Key inventory control system: A team project

Robin Marie FauntLeroy

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Key Inventory Control System
A Team Project

by
Robin Marie FauntLeroy
B. S., Humboldt State College, 1978

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As a computer scientist moves from a school environment to a work environment, a difference in the size of and approach to solving programming needs will be observed. As the size of a program grows, it becomes increasingly difficult for one person to comprehend the whole picture. Many companies are turning to a group or team approach to solve these types of problems. To gain experience in solving a problem with a team approach, this programming project was done with a strict division of the system into two subsystems, and an exchange of tasks throughout.

The Key Inventory Control System was a program requested by the University of Montana Physical Plant. It was felt that computerization would improve the key inventory control situation. The system subdivided nicely into two subsystems. The front office system maintained records of all persons possessing a given key, the deposits received, keys issued to an individual and deposit refunds. The locksmith system was responsible for maintaining records of key numbers currently in use, those available for use, those retired, and the length of retirement.

The Waterfall Method of designing software systems was used. This method partitions the problem into phases, each having a deliverable and a verification or validation process. As each phase of the project was completed, the documentation was exchanged and each individual on the project then continued the next phase by working with the team member's documentation on the other subsystem.

Although this method of approaching a programming problem is more time consuming, the end product was more thoroughly tested, was more bug-free, and was better documented than other projects that the author has been involved with.
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Introduction

Purpose

As we progress from the academic environment to the work environment, we will notice and must adapt to the differences that we encounter. The academic process of educating oneself in the field of Computer Science often is limited to the confines of the scholastic world. Familiarity with 'real-world' situations is a great asset to students graduating and moving into the work environment.

The purpose of this thesis, was two-fold. One purpose was to establish and verify that knowledge of the principles taught during the graduate level of study had been learned, and more importantly, could be applied. A second purpose was to choose a substantial programming project that was as close to a real world situation as was possible. Although the scope of this project was necessarily limited, due to time and manpower constraints, it was felt that this project was valuable in meeting this criteria as a close approximation of a real-world situation where the end product must meet the needs of the user.
Justification

The rationale in choosing this project and structuring it as a team effort was based upon meeting the following criteria:

1. It would provide graduate students with an opportunity to work on a team project defined by an outside group. This will generally be the method of producing a system in future career situations.

2. It would allow for rigorous and impartial testing, as functions, procedures, subsystems, etc. could be tested by the other member of the team, who would not be personally 'attached' to the code. This will provide for a more reliable and bug-free program for the Physical Plant. Because this system will provide for the security of the entire University, its correct operation is essential.

3. It would provide a cross-check on validation of the stages involved with the life-cycle of the system to ensure the writing of the 'right' program. In other words, it will establish that the program will perform according to the specifications set down in the requirements document.

4. It would provide for a cross-check on verifi-
cation of the stages involved with the life-cycle of the system to ensure that the program is written correctly, so that all functions operate as intended in the design document, and that there are no unintentional side effects.

5. It would provide assurance of program sufficiency for the user. Because cross-checks can be performed at various points within the life-cycle of the project, precision, depth of work and detail in each phase can be expected, leading to better assurance of user satisfaction with the system. Furthermore, complete, detailed and correct documentation will be a result of periodic review by someone besides the author of the documentation. Finally, a more rigorous approach to the life-cycle will produce a product which is easily maintainable in the future.

6. Specific division of labor. The structure of the problem is such that there are two major areas to be addressed. These are the locksmith functions and the record-keeping, or front office procedures. With this dichotomy, each team member may work on a discrete portion of the project in the development phase with the added advantage of cross-checking at validation and
verification checkpoints.

Purpose

We expected that a project structured as a team effort would consume more time than one done individually, or as a group effort. Not only are the lines of communication increased, but additional time must be spent in acquainting oneself with the author's intentions within the current working document. However, it is also expected that a more thorough, well designed, and well documented program would be the result of the interaction. Another result of the team effort would be a greater awareness of the problems, inconsistencies, and areas that were overlooked, as questions were posed from one team member to another.
Method

Problem Description

A brief description will be given here to aid the reader in understanding the problem as it existed, and the proposed areas of solution. For further descriptions, the reader is referred to the Appendixes. Appendix A contains a copy of the proposal submitted to the Physical Plant, which describes in detail the current manual system. Appendix C, the Requirements and Specification Document presents a thorough description of the proposed project and the areas of automation.

