST,
//    DCB=(RECFM=FB,LRECL=231,BLKSIZE=2310)
//GO.PRINT DD  SYSOUT=A
```

THE ALPHA-LISTING MASTER PRINT PROGRAM

```
//TECHXFER JOB (0973,0813,MZ51,,30),'TECHXFER',TIME=2
//   EXEC COBUCLG
//CCB.SYSIN DD *
        IDENTIFICATION DIVISION.
        PROGRAM-ID. PRINT-DIRECTORY.
        AUTHOR. MIKE HENDERSON
        ENVIRONMENT DIVISION.
        INPUT-OUTPUT SECTION.
        FILE-CONTROL.
            SELECT MASTER-FILE, ASSIGN TO UT-S-TAPEIN.
            SELECT NEW-MASTER, ASSIGN TO UT-S-TAPOUT.
            SELECT TRANSACTION-FILE, ASSIGN TO UR-S-IN1.
            SELECT SORT-FILE, ASSIGN TO DA-S-OUTFL.
            SELECT PRINT-FILE, ASSIGN TO UR-S-PRINT.

        DATA DIVISION.
        FILE SECTION.
        FD  MASTER-FILE
            RECORD CONTAINS 231 CHARACTERS
            LABEL RECORDS ARE STANDARD
            BLOCK CONTAINS 10 RECORDS
            DATA RECORD IS MASTER-CARD.
        01  MASTER-CARD.
            05  NEW-KEY.
                07  NEW-JUL-DAY        PIC 999.
                07  NEW-RCD-NUM        PIC 99.
                07  NEW-JUL-YR         PIC 99.
                07  NEW-DIR-NUM        PIC 99.
            05  FILLER                 PIC X(222).
        SD  SORT-FILE
            DATA RECORD IS NEW-SORT-RECORD.
        C1  NEW-SORT-RECORD.
            05  OLD-KEY.
                07  OLD-JUL-DAY        PIC 999.
                07  OLD-RCD-NUM        PIC 99.
                07  OLD-JUL-YR         PIC 99.
                07  OLD-DIR-NUM        PIC 99.
            05  OLD-NAME               PIC X(28).
            35  OLD-ORG                PIC X(35).
            05  OLD-OCCUP-CD           PIC 999.
            05  OLD-ADD-2              PIC X(29).
            05  OLD-STREET             PIC X(24).
            05  OLD-CITY               PIC X(16).
            05  OLD-STATE              PIC X(2).
            05  OLD-ZIP                PIC X(6).
```

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        05  OLD-FORIGN-ADD              PIC X(20).
        05  OLD-PHONE.
            07  AREA-CD                 PIC X(3).
            07  PRE-FIX                 PIC X(3).
            07  LAST-4                  PIC X(4).
            07  EXT                     PIC X(6).
        05  OLD-AREA-EXP.
            07  OLD-FIRST-EXP           PIC X(3).
            07  OLD-SECOND-EXP          PIC X(3).
            07  OLD-THIRD-EXP           PIC X(3).
        05  OLD-TITLE                   PIC X(28).
        05  OLD-FUTURE-USE              PIC X(6).
    FD  NEW-MASTER
        RECORD CONTAINS 231 CHARACTERS
        LABEL RECORDS ARE STANDARD
        BLOCK CONTAINS 10 RECORDS
        DATA RECORD IS NEW-MASTER-REC.
    01  NEW-MASTER-REC                  PIC X(231).
        EJECT
    FD  TRANSACTION-FILE
        LABEL RECORDS ARE OMITTED,
        BLOCK CONTAINS 5 RECORDS
        DATA RECORD IS DATA-CARD.
    01  DATA-CARD.
        05  CONTROL-FLD                 PIC X(12).
        05  CNT-DIR-NUM                 PIC 99.
        05  FILLER                      PIC X(66).
    FD  PRINT-FILE
        LABEL RECORDS ARE OMITTED
        BLOCK CONTAINS 25 RECORDS
        DATA RECORD IS PRINT-LINE.
    01  PRINT-LINE                      PIC X(133).
    WORKING-STORAGE SECTION.
    01  ACCUMULATORS.
        05  A-LINE-COUNTER    PIC S9(4) VALUE +126 COMP SYNC.
        05  A-PAGE-COUNTER    PIC S9(4) VALUE ZEROS.
        05  NEW-MAST-CTR      PIC 9(4)  VALUE ZEROS.
        05  DIR-HOLD          PIC 99    VALUE ZEROS.
    01  ERR-MESSAGES.
        05  ERR-1 PIC X(40)
            VALUE IS ' DIRECTORY NUMBER ON CONTROL CARD BLANK.'.
        05  ERR-2 PIC X(40)
            VALUE IS 'DIRECT-NUM ON CONTROL CARD NOT NUMERIC. '.
    01  PAGE-HDR.
        05  FILLER            PIC X(55) VALUE SPACES.
        05  PAGE-NUM          PIC ZZZ9  VALUE 0000.
        05  FILLER            PIC X(74) VALUE SPACES.
    01  HDR-1.
```

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       05  FILLER               PIC X(6),    VALUE SPACES.
       05  FILLER               PIC X(10),   VALUE 'NAME/TITLE'.
       05  FILLER               PIC X(30),   VALUE SPACES.
       05  FILLER               PIC X(7),    VALUE 'ADDRESS'.
       05  FILLER               PIC X(28)    VALUE SPACES.
       05  FILLER               PIC X(7),    VALUE 'AREA OF'.
       05  FILLER               PIC X(42)    VALUE SPACES.
   01  HDR-2.
       05  FILLER               PIC X(6),    VALUE SPACES.
       05  FILLER               PIC X(9),    VALUE 'ORG/PHONE'.
       05  FILLER               PIC X(65),   VALUE SPACES.
       05  FILLER               PIC X(9),    VALUE 'EXPERTISE'.
       05  FILLER               PIC X(7),    VALUE SPACES.
       05  FILLER               PIC X(13),   VALUE 'OCCUPATION'.
       05  FILLER               PIC X(27)    VALUE SPACES.
   01  ERR-HDR-1.
       05  FILLER               PIC X.       VALUE SPACES.
       05  ERR-MESSAGE          PIC X(40)    VALUE SPACES.
       05  FILLER               PIC X(92)    VALUE SPACES.
   01  STAT-HDR-4.
       05  FILLER               PIC X.       VALUE SPACES.
       05  FILLER               PIC X(40)    VALUE SPACES.
       05  FILLER               PIC X(30)    VALUE 'TOTAL NUMBER RECORDS ON FILE   '.
       05  FILLER               PIC X(5)     VALUE SPACES.
       05  TOT-RCD-COUNT        PIC 9(4)     VALUE ZEROS.
       05  FILLER               PIC X(53)    VALUE SPACES.
       EJECT
   01  DIR-LINE-1.
       05  FILLER               PIC X(6)     VALUE SPACES.
       05  NAME-PR              PIC X(28)    VALUE SPACES.
       05  FILLER               PIC X(12)    VALUE SPACES.
       05  ADD-2-PR             PIC X(29)    VALUE SPACES.
       05  FILLER               PIC X(5)     VALUE SPACES.
       05  AREA-EXP-PR.
           07  FIRST-AREA-PR    PIC X(3)     VALUE SPACES.
           07  FILLER           PIC X(3)     VALUE SPACES.
           07  SECOND-AREA-PR   PIC X(3)     VALUE SPACES.
           07  FILLER           PIC X(3)     VALUE SPACES.
           07  THIRD-AREA-PR    PIC X(3)     VALUE SPACES.
       05  FILLER               PIC X(8)     VALUE SPACES.
       05  OCCUP-PR             PIC 9(3)     VALUE ZEROS.
```