Current Procedures

There are two major divisions within the current key inventory control system. The first is the actual locksmith operation, in which not only are keys made, but records are kept of which keys open which locks. The locksmith must maintain records of key numbers currently in use, those available for use, those retired, and the length of retirement. Furthermore, an inventory must be maintained of key blanks and other lock components. Presently, the locksmith is notified as particular keys are disbursed and supplies are
depleted, thereby necessitating their duplication.

The second major portion of the key inventory system is key issue control. Records must be kept of all persons possessing a given key, the deposits received, keys issued to an individual, keys returned by an individual and deposit refunds. Although the procedure for this is relatively straightforward, the amount of information that must be processed is quite extensive. Accuracy is essential for university security. The only account of key distribution is maintained by this office.

Recently, an unofficial audit was performed by State of Montana auditors on the key inventory control system, which suggested improvements might be in order. Because of the large number of keys involved, it has become extremely difficult and tedious to perform manual searches of records for desired information. Furthermore, much valuable employee time is consumed in this process. With the amount of transactions performed daily in the office, the possibility of an error exists. In addition, prompt service is often requested and may not be possible due to the current manual system.
Proposed Key Inventory Control System

The following subsystems are components of the key inventory system, listed in order of decreasing importance.

1. The database would include files containing information on what keys an individual had been issued, which individual had a particular key, which keys open what doors, what keys belong to a building, and how long a key has been out.

2. Deposit accounting would trace the deposits entering the system and the refund of deposits after the return of a key.

3. The proposed system would interface with current administrative programs. An interface with personnel and registration is possible to allow for tracking of keys when an employee, staff, student, or instructor, with a key leaves the university. Furthermore, this interface will provide additional information to the Physical Plant which is not currently available. Cross-referencing of social security numbers stored in these files will enable the Physical Plant to maintain databases of a smaller size.
4. Information security, would provide for restricted access to the key inventory system. Accessibility of information within different parts of the system would be limited.

5. Correspondence generation, to provide for an automatic generation of form letters requesting the return of keys prior to graduation, or termination, etc.

6. Report generation, to provide for an automatic generation of reports which include such information as a list of all the keys individuals have issued to them, a list of what keys open which doors, or a list of all retired keys.

7. Key inventory control system, to provide instantaneous information regarding the number of any one key available to be issued, the number of individual keys, and the number of duplications to be made.

8. Bit pattern generation of numbers available to use for rekeying a lock, providing a number for the lock which would be compatible with the master keys opening the lock in question. This generation of numbers would also take into account any numbers which
are on the retired list, and requirements concerning bit cuts.

9. A rekey history would provide a means for tracing the history of a lock which was rekeyed.

10. A parts inventory control, which would maintain a count of all key blanks for each keyway. Yearly, an inventory re-order list would be generated.

Dual Authorship

As was previously mentioned, one of the requirements of a project to be considered as a candidate for a thesis was that it needed to be as close an approximation of a 'real world' system as possible and a system that would be used within the operation of an organization. In the work environment, it is clear that it is very probable that most projects to be undertaken are of a magnitude greater than the capacity of one individual to undertake. It is also possible that due to the structure of the organization where one becomes employed, an individual may not have the opportunity to follow one project completely from initiation to completion.
Therefore, quite a useful experience to undergo would be a team project where there is strict delineation of tasks. Each individual would be responsible for specific individual tasks corresponding to separate phases throughout the software life-cycle. It was believed that this project would be an appropriate one for this type of a study consisting of two individuals. The persons involved were myself and Michele Miley, co-author of the system.

Exchange of Tasks

The project lent itself readily to the exchange and delineation of tasks. The methodology employed to generate the entire system is the Waterfall Method, put forth by B. Boehm in "Software Engineering Economics". The reader is referred to his book for a more detailed discussion of this method. This is a well thought-of methodology consisting of specific steps, each step having an end product, or deliverable, and a verification or validation process. A copy of each deliverable for each phase has been attached to this document and the reader is referred to the Appendix for further reading. The following steps comprise the Software Life Cycle Waterfall Method through the implementation phase.
1. Feasibility - defining a preferred concept for the software product, and determining its feasibility and superiority to alternative concepts.

2. Requirements - a complete validated specification of the required functions, interfaces, and performance for the software product.

3. Product Design - a complete verified specification of the overall hardware-software architecture, control structure, and data structures for the product, with draft user's manuals and test plans.

4. Detailed Design - a complete verified specification of the control structure, data structures, interface relations, algorithms, etc., of each program component.

5. Coding - a complete, verified set of program components.

6. Integration - a properly functioning software product composed of the software components.
7. Implementation—a fully functioning operational hardware-software system, including such objectives as program and data conversion, installation, and training.