```
01
    05  FILLER                          PIC X(21)  VALUE SPACES.
01  DIR-LINE-2.
    05  FILLER                          PIC X(6)   VALUE SPACES.
    05  TITLE-PR                        PIC X(28)  VALUE SPACES.
    05  FILLER                          PIC X(12)  VALUE SPACES.
    05  STREET-PR                       PIC X(24)  VALUE SPACES.
    05  FILLER                          PIC X(53)  VALUE SPACES.
01  DIR-LINE-3.
    05  FILLER                          PIC X(6)   VALUE SPACES.
    05  ORG-PR                          PIC X(35)  VALUE SPACES.
    05  FILLER                          PIC X(5)   VALUE SPACES.
    05  CITY-PR                         PIC X(16)  VALUE SPACES.
    05  FILLER                          PIC X(2)   VALUE SPACES.
    05  STATE-PR                        PIC X(2)   VALUE SPACES.
    05  FILLER                          PIC X(6)   VALUE SPACES.
    05  ZIP-PR                          PIC X(49)  VALUE SPACES.
01  DIR-LINE-4.
    05  FILLER                          PIC X(6)   VALUE SPACES.
    05  PHONE-PR.
        07  AREA-CD-PR                  PIC X(3)   VALUE SPACES.
        07  HYP-PR                      PIC X(3)   VALUE SPACES.
        07  PREFIX-PR
        07  HYP-PREFIX-PR               PIC X(4)   VALUE SPACES.
        07  LAST-4-PR
        07  EXT-PR                      PIC X(6)   VALUE SPACES.
    05  FILLER                          PIC X(22)  VALUE SPACES.
    05  FORIGN-PR                       PIC X(20)  VALUE SPACES.
    05  FILLER                          PIC X(57)  VALUE SPACES.
    EJECT
PROCEDURE DIVISION.
MAIN-LINE SECTION.
    SORT SCRT-FILE,
        ASCENDING KEY OLD-NAME
        INPUT PROCEDURE IS VALIDATE,
        OUTPUT PROCEDURE IS UPDATE.
MAIN-P0025.
    MOVE +0 TO RETURN-CODE.
    GOBACK.
VALIDATE SECTION.
    OPEN INPUT TRANSACTION-FILE,
         OUTPUT PRINT-FILE.
VALIDATE-P0010.
    READ TRANSACTION-FILE,
        AT END GO TO VALIDATE-P0015.
VALIDATE-P0012.
    IF CNT-DIR-NUM EQUAL TO SPACES,
        GO TO VALIDATE-P0020.
```

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```
        IF CNT-DIR-NUM NOT NUMERIC,
            GO TO VALIDATE-P0022.
        MOVE CNT-DIR-NUM TO DIR-HOLD.
    VALIDATE-P0015.
        CLOSE TRANSACTION-FILE.
    VALIDATE-P0018.
        OPEN INPUT MASTER-FILE.
    VALIDATE-P0019.
        READ MASTER-FILE, AT END GO TO VALIDATE-END.
        IF NEW-DIR-NUM EQUAL TO DIR-HOLD,
            MOVE MASTER-CARD TO NEW-SORT-RECORD,
            RELEASE NEW-SORT-RECORD.
        GO TO VALIDATE-P0019.
    VALIDATE-P0020.
        MOVE SPACES TO PRINT-LINE
        MOVE ERR-1 TO ERR-MESSAGE.
        WRITE PRINT-LINE FROM ERR-HDR-1 AFTER POSITIONING 0 LINES.
        CLOSE TRANSACTION-FILE.
        CLOSE PRINT-FILE.
        GO TO MAIN-P0025.
    VALIDATE-P0022.
        MOVE SPACES TO PRINT-LINE
        MOVE ERR-2 TO ERR-MESSAGE.
        WRITE PRINT-LINE FROM ERR-HDR-1 AFTER POSITIONING 0 LINES.
        CLOSE TRANSACTION-FILE.
        CLOSE PRINT-FILE.
        GO TO MAIN-P0025.
    VALIDATE-END.
        CLOSE MASTER-FILE.
        EJECT
    UPDATE SECTION.
    UPDATE-P0010.
        OPEN OUTPUT NEW-MASTER.
        RETURN SORT-FILE,
            AT END GO TO UPDATE-END.
    UPDATE-P0015.
        MOVE NEW-SORT-RECORD TO NEW-MASTER-REC.
        WRITE NEW-MASTER-REC.
        ADD +1 TO NEW-MAST-CTR.
    UPDATE-P0020.
        IF A-LINE-COUNTER GREATER THAN 125,
            PERFORM HDR-ROUTINE THRU 020-EXIT.
        MOVE SPACES TO PRINT-LINE.
        MOVE SPACES TO AREA-EXP-PR.
        MOVE OLD-NAME TO NAME-PR.
        MOVE OLD-ADD-2 TO ADD-2-PR.
        IF OLD-FIRST-EXP NOT EQUAL TO SPACES,
            MOVE OLD-FIRST-EXP TO FIRST-AREA-PR.
```

```
        IF OLD-SECOND-EXP NOT EQUAL TO SPACES,
        MOVE OLD-SECOND-EXP TO SECOND-AREA-PR.
        IF OLD-THIRD-EXP NOT EQUAL TO SPACES,
        MOVE OLD-THIRD-EXP TO THIRD-AREA-PR.
        MOVE OLD-OCCUP-CD TO OCCUP-PR.
        WRITE PRINT-LINE FROM DIR-LINE-1 AFTER POSITIONING 2 LINES.
        ADD +2 TO A-LINE-COUNTER.
        MOVE SPACES TO PRINT-LINE.
        MOVE OLD-TITLE TO TITLE-PR.
        MOVE OLD-STREET TO STREET-PR.
        WRITE PRINT-LINE FROM DIR-LINE-2 AFTER POSITIONING 1 LINES.
        ADD +1 TO A-LINE-COUNTER.
        MOVE SPACES TO PRINT-LINE.
        MOVE OLD-ORG TO ORG-PR.
        MOVE OLD-CITY TO CITY-PR.
        MOVE OLD-STATE TO STATE-PR.
        MOVE OLD-ZIP TO ZIP-PR.
        IF OLD-FORIGN-ADD EQUAL TO SPACES,
        GO TO UPDATE-P0023.
        MOVE SPACES TO STATE-PR.
    UPDATE-P0023.
        WRITE PRINT-LINE FROM DIR-LINE-3 AFTER POSITIONING 1 LINES.
        ADD +1 TO A-LINE-COUNTER.
        MOVE SPACES TO PRINT-LINE.
        IF OLD-PHONE EQUAL TO SPACES,
        GO TO UPDATE-P0025.
        IF OLD-FORIGN-ADD EQUAL TO SPACES,
        MOVE AREA-CD TO AREA-CD-PR,
        MOVE PRE-FIX TO PREFIX-PR,
        MOVE -  - TO HYP-PREFIX-PR,
        MOVE LAST-4 TO LAST-4-PR,
        MOVE EXT TO EXT-PR,
        GO TO UPDATE-P0025.
        MOVE OLD-PHONE TO PHONE-PR.
    UPDATE-P0025.
        MOVE OLD-FORIGN-ADD TO FORIGN-PR.
        WRITE PRINT-LINE FROM DIR-LINE-4 AFTER POSITIONING 1 LINES.
        MOVE SPACES TO DIR-LINE-4.
        ADD +1 TO A-LINE-COUNTER.
        MOVE SPACES TO PRINT-LINE.
        IF A-LINE-COUNTER GREATER THAN 124,
        PERFORM PAGE-ROUTINE THRU 010-EXIT.
        GO TO UPDATE-P0013.
        EJECT
    PAGE-ROUTINE.
        MOVE SPACES TO PRINT-LINE,
        ADD +1 TO A-PAGE-COUNTER A-LINE-COUNTER,
```

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```
        MOVE A-PAGE-COUNTER TO PAGE-NUM,
        WRITE PRINT-LINE FROM PAGE-HCR AFTER PCSITIONING 2 LINES,
        MOVE SPACES TO PRINT-LINE.
    010-EXIT.
        EXIT.
    HDR-ROUTINE.
        MOVE SPACES TO PRINT-LINE.
        WRITE PRINT-LINE FROM HDR-1 AFTER POSITICNING O LINES.
        MOVE SPACES TO PRINT-LINE.
        WRITE PRINT-LINE FROM HDR-2 AFTER POSITICNING 1 LINES.
        MOVE SPACES TO PRINT-LINE.
        MOVE +2 TO A-LINE-COUNTER.
    020-EXIT.
        EXIT.
    UPDATE-END.
        MOVE SPACES TO PRINT-LINE.
        MOVE NEW-MAST-CTR TO TOT-RCD-COUNT.
        WRITE PRINT-LINE FROM STAT-HCR-4 AFTER POSITIONING O LINES.
        CLOSE NEW-MASTER PRINT-FILE.
//GO.TAPEIN DD DISP=(OLD,KEEP),UNIT=3400-3,LABEL=(1,SL),
//  VOL=SER=NPS200,DSNAME=F0973.STATE.NAME,
//  DCB=(RECFM=FB,LRECL=231,BLKSIZE=2310)
//GO.SORTLIB DD DSN=SYS1.SORTLIB,DISP=SHR
//GO.SORTPR DD SYSOUT=A
//GC.SORTWKO1 DD UNIT=2314,VOL=SER=SPOOL2,SPACE=(TRK,(30,10),,CONTIG)
//GC.SORTWKO2 DD UNIT=2314,VOL=SER=SPOOL2,SPACE=(TRK,(30,10),,CONTIG)
//GC.SORTWKO3 DD UNIT=2314,VOL=SER=SPOOL2,SPACE=(TRK,(30,10),,CONTIG)
//GO.SORTWKO4 DD UNIT=2314,VOL=SER=SPOOL2,SPACE=(TRK,(30,10),,CONTIG)
//GO.OUTFL DD UNIT=SYSDA,SPACE=(TRK,(70,10)),
//  DCB=(RECFM=FB,LRECL=231,BLKSIZE=2310)
//TAPOUT DD DISP=(NEW,KEEP),UNIT=3400-3,LABEL=(1,SL),
//  VOL=SER=NPS490,DSNAME=F0973.ORIG.NAME,
//  DCB=(RECFM=FB,LRECL=231,BLKSIZE=2310)
//GO.PRINT DD SYSOUT=A
//INI DD *
CONTROL CARDO2
```

```
//TEXSTATE JOB (0973,0813,MZ51,,10),'TEXSTATE',TIME=2
//     EXEC COBUCLG
//COB.SYSIN DD*
       IDENTIFICATION DIVISION.
       PROGRAM-ID. STATE-XREF.
       ENVIRONMENT DIVISION.
       INPUT-OUTPUT SECTION.
       FILE-CONTROL.
           SELECT STATE-TBL-FILE, ASSIGN TO UR-S-IN1.
           SELECT MASTER-FILE, ASSIGN TO UT-S-TAPEIN.
           SELECT SORTED-FILE, ASSIGN TO DA-S-ASRTFL.
           SELECT PRINT-FILE, ASSIGN TO DA-S-OUTFL.
           SELECT ERROR-REPORT, ASSIGN TO UR-S-PRINT.
                                ASSIGN TO UR-S-ERROR.
       DATA DIVISION.
       FILE SECTION.
       FD  MASTER-FILE,
           LABEL RECORDS ARE STANDARD
           BLOCK CONTAINS 10 RECORDS
           RECORD CONTAINS 231 CHARACTERS
           DATA RECORD IS MASTER-REC.
       01  MASTER-REC                              PIC X(231).
       FD  SORTED-FILE
           LABEL RECORDS ARE STANDARD
           RECORD CONTAINS 146 CHARACTERS
           BLOCK CONTAINS 10 RECORDS
           DATA RECORD IS MASTER-CARD.
       01  MASTER-CARD.
           05  OLD-KEY.
               07  OLD-JUL-DAY                     PIC 999.
               07  OLD-RCD-NUM                     PIC 99.
               07  OLD-JUL-YR                      PIC 99.
               07  OLD-DIR-NUM                     PIC 99.
           05  NAME-CD                             PIC X(28).
           05  FILLER                              PIC X(35).
           05  OCCUP-CD                            PIC X(3).
           05  ADD-LINE-1                          PIC X(29).
           05  FILLER                              PIC X(40).
           05  STATE-CD                            PIC XX.
```

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```
FD  STATE-TBL-FILE.
    RECORD CONTAINS 80 CHARACTERS
    LABEL RECORDS ARE OMITTED
    DATA RECORD IS DATA-CARD.
01  DATA-CARD.
    05  STATE-CD-DATA              PIC X(2).
    05  STATE-NAME                 PIC X(20).
    05  FILLER                     PIC X(58).
SD  SORT-FILE
    DATA RECORD IS SORT-RECORD.
01  SORT-RECORD.
    05  SORT-KEY                   PIC 9(9).
    05  SORT-NAME                  FILLER X(28).
    05  FILLER                     PIC X(35).
    05  SORT-OCCUP-CD              PIC X(3).
    05  FILLER                     FILLER X(69).
    05  SORT-STATE-CD              PIC X(2).
FD  PRINT-FILE.
    LABEL RECORDS ARE OMITTED
    BLOCK CONTAINS 25 RECORDS
    DATA RECORD IS PRINT-LINE.
01  PRINT-LINE.
    05  FILLER                     PIC X(5).
    05  DATA-LINE                  PIC X(128).
FD  ERROR-REPORT.
    LABEL RECORDS ARE OMITTED
    RECORD CONTAINS 133 CHARACTERS
    DATA RECORD IS ERROR-RECORD.
01  ERROR-RECORD.
    05  ERR-CARR-CNT               PIC X.
    05  FILLER                     FIC X(132).
    EJECT
WORKING-STORAGE SECTION.
77  NROW                           PIC 99  VALUE IS 1.
77  NCOL                           PIC 9   VALUE IS 1.
01  INPUT-TABLE.
    05  STATE-FILE-TBL OCCURS 79 TIMES
        ASCENDING KEY IS STATE-CD-TBL
        INDEXED BY STATE-INDEX.
        07  STATE-CD-TBL           PIC X(2).
        07  STATE-NAME-TBL         PIC X(22).
01  ACCUMULATORS.
    10  NAME-CTR                   PIC 9(4) VALUE ZERO.
    10  A-LINE-COUNTER             PIC S9(4) VALUE +85 COMP SYNC.
    10  R-LINE-COUNTER             PIC S9(4) VALUE +140 COMP SYNC.
01  PAGE-FORMAT.
    03  ROW OCCURS 64 TIMES.
        05  CCL OCCURS 3 TIMES.
```

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```
    07  NAME-FLD.
        08  STATE-STAR          PIC  X(3).
        08  STATE-FLD           PIC  X(22).
        08  STATE-STAR-2        PIC  X(3).
        08  STATE-REST          PIC  X(5).
01  CONSTANTS.
    05  C-ERR-HEADING-1.
        15  FILLER              PIC  X  VALUE '1'.
        15  FILLER              PIC  X(50) VALUE SPACES.
        15  FILLER              PIC  X(31) VALUE 'STATE/COUNTRY ERROR CODE REPORT'.
        15  FILLER              PIC  X(51) VALUE SPACES.
    05  C-ERR-HEADING-2.
        15  FILLER              PIC  X  VALUE '1'.
        15  NAME-HDR            PIC  X(4) VALUE 'NAME'.
        15  FILLER              PIC  X(29) VALUE SPACES.
        15  KEY-HDR             PIC  X(9) VALUE 'KEY FIELD'.
        15  FILLER              PIC  X(5) VALUE SPACES.
        15  STATE-HDR           PIC  X(18) VALUE 'INVALID STATE CODE'.
        15  FILLER              PIC  X(66) VALUE SPACES.
    05  C-ERR-HEADING-3.
        15  FILLER              PIC  X  VALUE '1'.
        15  NAME-ERR-AREA       PIC  X(28) VALUE SPACES.
        15  FILLER              PIC  X(5) VALUE SPACES.
        15  KEY-PR              PIC  9(9) VALUE ZEROS.
        15  FILLER              PIC  X(13) VALUE SPACES.
        15  STATE-ERR           PIC  X(2) VALUE SPACES.
        15  FILLER              PIC  X(75) VALUE SPACES.
01  TITLE-NAME.
    05  FILLER                  PIC  X(25) VALUE SPACES.
    05  FILLER                  PIC  X(43) VALUE '***STATE/COUN
    05  FILLER                  PIC  X(64) VALUE SPACES.
    'TRY CROSS REFERENCE LISTING***'.
    HDR-U-LINE.
    05  FILLER                  PIC  X(25) VALUE SPACES.
    05  FILLER                  PIC  X(43) VALUE '--------------
    05  FILLER                  PIC  X(64) VALUE SPACES.
01  BLK-LN.
    05  FILLER                  PIC  X(132) VALUE SPACES.
01  TOTAL-NAME.
    05  FILLER                  PIC  X(11) VALUE IS 'TOTAL NAMES'.
    05  FILLER                  PIC  XX VALUE SPACES.
```

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```
        05  TCT-NM-CTR           PIC 9(6) VALUE ZERO.
        05  FILLER               PIC X(113) VALUE SPACES.
    01  WORK-AREAS.
        05  STATE-HOLD           PIC XX VALUE 'XX'.
    EJECT
    PROCEDURE DIVISION.
    INITIAL-ROUTINE.
        SORT SORT-FILE
            ASCENDING KEY SORT-STATE-CD
            ASCENDING KEY SORT-NAME
            USING MASTER-FILE
            GIVING SORTED-FILE
            OPEN INPUT SORTED-FILE
            OPEN INPUT STATE-TBL-FILE,
                 OUTPUT PRINT-FILE,
                 OUTPUT ERROR-REPORT.
        SET STATE-INDEX TO 1.
        MOVE SPACES TO PAGE-FORMAT.
    READ-TBL.
        READ STATE-TBL-FILE, AT END GO TO MASTER-TAPE-ROUTINE.
    BUILD-TBL-SECTION.
        MOVE STATE-CD-DATA TO STATE-CD-TBL (STATE-INDEX).
        MOVE STATE-NAME TO STATE-NAME-TBL (STATE-INDEX).
        SET STATE-INDEX UP BY 1.
        IF STATE-INDEX NOT EQUAL TO +80,
        GO TO READ-TBL.
    MASTER-TAPE-ROUTINE.
        CLOSE STATE-TBL-FILE.
        SET STATE-INDEX TO 1.
    SET-UP-NCOL.
        MOVE 1 TO NCOL.
    SET-UP-NROW.
        MOVE 1 TO NROW.
    FILLUP-TABLE.
        READ SORTED-FILE, AT END GO TO END-OF-JOB.
        SET STATE-INDEX TO 1.
    SEARCH-ROUTINE.
        SEARCH STATE-FILE-TBL
            AT END GO TO ERROR-ROUTINE
            WHEN STATE-CD = STATE-CD-TBL (STATE-INDEX)
            GO TO CHECK-STATE-ROUTINE.
    CHECK-STATE-ROUTINE.
        IF STATE-CD NOT EQUAL TO STATE-HOLD
        GO TO NEW-STATE-ROUTINE
        ELSE GO TO MOVE-NAME-ROUTINE.
    MOVE-NAME-ROUTINE.
        MOVE NAME-CD TO NAME-FLD (NROW, NCOL).
        ADD +1 TO NAME-CTR,
```

```
        IF NROW LESS THAN 63 ADD 1 TO NROW,
            GO TO FILLUP-TABLE.
        IF NCOL LESS THAN 3 ADD 1 TO NCOL, GO TO SET-UP-NROW.
BLD-HDR.
        PERFORM HDR-ROUTINE THRU 020-EXIT.
WRITE-PAGE.
        MOVE ZERO TO NROW.
        PERFORM PRINTOUT THRU 010-EXIT 64 TIMES.
        MOVE SPACES TO PAGE-FORMAT.
        GO TO SET-UP-NCOL.
NEW-STATE-ROUTINE.
        MOVE '****' TO STATE-STAR (NROW, NCOL).
        MOVE STATE-NAME-TBL (STATE-INDEX) TO STATE-FLD (NROW, NCOL).
        MOVE '****' TO STATE-STAR-2 (NROW, NCOL).
        MOVE SPACES TO STATE-REST (NROW, NCOL).
        MOVE STATE-CD TO STATE-HOLD.
WRITE-IT.
        ADD 1 TO NROW.
        GO TO MOVE-NAME-ROUTINE.
PRINTOUT.
        ADD 1 TO NROW.
        MOVE SPACES TO PRINT-LINE.
        MOVE ROW (NROW) TO DATA-LINE.
        WRITE PRINT-LINE AFTER POSITIONING 2 LINES.
010-EXIT.
        EXIT.
EJECT
HDR-ROUTINE.
        MOVE SPACES TO PRINT-LINE.
        WRITE PRINT-LINE FROM TITLE-NAME AFTER POSITIONING 0 LINES,
        MOVE SPACES TO PRINT-LINE.
        WRITE PRINT-LINE FROM HDR-U-LINE AFTER POSITIONING 1 LINES,
        MOVE SPACES TO PRINT-LINE.
        WRITE PRINT-LINE FROM BLK-LN        AFTER POSITIONING 2 LINES,
        MOVE SPACES TO PRINT-LINE.
020-EXIT.
        EXIT.
ERROR-ROUTINE.
        IF A-LINE-COUNTER GREATER THAN +80,
        PERFORM EDR-ROUTINE THRU 030-EXIT.
        MOVE SPACES TO ERROR-RECORD.
        MOVE NAME-CD TO NAME-ERR-AREA,
        MOVE OLD-KEY TO KEY-PR,
        MOVE STATE-CD TO STATE-ERR,
        MOVE C-ERR-HEADING-3 TO ERROR-RECORD.
        WRITE ERROR-RECORD AFTER POSITIONING 2 LINES,
        MOVE ALL SPACES TO ERROR-RECORD, NAME-ERR-AREA, STATE-ERR.
        ADD +2 TO A-LINE-COUNTER.
```