The only change made to this process was to combine the high-level product design and the low-level detailed design phase into one deliverable. This change was considered appropriate because the system under construction was not large enough to warrant two levels of design. It was felt that this would be an unnecessary duplication of effort.

The chart presented below shows the various steps of the Waterfall method and who was responsible for specific tasks.

<table>
<thead>
<tr>
<th></th>
<th>Locksmith Function</th>
<th>Front Office Function</th>
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<tbody>
<tr>
<td>Proposal</td>
<td>both</td>
<td>both</td>
</tr>
<tr>
<td>Feasibility</td>
<td>both</td>
<td>both</td>
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<tr>
<td>Requirements</td>
<td>Michele</td>
<td>Robin</td>
</tr>
<tr>
<td>Design</td>
<td>Robin</td>
<td>Michele</td>
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<tr>
<td>Coding (unit testing)</td>
<td>Michele</td>
<td>Robin</td>
</tr>
<tr>
<td>Testing (integration)</td>
<td>Robin</td>
<td>Michele</td>
</tr>
</tbody>
</table>

As can be seen, the purpose of the exchange of tasks was to provide each individual with the opportunity to do specific tasks throughout the life-cycle,
without following the same function in its entirety.

As was mentioned previously, the Key Inventory System divided nicely into two unique subsystems which interfaced only through files. An arbitrary decision was made to determine how the initial assignment was to be made. Following that, a switch on the subsystem was made at each baseline. As the author did the Requirements for the Front Office System, Michele then took those Requirements and generated a Design following the specifications that had been laid down. The author then took her design and coded that portion of the entire system. She then did the final testing on the author's coded modules. Obviously, the opposite situation occurred on the Locksmith portion of the Key Inventory System.

Great care was taken to maintain this separation. No assumptions were made by either of us as to what the author of our current working document intended. All questions and specifically doubts and/or any changes, were thoroughly discussed with the author prior to making any decisions.
Problems Encountered

Not many problems were encountered. Only one problem could be specifically blamed on the methodology, in that the team effort appeared to be more time consuming than an individual or group effort. The other problems encountered were derived from a different source.

There were times when the proposed design was not amenable to the language chosen and changes in process descriptions needed to be made. I believe that more valuable time was spent here than would have been using another methodology. The coder needed to fully understand the intent of the designer prior to restructuring the process to fit the language, or proposing a change to the author. It was also a standard between both of us, that the author should be contacted and the situation fully explained, should any questions arise and prior to making anything more than a minor change in the process descriptions. Had we not split the system into two halves, this would not have occurred.

The completed project follows the structure of the design entirely. Only one change had to be made in the
design during coding and implementation. This problem arose with the proverbial user question "But, can it do this?". To add the requested functions would have required additional modules and a rather convoluted design. A redesign took place, resulting in a simpler, more elegant solution. In all other cases, the design was followed and no problems were encountered in coding from another's design.

The user interface was not dealt with to the extent that it should have been during the Requirements and Specification phase. Once the system was delivered to them, under a trial basis, many items were brought up, necessitating time spent recoding existing modules. The user interface needs to be specified down to the level that will affect the structure of the system. A minor modification to a module is not as time consuming as a re-structuring of the modules within a function. The time spent working with the user at this level is well worth the trade-off in less time spent on re-structuring the delivered system. Although some of the detailed lower level interface specifications cannot be extracted from the user until they have a trial system available to them, most of these changes require only minor adjustments to the existing code. To attempt to
make these decisions prior to delivering a trial system would require too much time explaining details.

The file interface was not specified as much as it could have been. When interfacing with existing files and/or software, more time should be spent in determining structures and interface parameters. Time was spent in coding modules, only to find out that the structure of the file was not as expected and more time was spent re-coding modules and functions.

The last major problem encountered resulted not from the method used, but from an unexpected source. One of the benefits of the resulting system would be access of the program to existing university files containing information on students and personnel. By accessing these files, the Physical Plant would not only need to store less information in their own data files, but would have access to more information than they currently store in their paper files. However, progress was not as smooth as was expected, and program modules that were expected to work, simply did not. After endless hours of consultation with the Computer Center personnel, the conclusion was finally reached that because the files were stored in a different format from the text files we had been using elsewhere, the commands that were expected to work, did not.
After talking to the Software House responsible for the software package, the conclusion was reached that a bonafide 'bug' had been found. We have written the program under the assumption that the files will be converted to the format where these programming constructs will work properly.

Benefits

Benefits from this project, I believe, were numerous and stemmed not only from the division of labor concept, but also because the system being built dealt with a "real" user and had a great deal of user interface to contend with. I feel that this added complication created a much more viable project. Many of the benefits and added knowledge would not have presented themselves had there not been considerable user interface to be specified individually.

It was good experience to work from someone else's documents, especially the design document. In coding from another design, one can more easily accept the fact that there are many different, but equally as good ways of visualizing a problem and the process necessary to solve it. As one gains more experience in Computer Science, I believe an individual develops their own style. This is only natural, but leads to the feeling
that your way is the only way. By coding from another
design, one gets a greater appreciation for the varia-
tion in solutions to any one problem and a greater
faith in another's ability to solve problems.

By working from someone else's design, I now have
a much better knowledge of how much and how little to
specify in a working design document. Questions that I
would have in coding from another's design would allow
me to reflect on how I had designed my half. There
were instances where I had over-specified, leaving
nothing creative for the coder to do, and other areas
where I had not specified completely enough. I,
specifically, had a tendency to overspecify the actual
pseudo-code, and not be complete enough with the con-
trol flags necessary to indicate paths of execution.

A greater awareness of the need to further specify
the high level user interface was gained. As the time
came to separate and begin the design of the individual
subsystems, using requirements laid out by the other
team member, it became apparent that the high level
interfaces between the two systems needed to be speci-
fied before either one of us could begin to design our
portion. Often the user interface has been ignored
until coding actually begins, but with the division of
tasks as we had, it was quite apparent that the user
interface needed to be looked into much earlier in the life cycle.

Standardization of user interface on this type of project is essential. This is typically not addressed until the user manual is written. However, during integration, we became aware that, although the system ran and integration had been successful, the user interface looked sloppy. Different prompts were being used, and different feedback was being directed at the user. To create a good looking and a properly executing system, these items needed to be addressed before undertaking coding. As it was, several man-days of time were wasted in re-doing the existing code, to standardize the low-level user interfaces.

Lastly, along the same lines, I can see where much more time needs to be spent with the potential users. These users should be the ones who will be actually using the system, not the managers who have requested it. A prototype of the user interface would be nice, although not always practical. However, it is much less practical to deliver a finished system, only to have the user ask "Could it do this?", or "Why doesn't it do this". A lot of time can be spent in fixing little items which will make it much more usable by the
end user, but were not thought of at the time, by the high level manager who only requested the system, or the designer who will not be dealing with it on a daily basis.

Discussion

Throughout the phases of this project, strict adherence was observed to the ground rules set down at the initiation of the project regarding individual tasks. Also, as previously mentioned, all questions were presented to the other team member as they arose and no assumptions were made. An attempt was made to create an atmosphere that was as close to a 'real world' work environment as was possible. Because of this, I believe the project was a success. I do feel that it took a greater amount of time and effort as a team project, than as either an individual effort or a group project. More time must be spend in consultation with the author's of the current working document to fully understand their intentions.

However, I also am firmly convinced that the final product, including all the documentation is more complete, more accurate, and the program more thoroughly tested than would otherwise have been under other circumstances. With the exchange of effort throughout the life cycle phases, no individual was 'attached' to his
code, this tendency as been mentioned and described by Boehn[1], Myers[7], and DeMarco[3]. It became possible to look at the product in a more detached frame of mind and the individual was more open to suggestions. Also, because of this exchange of tasks, there were no assumptions made, and as a question or ambiguity arose, the subject was thoroughly discussed. In this manner, more problems were recognized sooner and a solution arrived at in a timely manner, thereby increasing the validity of the end product. However, I believe that the structure of this project may have enhanced this type of approach. Because the two subsystems interfaced only through files, and not through data, not as much time needed to be spent specifying the interfaces and work was done individually with no need to collaborate.

Because of the use of the Waterfall Method, which divides the process into specific tasks, delineation of individual portions was not difficult. This may not always be possible. Also, as an individual switched back and forth between the Front Office System and the Locksmith System, some knowledge of the entire system was obtained. This may have provided the individual with an advantaged that would not always be present. If
an individual with no prior knowledge of the project, is handed a document to continue work upon, the process may not go as smoothly.