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```
        SET STATE-INDEX TO 1.
        GO TO FILLUP-TABLE.
ERROR-ROUTINE-EXIT.
    EXIT.
EDR-ROUTINE.
    MOVE +6 TO A-LINE-COUNTER.
    MOVE SPACES TO ERROR-RECORD.
    MOVE C-ERR-HEADING-1 TO ERROR-RECORD.
    WRITE ERROR-RECORD AFTER POSITIONING 0 LINES.
    MOVE SPACES TO ERROR-RECORD.
    MOVE C-ERR-HEADING-2 TO ERROR-RECORD.
    WRITE ERROR-RECORD AFTER POSITIONING 3 LINES.
    MOVE ALL SPACES TO ERROR-RECORD.
030-EXIT.
    EXIT.
END-OF-JOB.
    PERFORM HDR-ROUTINE THRU 020-EXIT.
    MOVE ZERO TO NROW.
    PERFORM PRINTOUT THRU 010-EXIT 63 TIMES.
    MOVE SPACES TO PRINT-LINE.
    MOVE NAME-CTR TO TOT-NM-CTR.
    WRITE PRINT-LINE FROM TOTAL-NAME AFTER POSITIONING 0 LINES.
    CLOSE PRINT-FILE.
    CLOSE ERROR-REPORT.
    CLOSE SORTED-FILE.
    STOP RUN.
//GO.SORTLIB DD DSN=SYS1.SORTLIB,DISP=SHR
//GC.SCRTPR DD SYSOUT=A
//GO.SORTWK01 DD UNIT=2314,VOL=SER=SPOOL2,SPACE=(TRK,(30,10),,CONTIG)
//GC.SORTWK02 DD UNIT=2314,VOL=SER=SPOOL2,SPACE=(TRK,(30,10),,CONTIG)
//GO.SORTWK03 DD UNIT=2314,VOL=SER=SPOOL2,SPACE=(TRK,(30,10),,CONTIG)
//GO.SORTWK04 DD UNIT=2314,VOL=SER=SPOOL2,SPACE=(TRK,(30,10),,CONTIG)
//GO.TAPEIN DD DISP=(OLD,KEEP),UNIT=3400-3,LABEL=(1,SL),
//         VOL=SER=NP5490,DSNAME=F0973.ORIG.NAME,
//         DCB=(RECFM=FB,LRECL=231,BLKSIZE=2310)
//GC.PRINT DD SYSOUT=A
//GC.ERROR DD SYSOUT=A
//GO.OUTFL DD UNIT=SYSDA,SPACE=(TRK,(70,10)),
//         DCB=(RECFM=F,LRECL=146,BLKSIZE=1460),
//GO.IN1 DD *
ALALAMABA
AKALASKA
ASAUSTRALIA
AZARIZONA
ARARKANSAS
BEBELGIUM
CACALIFCRNIA
CHCHILE
```

```
CL CLUMBIA
CN CANADA
CO COLORADO
CT CONNECTICUT
DE DELAWARE
DC DISTRICT CF COLUMBIA
FL FLORIDA
FN FINLAND
FR FRANCE
GA GEORGIA
GE GERMANY
GU GUAM
HI HAWAII
ID IDAHO
II INDIA
IL ILLINOIS
IN INDIANA
IA IOWA
IR IRELAND
IS ISRAEL
IT ITALY
KS KANSAS
KY KENTUCKY
LA LOUISIANA
JA JAPAN
ME MAINE
MD MARYLAND
MA MASSACHUSETTS
MI MICHIGAN
MN MINNESOTA
MS MISSISSIPPI
MO MISSOURI
MT MONTANA
NE NEBRASKA
NO NORWAY
NV NEVADA
NH NEW HAMPSHIRE
NJ NEW JERSEY
NM NEW MEXICO
NY NEW YORK
NZ NEW ZEALAND
NC NORTH CAROLINA
ND NORTH DAKOTA
OH OHIO
OK OKLAHOMA
OR OREGON
PA PENNSYLVANIA
RI RHODE ISLAND
```

SCSOUTH CAROLINA
SDSOUTH DAKOTA
SLSCOTLAND
SPSPAIN
SWSWEDEN
SZSWITERLAND
TNTENNESSEE
TXTEXAS
UKENGLAND
UTUTAH
VIVIRGIN ISLANDS
VTVERMONT
VAVIRGINIA
WAWASHINGTON
WVWEST VIRGINIA
WIWISCONSIN
WYWYOMING
BRBRAZIL
TUTURKEY
ECECUADOR
SASOUTH AFRICA
YYNCT SPECIFIED
ZZOTHER COUNTRIES

```
//TECHXOCP JOB (0973,0813,MZ51,,10),'TECHXOCP',TIME=2
//      EXEC COBUCLG
//COB.SYSIN DD *
       IDENTIFICATION DIVISION.
       PROGRAM-ID. OCCPXREF.
       ENVIRONMENT DIVISION.
       INPUT-OUTPUT SECTION.
       FILE-CONTROL.
           SELECT MASTER-FILE, ASSIGN TO UT-S-TAPEIN.
           SELECT SORT-FILE, ASSIGN TO DA-S-ASRTFL.
           SELECT SORTED-FILE, ASSIGN TO DA-S-OUTFL.
           SELECT PRINT-FILE, ASSIGN TO UR-S-PRINT.
       DATA DIVISION.
       FILE SECTION.
       FD  MASTER-FILE,
           RECORD CONTAINS 231 CHARACTERS
           LABEL RECORDS ARE STANDARD
           BLOCK CONTAINS 10 RECORDS
           DATA RECORD IS MASTER-REC.
       01  MASTER-REC.                        PIC X(231).
       FD  SORTED-FILE
           LABEL RECORDS ARE STANDARD
           RECORD CONTAINS 75 CHARACTERS
           BLOCK CONTAINS 10 RECORDS
           DATA RECORD IS MASTER-CARD.
       01  MASTER-CARD.
           05  OLD-KEY.
               07  OLD-JUL-DAY               PIC 999.
               07  OLD-RCD-NUM               PIC 99.
               07  OLD-JUL-YR                PIC 99.
               07  OLD-DIR-NUM               PIC 99.
           05  NAME-CD                       PIC X(28).
           05  FILLER                        PIC X(35).
           05  OCCUP-CD                      PIC X(3).
       SD  SORT-FILE
           DATA RECORD IS SCRT-RECORD.
       01  SORT-RECORD.
           05  SORT-KEY                      PIC 9(9).
           05  SORT-NAME                     PIC X(28).
           05  FILLER                        PIC X(35).
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FD      05 SORT-OCCUP-CD              PIC X(3).
        PRINT-FILE,
        LABEL RECORDS ARE OMITTED,
        RECORD CONTAINS 133 CHARACTERS
        BLOCK CONTAINS 25 RECORDS
        DATA RECORD IS PRINT-LINE.
01      PRINT-LINE.
        05 FILLER                    PIC X(5).
        05 DATA-LINE                 PIC X(128).
        EJECT
WORKING-STORAGE SECTION.
77      NROW                         PIC 99 VALUE IS 1.
77      NCOL                         PIC 9 VALUE IS 1.
01      ACCUMULATORS.
        13 NAME-CTR                  PIC 9(4) VALUE ZERO.
01      WORK-AREAS.
        05 OCCUP-HOLD                PIC X(3) VALUE IS 'XXX'.
01      PAGE-FORMAT.
        03 ROW OCCURS 64 TIMES.
           05 CCL OCCURS 3 TIMES.
              07 NAME-FLD.
                 08 OCCUP-FLD        PIC X(20).
                 08 OCCUP-PR         PIC X(3).
                 08 OCCUP-STAR       PIC X(3).
                 08 OCCUP-REST       PIC X(7).
01      OCCUPATION.
        05 FILLER                    PIC X(20) VALUE IS '***OCCUPATION
        • CODE •.
01      TITLE-NAME.
        05 FILLER                    PIC X(27) VALUE SPACES.
        05 FILLER                    PIC X(40) VALUE IS '***OCCUPATION
        • CROSS REFERENCE LISTING***'.
01      HDR-U-LINE.                  PIC X(65) VALUE SPACES.
        05 FILLER
        05 FILLER                    PIC X(27) VALUE SPACES.
        05 FILLER                    PIC X(40) VALUE IS '------------
        •-|-------------------
01      BLK-LN.                      PIC X(65) VALUE SPACES.
        05 FILLER
        05 FILLER                    PIC X(132) VALUE IS SPACES.
01      TOTAL-NAME.
        05 FILLER                    PIC X(11) VALUE IS 'TOTAL NAMES'.
        05 FILLER                    PIC XX VALUE SPACES.
        05 TOT-NM-CTR                PIC 9(6) VALUE ZERO.
```

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                              PIC X(113) VALUE SPACES.
    05 FILLER
EJECT
PROCEDURE CIVISION.
INITIAL-ROUTINE.
    SORT SORT-FILE.
    ASCENDING KEY SORT-OCCUP-CD
    ASCENDING KEY SORT-NAME
    USING MASTER-FILE
    GIVING SORTED-FILE
    OPEN INPUT SORTED-FILE,
         OUTPUT PRINT-FILE.
    MOVE SPACES TO PAGE-FORMAT.
SET-UP-NCOL.
    MOVE-NCOL.
    MOVE 1 TO NCOL.
SET-UP-NROW.
    MOVE 1 TO NROW.
FILLUP-TABLE.
    READ SORTED-FILE, AT END GC TC END-OF-JOE.
CHECK-OCCUP-ROUTINE.
    IF OCCUP-CD NOT EQUAL TO OCCUP-HOLD
    GO TO NEW-OCCUP-ROUTINE
    ELSE GO TO MOVE-NAME-ROUTINE.
MOVE-NAME-ROUTINE.
    MOVE NAME-CD TO NAME-FLD (NROW, NCOL).
    ADD +1 TO NAME-CTR,
    IF NROW LESS THAN 63 ADD 1 TC NROW,
    GO TO FILLUP-TABLE.
    IF NCOL LESS THAN 3 ADD 1 TO NCOL, GO TO SET-UP-NROW.
BLD-HDR.
    PERFORM HDR-ROUTINE THRU J20-EXIT.
WRITE-PAGE.
    MOVE ZERO TO NROW.
    PERFORM PRINTOUT THRU 010-EXIT 63 TIMES.
    MOVE SPACES TO PAGE-FORMAT.
    GO TO SET-UP-NCOL.
NEW-OCCUP-ROUTINE.
    MOVE OCCUPATION TO OCCUP-FLD (NROW, NCOL).
    MOVE '***' TC OCCUP-STAR (NROW, NCOL).
    MOVE SPACES TO OCCUP-REST (NROW, NCOL).
    IF OCCUP-CD EQUAL TO OCCUP-PR (NROW, NCOL),
    MOVE '000' TO OCCUP-PR (NROW, NCOL),
    GO TO WRITE-IT.
    MOVE OCCUP-CD TO OCCUP-HOLD OCCUP-PR (NROW, NCOL).
WRITE-IT.
    ADD 1 TC NROW.
    IF NROW NOT LESS THAN 63, ADE 1 TO NCOL,
    MOVE 1 TO NROW.
```

```
        GO TO MOVE-NAME-ROUTINE.
PRINTOUT.
    ADD 1 TO NROW.
    MOVE SPACES TO PRINT-LINE.
    MOVE RCW (NROW) TO DATA-LINE.
    WRITE PRINT-LINE AFTER POSITIONING 2 LINES.
010-EXIT.
    EXIT.
HDR-ROUTINE.
    MOVE SPACES TO PRINT-LINE.
    WRITE PRINT-LINE FROM TITLE-NAME AFTER POSITIONING 0 LINES,
    MOVE SPACES TO PRINT-LINE.
    WRITE PRINT-LINE FROM HDR-U-LINE AFTER POSITIONING 1 LINES,
    MOVE SPACES TO PRINT-LINE.
    WRITE PRINT-LINE FROM BLK-LN        AFTER POSITIONING 2 LINES,
    MOVE SPACES TO PRINT-LINE.
020-EXIT.
END-OF-JOB.
    PERFORM HDR-ROUTINE THRU 020-EXIT.
    MOVE ZERO TO NROW.
    PERFORM PRINTOUT THRU 010-EXIT 63 TIMES.
    MOVE SPACES TO PRINT-LINE.
    MOVE NAME-CTR TO TOT-NM-CTR.
    WRITE PRINT-LINE FROM TOTAL-NAME AFTER POSITIONING 0 LINES.
    CLOSE PRINT-FILE.
    CLOSE SORTED-FILE.
    STOP RUN.
//GO.SORTLIB DD DSN=SYS1.SORTLIB,DISP=SHR
//GO.SORTPR  DD SYSOUT=A
//GO.SORTWK01 DD UNIT=2314,,VOL=SER=SPOOL2,SPACE=(TRK,(30,10),,CONTIG)
//GO.SORTWK02 DD UNIT=2314,,VOL=SER=SPOOL2,SPACE=(TRK,(30,10),,CONTIG)
//GO.SORTWK03 DD UNIT=2314,,VOL=SER=SPOOL2,SPACE=(TRK,(30,10),,CONTIG)
//GO.SORTWK04 DD UNIT=2314,,VOL=SER=SPOCL2,SPACE=(TRK,(30,10),,CONTIG)
//GO.TAPEIN  DD DISP=(OLD,KEEP),UNIT=3400-3,LABEL=(1,SL),
//    VOL=SER=NPS490,DSNAME=F0973.ORIG.NAME,
//    DCB=(RECFM=FB,LRECL=231,BLKSIZE=2310)
//GO.PRINT   DD SYSOUT=A
//GO.OUTFL  DD UNIT=SYSDA,SPACE=(TRK,(70,10)),
//    DCB=(RECFM=F,LRECL=75,BLKSIZE=750)
```
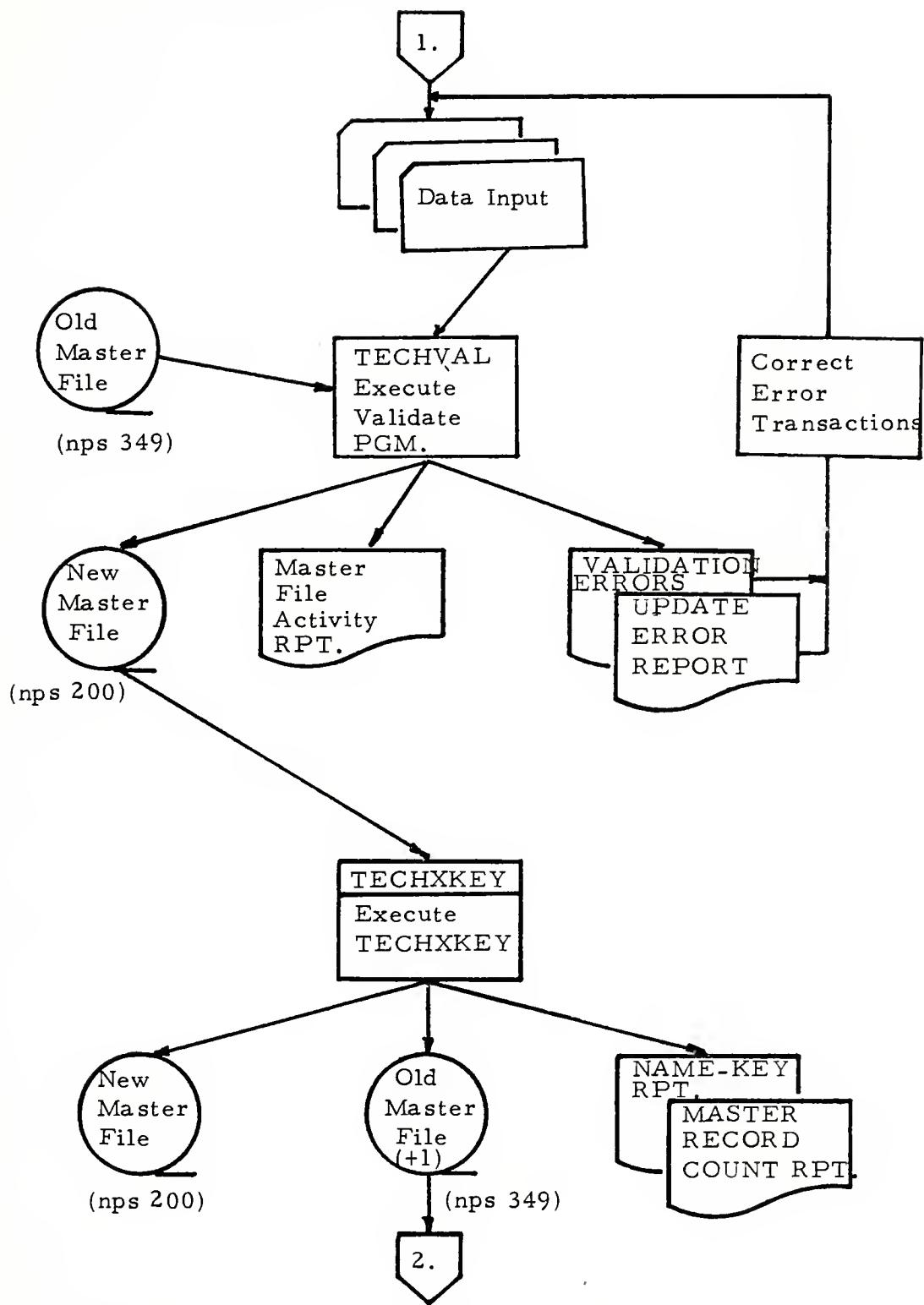
START