I am of the opinion that this project was as successful as it was, for one other very important reason. In this situation, both individuals were able to choose their team member. This choice was based upon knowledge of the others' computing skills', i.e. an ability to competently design, code and test in whatever language was chosen. Also important was confidence in the other's commitment to a quality project, and their willingness to meet deadlines and do their fair share. Without this knowledge, I don't think the project would have been quite so successful. In a job situation, where group and team members are chosen by the management, problems relating to these types of concerns are unavoidable. However, should an individual be either in job situation where there is an opportunity to choose a team member, or perhaps in a situation where a partnership is being considered to create a privately owned business, these qualities and commitments need to be inherent for an endeavor to succeed.
References


THESIS PROPOSAL:

KEY INVENTORY CONTROL

by

Robin M. Fauntleroy

Michele Miley

April 4, 1985
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Introduction

Prior to the commencement of effort involved with a major undertaking such as a thesis project, clarification of the problem is attained through the written proposal. The purpose of this document is, therefore, to provide a general understanding of the problem as it exists, an overview of the scope of possible solutions, and a rationale for resolution. This proposal is prepared as a preliminary step toward the completion of a master's thesis project for the Department of Computer Science within the University of Montana.

The project under consideration has been requested by the University of Montana Physical Plant, the department responsible for campus security and maintenance. The need for an improved key inventory control system is recognized as a priority within the Physical Plant and by the State of Montana auditors. It was suggested that
computerization would meet this need.

Current System Description

There are two major divisions within the current key inventory control system. The first is the actual locksmith operation, in which not only are keys made, but records are kept of which keys open which locks. There are approximately 7000 locks on campus, including both door locks and padlocks. All types of locks are referred to as cylinders. Keys are sorted into four levels. The lowest level of key is a change key (CK) which will open at most only a few doors. The next level is the master key (M) which opens several doors. There are various kinds of master keys, such as those issued for faculty, staff, or departmental specialty. Above the master key is the grand master (GM) which may open all locks in an entire building and is issued for the most part to custodial staff. The highest level is the great grand master (GG). This key is not an issue
key, and is distributed exclusively to maintenance and security personnel. It has the capability of opening all cylinders in several buildings. Currently, there are 18 of these, but it is hoped that the number be reduced to 8 to 10 in the future.

Each key has two numbers on it, the first corresponding to the keyway, and the second reflecting the cut or bit numbers. The keyway refers to the slots on the side of the key, whereas the bit numbers refer to the actual cylinder arrangements of the lock which the key is cut for. The keyway prefix is given with each key blank, whereas the bit number is not stamped until the bit cut has been made. There are six points to each key where a bit cut may be made. On at least one cut per key, there must be a minimum of two bits difference from any other key. When a lock is rekeyed, the old key is retired for one year, prior to reuse.
The locksmith must maintain records of key numbers currently in use, those available for use, those retired, and the length of retirement. Furthermore, an inventory must be maintained of key blanks and other lock components. Presently, the locksmith is notified as particular keys are disbursed and supplies are depleted, thereby necessitating their duplication.

The second major portion of the key inventory system is key issue control. Records must be kept of all persons possessing a given key, the deposits received, keys issued to an individual, keys returned by an individual and deposit refunds. Although the procedure for this is relatively straightforward, the amount of information that must be processed is quite extensive. Accuracy is essential for university security. The only account of key distribution is maintained by this office.
Problems With The Current System

Recently, an unofficial audit was performed by State of Montana auditors on the key inventory control system, which suggested improvements might be in order. Because of the large number of keys involved, it has become extremely difficult and tedious to perform manual searches of records for desired information. Furthermore, much valuable employee time is consumed in this process. With the amount of transactions performed daily in the office, the possibility of an error exists. In addition, prompt service is often requested and may not be possible due to the current manual system.

Two factors contribute to the cost of the current system. One previously discussed, is that of employee time spent manually searching records. The second is the cost incurred when a key is not recovered. The cost of rekeying a building due to the loss of a grand master may easily approach
$20,000. Should a great grand master be lost, the cost would be phenomenal. With current procedures, recovery of keys is not always possible as people leave the university system.

Proposed Areas of Solution

It is proposed that a computerized system would address the following areas:

1. A key inventory control system, to provide instantaneous information regarding the number of any one key available to be issued, the number of those keys already issued, a threshold number for ordering the duplication of individual keys, and the number of duplications to be made.

2. A parts inventory control, which would maintain a count of all key blanks for each key-way. Yearly, an inventory re-order list would be generated. In addition, a count of lock components would also be maintained.
3. Bit pattern generation, of numbers available to use for any one lock, providing a number for the lock which would be compatible with the master keys opening the lock in question. This generation of numbers would also take into account any numbers which are on the retired list, and requirements concerning bit cuts.

4. A rekey history would provide a means for tracing the history of a lock which was rekeyed.

5. Database information would include files containing information on what keys an individual is issued, which individuals had a particular key, what keys open what doors, what keys belong to a building, what keys (or doors) a master key would open, and how long a key has been out.

6. Deposit accounting would trace the deposits entering the system and the refund of deposits after the return of a key.
7. Expenditure accounting would provide the department with a trace of expenditures on inventory and other aspects of the system.

8. Interface with current administrative programs. An interface with payroll is possible to allow for tracking of keys when an employee, staff or instructor, with a key leaves the university. Furthermore, an interface with the registrars office would provide lists of those persons graduating, to cross-reference with outstanding keys.

9. Correspondence generation, to provide for an automatic generation of form letters requesting the return of keys prior to graduation, or summer break, etc.

10. Information security, providing for restricted access to the key inventory system. Accessibility of information within different parts of the system would be limited.
Justification

Due to the nature of this project, involving the security of the university, a complete and thorough job of the entire life cycle is indicated. The size of the project, items requested, and the expectation of a system that is operational, thoroughly tested, and complete with detailed documentation and a user's manual indicate that the project could be allocated to two people.

The following reasons are presented for working on this project as a team:

1. A well written, documented system meeting the needs and requirements of the Physical Plant, as has been requested, would enhance relations between the computer science department and other departments involved.

2. Provides graduate students an opportunity to work on a team project, defined by an outside
group. This will generally be the method of producing a system in future career situations.

3. Provides for rigorous and impartial testing, as functions, procedures, subsystems, etc. can be tested by the other member of the team, who is not personally 'attached' to the code. This will provide for a more reliable and bug-free program for the Physical Plant. Because this system will provide for the security of the entire University, its correct operation is essential.

4. Provides a cross-check on validation of the stages involved with the life-cycle of the system to ensure the writing of the 'right' program.

5. Cross-check on verification of the stages involved with the life-cycle of the system to ensure writing the program correctly.

6. Assurance of program sufficiency for the user. Because cross-checks can be performed at
various points within the life-cycle of the project, precision and depth of work in each phase can be expected, leading to better assurance of user satisfaction with the system. Furthermore, complete, detailed and correct documentation will be a result of periodic review by someone besides the author of the documentation. Finally, the more rigorous approach to the life-cycle will produce a product which is easily maintainable in the future.

7. Required effort estimation. There are ten proposed areas of solution to the problem, and each represents a separate program. At an average of 500 lines per program, this produces an overall estimate of 5,000 lines of code at completion. Using formulas as discussed in the COCOMO model of estimation, this yields 13 man-months of work, with a time for development of 6.6 months, and an average of 2 full time persons working on the project. The formulas are as follows:
8. Specific division of labor. The structure of the problem is such that there are two major areas to be addressed. These are the locksmith function areas and the record-keeping, or front office procedures. With this dichotomy, each team member may work on a discrete portion of the project in the development phase with the added advantage of cross-checking at validation and verification checkpoints.
Conclusion

In conclusion, several major points stand out from the foregoing discussion as being particularly important in the proposed project. First of all is the critical nature of the problem. Since campus security depends upon the correct and complete resolution of the problem, care must be taken to provide appropriate and thorough solutions. This can be provided via a joint effort and system of cross-checks throughout the development of the system. Second, as demonstrated by the COCOMO model of estimation, the amount of labor required is sufficient to justify the work contribution of two persons. And finally, a commitment to complete the project and produce a fully documented and tested system to be used by the Physical Plant by August, 1985, requires that enough manpower be provided to ensure successful conclusion of the project.
FEASIBILITY STUDY:

KEY INVENTORY CONTROL

by

Michele Miley

Robin Fauntleroy

April 29, 1985
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Introduction

Some purposes for the completion of a feasibility study are to determine whether there is a new way of doing business that justifies the expense of a project, and to document the parameters that would govern such a project. The development of the feasibility document also benefits the user in that it will determine if the system specified can be implemented within given constraints, assures that the project the user wants will be developed within the forementioned constraints, and assures that the user and developer have the same time and cost expectations. Furthermore, it will determine if time, money and other resources are adequately available to complete a given project and provide a milestone from which the next phase of the software life cycle may proceed. Finally, some of the purposes are to determine whether the objectives stated in the proposal are attainable, and if not, what constraints must be removed, to define the major problems existing so that the systems analyst can plan his strategy for the full investigation, to define the areas where potential
exists for making savings of money time or effort, and to decide if specialists will be needed to render assistance in the full investigation.

In summary, the feasibility study is an integral part of the production of a viable software product. If researched thoroughly, the conclusions reached will serve as a framework for future stages in system development.