Old
Master
File

(nps 349)

TECHSLBL
Execute
Label
Program

Address
Labels

Invitation
Forms

Code Sheet
and
Instructions

Mail Out
Invitation
Package

Assign Key
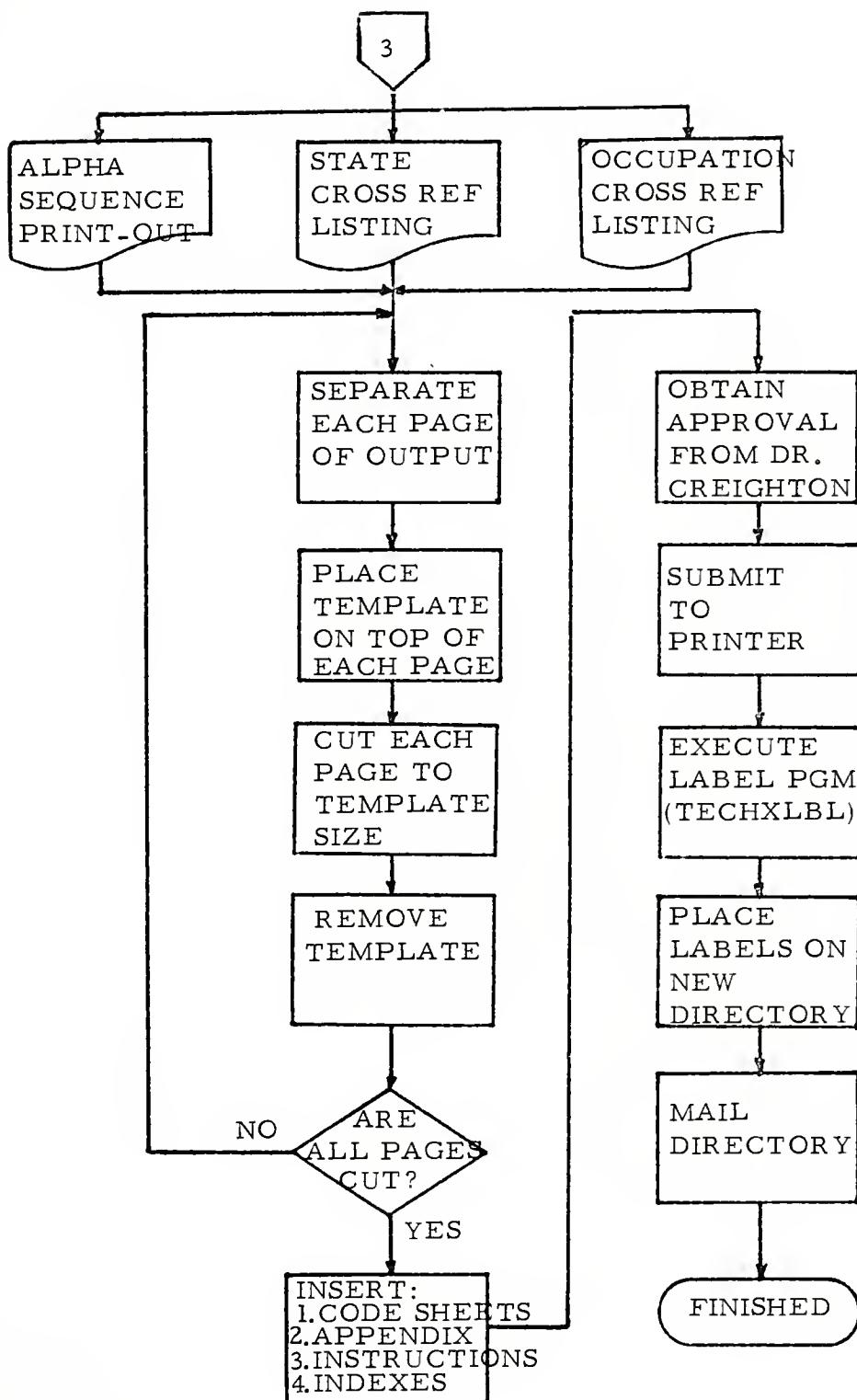to Returned
Forms

Keypunch
Data From
Invitation
Forms

1.

System Flow Chart One. Prepare, Mail and Keypunch
Invitation Authorization Form Data

System Flow Chart Two. Data Base Maintenance Sub-System

2

Old Master File
(nps 349)

Directory Print Control card

TECHXFER
EXECUTE Master Print Pgm.

ALPHA SEQ. Directory Print out

Master Print Tape
(nps 490)

Old Master File
(nps 349)

Total Name Count Report

TECHXOCP
Execute Occup-xref Program

TECHLBL
Execute Label Program

TEXSTATE
Execute State-Xref Program

Occupation Directory Report

Address Directory Labels

State/Country Rpt

State Code Error Report

Prepare Manuscript for Printing

Correct Any State Codes in Error

3

System Flow Chart Three.   Report Generation Sub-System

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3

ALPHA SEQUENCE PRINT-OUT

STATE CROSS REF LISTING

OCCUPATION CROSS REF LISTING

SEPARATE EACH PAGE OF OUTPUT

OBTAIN APPROVAL FROM DR. CREIGHTON

PLACE TEMPLATE ON TOP OF EACH PAGE

SUBMIT TO PRINTER

CUT EACH PAGE TO TEMPLATE SIZE

EXECUTE LABEL PGM (TECHXLBL)

REMOVE TEMPLATE

PLACE LABELS ON NEW DIRECTORY

ARE ALL PAGES CUT?

NO

YES

MAIL DIRECTORY

INSERT:
1. CODE SHEETS
2. APPENDIX
3. INSTRUCTIONS
4. INDEXES

FINISHED

Manuscript Preparation Flow Chart

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Appendix E

INTRODUCTION

This addendum to the 1977 Technology Transfer Directory
of People is being issued to include those individuals whose
authorization forms were received after the printing cut-off
date. If this method proves acceptable, we intend to utilize
it in the future not only for this purpose but also to cor-
rect errors that may have escaped our editing procedures and
to provide revised information for those currently listed.
We believe this is consistent with our original intentions
that this directory be of substantial benefit to those inter-
ested in the technology transfer process.