A proposal was submitted, April 4, 1985, to involved parties, outlining the keys inventory control project under consideration. This document is a feasibility study of that system containing possible alternative solutions, evaluation of those alternatives, and recommendations.

Management Summary and Recommendations

Based on the following discussion, it is the recommendation of this study that the first alternative discussed, that of implementing the entire system on the DEC 2065 is the most feasible solu-
tion. Although some of the assumptions made concerning the TRS 80 may be realized at a future date, current conditions are such that a decision should not be based on these assumptions. The adoption of this alternative, of course, is contingent upon approval by the Computer Center. Along the same lines, alternative options discussed which involve the purchase of a microcomputer, assume that the purchase could be approved and made in a timely manner. As these conditions cannot be guaranteed, basing a decision on these assumptions would not be warranted.

In summarizing the reasons for recommending this alternative, it has been found that the DEC 2065 provides the most amenable environment for the project development. User access to this system is satisfactory, along with response time, and program interface with administrative systems is feasible. Increased efficiency of key issue control may be realized via this alternative. Furthermore, preliminary estimates of disk space
requirements are in a reasonable range.

Current System Description

Overview

The project under consideration has been requested by the University of Montana Physical Plant, the department responsible for campus security and maintenance. The need for an improved key inventory control system is recognized as a priority within the Physical Plant and by the State of Montana auditors. It was suggested that computerization would meet this need.

There are two major divisions within the current key inventory control system. The first is the actual locksmith operation, in which not only are keys made, but records are kept of which keys open which locks. The locksmith must maintain records of key numbers currently in use, those available for use, those retired, and the length of retirement. Furthermore, an inventory
must be maintained of key blanks and other lock components. Presently, the locksmith is notified as particular keys are disbursed and supplies are depleted, thereby necessitating their duplication.

The second major portion of the key inventory system is key issue control. Records must be kept of all persons possessing a given key, the deposits received, keys issued to an individual, keys returned by an individual and deposit refunds. Although the procedure for this is relatively straightforward, the amount of information that must be processed is quite extensive. Accuracy is essential for university security. The only account of key distribution is maintained by this office.

Recently, an unofficial audit was performed by State of Montana auditors on the key inventory control system, which suggested improvements might be in order. Because of the large number of keys involved, it has become extremely difficult and
tedious to perform manual searches of records for desired information. Furthermore, much valuable employee time is consumed in this process. With the amount of transactions performed daily in the office, the possibility of an error exists. In addition, prompt service is often requested and may not be possible due to the current manual system.

Constraints

The major constraint foreseen for the project concerns available hardware. Currently there are two machines feasible for consideration. These are the DEC 2065 and a TRS 80 previously purchased by the University of Montana Physical Plant. It is possible that a hardware purchase will be made in the future, however, not necessarily in time to host the key inventory system. Included here, is a study of several micro computers on the market today, which could sufficiently contain the key inventory system.
Furthermore, response time to user requests is required within a reasonable amount of time. It must be faster and more efficient than the current manual lookup system. Sufficient storage must be provided to accommodate the amount of data necessary on-line, and off-line storage must be available for audit and security purposes.

Prioritized Subsystems

The following subsystems are components of the key inventory system, as previously listed in the project proposal. They are listed in order of decreasing importance.

1. The database information would include files containing information on what keys an individual is issued, which individual had a particular key, what keys open what doors, what keys belong to a building, what locks (or doors) a master key would open, and how long a key has been out.
2. Deposit accounting would trace the deposits entering the system and the refund of deposits after the return of a key.

3. Interface with current administrative programs. An interface with payroll is possible to allow for tracking of keys when an employee, staff, or instructor, with a key leaves the university. Furthermore, an interface with the registrars office would provide lists of those persons graduating, to cross reference with outstanding keys.

4. Information security, providing for restricted access to the key inventory system. Accessibility of information within different parts of the system would be limited.

5. Correspondence generation, to provide for an automatic generation of form letters requesting the return of keys prior to graduation, or summer break, etc.
6. Key inventory control system, to provide instantaneous information regarding the number of any one key available to be issued, the number of those keys already issued, a threshold number for ordering the duplication of individual keys, and the number of duplications to be made.

7. Bit pattern generation of numbers available to use for any one lock, providing a number for the lock which would be compatible with the master keys opening the lock in questions. This generation of numbers would also take into account any numbers which are on the retire list, and requirements concerning bit cuts.

8. A rekey history would provide a means for tracing the history of a lock which was rekeyed.

9. A parts inventory control, which would maintain a count of all key blanks for each keyway. Yearly, an inventory re-order list would be generated. In addition, account of lock components would also be maintained.
10. Expenditure accounting would provide the department with a trace of expenditures on inventory and other aspects of the system.