You will find that this addendum has a different format
than the directory itself. In addition to the revised format,
we have eliminated the AREAS of INTEREST codes and have added
the titles of those listed. These revisions, along with re-
vised OCCUPATION and AREAS of EXPERTISE codes based primarily
on the DICTIONARY of OCCUPATION TITLES published by the U. S.
Department of Labor, will be included in the next directory.
Additionally, the next directory will contain a form which
will enable you to change and/or correct any information in
our data base. Also, the next directory will incorporate
ring binder holes to accommodate future addendums.

Many of the current and anticipated changes are the result
of recommendations you submitted. We encourage further sug-
gestions and therefore have provided a form to facilitate
their submission. Furthermore, if you know of any individuals
who would be interested in being listed in the next directory,
please provide their names and addresses so that we may send
them an invitation.

Single copies of the 1977 directory and the addendum
may be obtained by writing to any one of the three editors.

NAME/TITLE ORG/PHONE	ADDRESS	AREA OF EXPERTISE	OCCUPATION
ALDRICH, RICHARD J. DEPUTY DIR. COOP. RESEARCH SCIENCE & EDUCATION ADMINISTRATION 202-447-4423	US DEPT AGRICULTURE WASHINGTON DC 20250	706	306
ANGELEVICZ, JACOB FUNDACAO GETULIO VARGAS 011-670436	AV. ANGELICA, 696 AP. 31 SAO PAULO 01228 BRAZIL	387 348	712
ANDERSON, BRUCE N. PRESIDENT TOTAL ENVIRONMENTAL ACTION INC. 603-827-3361	CHURCH HILL HARRISVILLE NH 03450	733 751 662	435
ANTIN, IRVING DIRECTOR OFC OF RES SUPPORT MARQUETTE UNIVERSITY 414-224-7200	1217 W. WISCONSIN AVE. MILWAUKEE WI 53233	499	000
AYALA, HECTOR PROFESSOR, RESEARCHER UNIVERSIDAD DE LOS ANDES 2824066150	CARRERA 1E 8A 10 P.O. BOX 4976 BOGOTA COLOMBIA	712 706 865	474
BECKER, FABIO SUPERINTENDENT SPL SERVICOS DE PLANEJAMENTO SA 2553011	RVA BARATA RIBEIRO 38380 RIO DE JANEIRO BRAZIL	799	348
BEETH, GUNNAR PRESIDENT IMACONSULT S.A. 3226739932	AV D ITALIE 43 BTE 26 BRUSSELS B 1050 BELGIUM	899	348
BELLICHA, TERRY NATL CLEARINGHOUSE FOR ALCOHOL INFO 301-948-4450	P.O. BOX 2345 ROCKVILLE MD 20850	844	499
BENOIX, DR. SELINA ENVIRONMENTAL REVIEW OFFICER CITY & CO OF SAN FRANCISCO 415-558-3056	DEPT. OF CITY PLANNING 100 LARKIN STREET SAN FRANCISCO CA 94102	751 769 844	000
BIGGY, M. VIRGINIA PRESIDENT DESIGNS FOR EDUCATION 617-369-7555	162 PARKLANE CONCORD MA 01742	712 742 371	306
BIRNBAUM, ABRAHAM H. NAVAL AIR DEV. CENTER 215-441-3167	JACKSONVILLE ST. WARMINSTER PA 18974		000
BORNMAN, DONALD R. PRODUCT DEVELOPMENT MANAGER PROCTER AND GAMBLE COMPANY 513-674-8730	17 TWIN LAKES DR. FAIRFIELD OH 45014	793 862	393
BROWN, ELWOOD B. DIRECTOR SYSTEM DEVELOPMENT REXNORD INC 414-643-2708	P.O. 2022 5101 WEST BELOIT RD MILWAUKEE WI 53201	871 799	393
CALL, DOUGLAS W. AEROSPACE PHYSIOLOGIST NATIONAL PARACHUTE TEST RANGE 714-353-2354	BIOMEDICAL DEPT. EL CENTRO CA 92243	844	462
CARVAJAL, JOSEPH J. FEDERAL ENERGY ADMINISTRATION 202-566-9492	RM 6532, FED. BLDG. WASHINGTON DC 20461	703 769	405
CHANDLER, GEORGE P., JR. CHIEF SCI & TECH INFO OFF NASA HEADQUARTERS 202-755-3548	CODE NST ID WASHINGTON DC 20546	745 748 784	405
DAVILA CARLOS ASSOCIATE PROFESSOR UNIVERSIDAD DE LOS ANDES	P.O. BOX 4976 BOGOTA COLOMBIA	862	474
DENNIS, BERNARD R. PROJECT LEADER TECH TRANSFER US FISH & WILDLIFE SERVICE 202-634-4910	US DEPT OF THE INTERIOR FISH & WILDLIFE SERVICE WASHINGTON DC 20240		000
DEUTSCH, WARREN A. SCIENCE ADVISOR CITY OF SANTA CLARA 408-984-3165	1500 WARBURTON AVE. SANTA CLARA CA 94303	862 794	393
DIXON, THOMAS F. PRESIDENT TELEDYNE MCCORMICK SELPH 408-659-3516	CARMEL VALLEY CA 93924	784	306
DORDICK, HERBERT S. ASSOC. DIRECTOR ANNENBERG SCHOOL OF COMM. USC 213-741-2253	CENTER FOR COMM. POLICY RES. UNIVERSITY PARK LOS ANGELES CA 90007	742 745 748	387
DUCHACEK, HOWARD PROFESSOR OF MECH ENGRG UNIVERSITY OF VERMONT 802-862-1015	88 SARATOGA AVE. BURLINGTON VT 05401	387 468 369	393
ERLHART, RUSSELL C. SECTION SUPERVISOR JOHNS HOPKINS APPLIED PHYSICS LAB 301-953-7100 X3927	JOHNS HOPKINS APL JOHNS HOPKINS ROAD LAUREL MD 20810	748 862 889	393
FIMUTIS, EDWARD C. RESEARCH GROUP LEADER MONSANTO RESEARCH CORP. 513-268-3411 X337	BOX 8 STATION B DAYTON OH 45407	748 862 793	468
ENG, DR. RALPH L. NEWFOUNDLAND & LABRADOR CORP. LTD. 709-753-3560	P.O. BOX 1738 SAINT JOHN NEWFOUNDLAND CANADA	733 769 838	393

NAME/TITLE ORG/PHONE	ADDRESS	AREA OF EXPERTISE	OCCUPATION
FLAHERTY, DAVID C. INTER WRITER MULTIMEDIA SPEC US FISH AND WILDLIFE SERVICE WELUT 303-493-4275	206 FEDERAL BUILDING 301 S. HOWES FORT COLLINS CO 80521	712 736 739	378
FROST, PAUL O. SR TECHNICAL ADVISOR BATTELLE COLUMBUS DIVISION 614-263-3762	175 WEBSTER PARK AVENUE COLUMBUS OH 43214		393
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GERMANN, RICHARD P. PRESIDENT GERMANN INTERNATIONAL LTD. 419-626-5600	2719 MULBERRY DRIVE SANDUSKY OH 44870	793 862	348
GLANTZ, LESTER M. MEDICAL PRODUCTS INSTITUTE 2047834139	1000 NORTRE DAME AVENUE WINNIPEG R3FON3 MANITOBA, CANADA	844 862 899	354
GOEDEKE, A. DONALD DIRECTOR USER AFFAIRS NASA 202-755-0546	CODE EK 3 600 INDEPENDENCE AVE. WASHINGTON DC 20546	769 405	000
GUSS, LEONARD M. PRESIDENT LEONARD GUSS ASSOCIATES INC. 206-759-3507	4341 RUSTON WAY TACOMA WA 98402	862 557	000
HACKAMACK, LAWRENCE C. PARTNER COMPUTERIZED MACH REPLACEMENT SER 815-756-7279	205 JOANNE LANE DEKALB IA 60115	899	348
HALTERMAN, JERRY J. DIRECTOR AGL. TECHNICAL INSTITUTE 216-264-3911	SR 250 WOOSTER OH 44691	706 306 387	600
HANNAH, ROBERT P. OFF SCI, TECH & ENVIR POLICY 504-389-2849	NASA NSTL BUILDING 1100 BAY ST LOUIS MO 39529	899	499
HANSEN, CHARLES E. DIR ECON & TECHNOLOGY DEV INTERNATIONAL BUSINESS SERVICES 202-626-1470 X44	1010 VERMONT NW SUITE 1010 WASHINGTON DC 20005	706 733 871	372
HANSON, AUSTIN M. MGR. OF INTELLECTUAL PROP. GRAIN PROCESSING CORP. 319-264-4387	1600 OREGON ST. MUSCATINE IA 52761		802
HEDBERG, BERTIL DIRECTOR OF LICENSING KEMANOBEL 08-449040	P.O. BOX 11065 STOCKHOLM 10061 SWEDEN	796	357
HEINZ, WINFIELD B. PRESIDENT TECHNOLOGY TRANSFER ACTION, INC. 213-820-6111	SUITE 202 922 S. BARRINGTON AVE. LOS ANGELES CA 90049	799 853	354
HILL, TOMMY F. OFFICE SCI, TECH AND ENVIR POLICY 601-688-3008	44075 CAPITOL STATION BATON ROUGE LA 70804	718 769 862	405
HILMON, J. B. STATION DIRECTOR US FOREST SERVICE SE FOR EXP ST	P.O. BOX 2570 ASHEVILLE NC 28802	766 769 862	306
HOSMER, BRUCE E. CHEMICAL DIV PATENT COUNSEL GULF WESTERN INVEN DEVELOP CORP 212-333-4932	GULF WESTERN PLAZA NEW YORK NY 10023		321
HUGHES, THOMAS W. RESEARCH GROUP LEADER MONSANTO RESEARCH CORPORATION 513-268-3411 X215	STATION B BOX 8 DAYTON OH 45407	793 862	393
HUMPHRIES, GEORGE E. MANAGING DIRECTOR ADVANCED TECH. MGT. ASSOCIATES 202-546-9659	716 FOURTH STREET S.E. WASHINGTON DC 20003	862 721 899	435
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JAMES, MRS. APRIL L. LIBRARIAN RESEARCH PRODUCTIVITY COUNCIL 5064558994 X255	BOX 6000 FREDERICTON NEW BRUNSWICK CANADA	862	423
JARAMILLO, LUIS JAVIER HEAD TECHNOLOGY DIVISION COLCIENCIAS 2551967	TRANSVERSAL 9A 13328 APARTADO AEREO 29828 BOGOTA COLOMBIA	769 862	381
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JENNINGS, LEE W. DIRECTOR OFF SCI, TECH & ENVIR POL 504-389-2849	44095 CAPITOL STATION BATON ROUGE LA 70804	769	336

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NAME/TITLE ORG/PHONE	ADDRESS	AREA OF EXPERTISE	OCCUPATION
JUDET, PIERRE MAITRE ASSISTANT I.REP 76 548178 E495	BP 47 CENTRE DE T21 38040 GRENOBLE CEDEX GRENOBLE FRANCE	862	000
KERSE, DR. AHMET ATTORNEY AVUKAT	NECATIBEY CAD 20 19 ANKARA TURKEY	793	321
KINDEL, STEPHEN NEWSWEEK, INC. 212-350-2773	444 MADISON AVE. NEW YORK NY 10022	739	378
LACASSE, JOHN A. MEDICAL CARE DEVEL. INC. 207-622-7566	295 WATER STREET AUGUSTA ME 04330	748 844 862	393
LATHROP, DOUGLASS S. VICE PRESIDENT MANALYTICS INC. 415-788-4143	625 THIRD ST. SAN FRANCISCO CA 94107	862 836	357
LEVAND, DR. OSCAR ASSISTANT PROFESSOR UNIVERSITY OF GUAM	BOX EK AGANA 96910 GUAM	712	468
LIOR, NOAM ASST PROFESSOR MECH ENGRG UNIVERSITY OF PENNSYLVANIA MECH ENG 215-243-4833	DEPT MEAM 111 TB D3 PHILADELPHIA PA 19104	712 862 721	387
MACIULA, L. A. ASSOCIATE DIRECTOR OKLAHOMA STATE UNIVERSITY 405-624-6049	CENTER FOR LOCAL GOV TECH 318 ENGINEERING N. OSU STILLWATER OK 74074	733	381
MALLICK, SUBHASH K. PRESIDENT WORLD KNOWLEDGE BANK 415-349-6293	626 TWENTYSIXTH AVENUE SAN MATEO CA 94403	712	462
MARTINEZ, VICTOR DIRECTOR SERVICIO INFORMACION TECNICA 307628 E341288	P.O. BOX 5833 GUAYAQUIL ECUADOR		348
MCLINDEN, JAMES E. VICE PRES TECHNICAL DIRECTOR CHASE MANHATTAN BANK 212-552-3783	1 CHASE MANHATTAN PLAZA NEW YORK NY 10015	745 748 754	393
MENDELL, JAY S. INTERNATIONAL TECHNOLOGY BANK 305-595-7365	9141 SW 85 ST MIAMI FL 33173		000
MOHAN, RADHE DIRECTOR MODCS MEMORIAL HOSPITAL	1275 YORK AVE NEW YORK NY 10021	748 844	468
MOLANDER, BLAIR L. PROJECT MANAGER TISC LOS ANGELES AREA CHAMBER OF COMM. 213-629-0704	404 BIXEL STREET LOS ANGELES CA 90017	784 814	348
MOYER, ELMO E. CONSULTING ENGINEER (RET) E2M ENGINEERING SERVICES	7 FENLON STREET WEST SARATOGA SPRINGS NY 12866	393 387	348
NEES, MONICA R. DIR. CHEM-BIOMED. SERVICES NC SCIENCE AND TECH RESEARCH CEN 919-549-0671 X273	P.O. BOX 12235 RES TRIANGLE PK NC 27709	765 899	468
NELSON, STEPHEN D. PH.D. ADMIN OFFICER POLICY STUDIES AMERICAN PSYCHOLOGICAL ASSOCIATION 202-833-7650	1200 17TH ST NW WASHINGTON DC 20036	721 862	474
NESS, ROBERT L. INSTITUTE FOR ALTERNATIVE FUTURES 206-422-5400	P.O. BOX 81 MT VERNON WA 98273	709 712 853	499
NISENOFF, NORMAN VP & TECH DIR-TELECOM/COMP FORECASTING INTERNATIONAL LTD 703-527-1311	1001 N HIGHLAND ST ARLINGTON VA 22201		393
NOONE, THOMAS M. ASSOCIATE, PATENT PROGRAM RESEARCH CORPORATION 212-986-6622	405 LEXINGTON AVE. NEW YORK NY 10017	787 793 820	348
ODENDAAL, PIETER E. SENIOR ADVISOR WATER RESEARCH COMMISSION 012485461	P.O. BOX 824 PRETORIA 0001 SOUTH AFRICA	468	862
OLLILA, RICHARD G. PRINCIPAL RESEARCH SCIENTIST BATTELLE COLUMBUS LABORATORIES 614-424-7036	DEFENSE SYSTEMS & TECHNOLOGY 505 KING AVENUE COLUMBUS OH 43201	862	393
ONEILL, JAMES P. CONSULTANT ROHM & HAAS COMPANY	INDEPENDENCE MALL WEST PHILADELPHIA PA 19105	712 793 727	474
OWENS, JAMES M. DIRECTOR OFF OF BASIC INDUSTRIES, BDBD, ITA 202-377-5221	US DEPARTMENT OF COMMERCE ROOM 2137 WASHINGTON DC 20230	769	405
PARK, JACK PRESIDENT HELION INC. 916-752-478	BOX 445 BROWNSVILLE CA 95919	799 862	348

NAME/TITLE ORG./PHONE	ADDRESS	AREA OF EXPERTISE	OCCUPATION
PASTOR, GEORGE J. ASSOC.ADMINISTR.FOR TECHNOL. US DEPT. OF TRANSPORTATION UMTA 202-426-4052	2100 2ND ST NW RM 6200 WASHINGTON DC 20590	769 862 877	393
PERRIN JACQUES IREP CRIO UNIVERSITE II GRENOBLE 862 4710/1301	BP 47 CENTRE OETRI 38 OLD GRENOBLE GRENOBLE FRANCE	474 348	333
PHILLIPS, MICHAEL J. PH.D. FOOD MARKETING SPECIALIST US CONGRESS OFFICE OF TECH ASSESSM 202-225-5021	WASHINGTON DC 20510	706 802 865	474
PICKARD, WILLIAM F. OWNER OPERATOR MCDONALDS HAMBURGER 313-336-8126	16051 KNOLLWOOD DRIVE DEARBORN MI 48120	865	435
PILNICK, CARL PRESIDENT TELECOMMUNICATIONS MANAGEMENT CORP 213-653-0810	6380 WILSHIRE BLVD 808 LOS ANGELES CA 90048	742 745 748	348
QURESHI, M. A. SCIENTIST COUNCIL SCIENTIFIC & INDUSTRIAL RES	CEN STUDY SCI, TECH, DEVELOP CSIR COMPLEX AT NPL NEW DELHI 110012 INDIA	474	862
RAGAN, RALPH R. HEAD PLANNING OFFICE CHARLES STARK DRAPER LABORATORY 617-258-1307	555 TECHNOLOGY SQUARE RM 8104 MAIL STA 70 CAMBRIDGE MA 02139	862	393
RIDER, BRENT T. PRESIDENT UNION VENTURE CORPORATION 213-627-5797	445 SOUTH FIGUEROA ST LOS ANGELES CA 91011	760 748 745	402
RIFAS, BERTRAM E. VICE PRESIDENT MANALYTICS, INC. 415-788-4143	625 THIRD STREET SAN FRANCISCO CA 94107	877 883 836	348
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