Alternative Solutions

The two computers available for use are the DEC 2065 and the TRS 80. The DEC 2065 is operated by the University of Montana Computer Center and is the host machine for many of the campus administrative programs. The computer center provides support services for qualifying programs. The TRS 80 is a micro-computer owned by the Physical Plant. It is currently used by several people in that department, however, investigations are being conducted to determine the feasibility of purchasing another microcomputer.

DEC 2065

The project under study is dependent upon extensive data files to which storage and access is necessary. This aspect of the system indicates
that a database approach is appropriate. While a
database may be constructed in any one of the
languages available on the DEC 2065, the amount of
effort required to produce such a system would be
prohibitive. The DEC 2065 does, however, provide
a database manager, 1022, and its associated pro-
gramming language, PL1022. Furthermore, support
for this language is provided by the Computer
Center and several of the administrative programs
are written in PL1022, making it easier for these
programs to be interfaced with each other. There­
fore, it is recommended that the 1022 system be
used for the current project. The following esti­
mates and figures are based on this assumption.

A preliminary estimate has been made to
determine the amount of space necessary to store
both the proposed program and its files on the DEC
2065. File structures have been drafted to esti­
mate the space requirements, however, this is not
necessarily the final structure of the files. A
more detailed study of the system will be required
to determine the precise layout.

There are six files needed to store the necessary information in an efficient manner. These are the Name File, Key Id File, Master File, Master Key File, Change Key File, and Parts Inventory File. The fields of these files and the space required for each file is listed below.

Name File:

<table>
<thead>
<tr>
<th>Field Type</th>
<th>Type</th>
<th># Bytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Security Number</td>
<td>integer</td>
<td>9</td>
</tr>
<tr>
<td>Name</td>
<td>text</td>
<td>30</td>
</tr>
<tr>
<td>Key Id Number</td>
<td>integer</td>
<td>5</td>
</tr>
<tr>
<td>Date Out</td>
<td>date</td>
<td>8</td>
</tr>
<tr>
<td>Deposit</td>
<td>integer</td>
<td>4</td>
</tr>
</tbody>
</table>

19,872 records X 52 bytes = 1,033,344 bytes

1,033,344 bytes / 2560 bytes/page = 403 pages

Key Id File:

<table>
<thead>
<tr>
<th>Field Type</th>
<th>Type</th>
<th># Bytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key Identification</td>
<td>text</td>
<td>10</td>
</tr>
<tr>
<td>Key Id Number</td>
<td>integer</td>
<td>5</td>
</tr>
</tbody>
</table>

7500 records X 15 bytes = 112,500 bytes

112,500 bytes / 2560 bytes/page = 44 pages
<table>
<thead>
<tr>
<th>Field</th>
<th>Type</th>
<th># Bytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key Id Number</td>
<td>integer</td>
<td>5</td>
</tr>
<tr>
<td>Type</td>
<td>text</td>
<td>1</td>
</tr>
<tr>
<td>Number Out</td>
<td>integer</td>
<td>3</td>
</tr>
<tr>
<td>Total Number</td>
<td>integer</td>
<td>3</td>
</tr>
<tr>
<td>Status</td>
<td>text</td>
<td>1</td>
</tr>
<tr>
<td>Date</td>
<td>date</td>
<td>8</td>
</tr>
</tbody>
</table>

7500 records x 21 bytes = 157,500 bytes

157,500 bytes / 2560 bytes/page = 62 pages

<table>
<thead>
<tr>
<th>Field</th>
<th>Type</th>
<th># Bytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key Id Number</td>
<td>integer</td>
<td>5</td>
</tr>
<tr>
<td>Building</td>
<td>text</td>
<td>3</td>
</tr>
<tr>
<td>Lock/Room</td>
<td>text</td>
<td>4</td>
</tr>
</tbody>
</table>

5000 records x 12 bytes = 60,000 bytes

60,000 bytes / 2560 bytes/page = 25 pages

<table>
<thead>
<tr>
<th>Field</th>
<th>Type</th>
<th># Bytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key Id Number</td>
<td>integer</td>
<td>5</td>
</tr>
<tr>
<td>Building</td>
<td>text</td>
<td>3</td>
</tr>
<tr>
<td>Lock/Room</td>
<td>text</td>
<td>4</td>
</tr>
</tbody>
</table>

7000 records x 12 bytes = 84,000 bytes

84,000 bytes / 2560 bytes/page = 35 pages
Parts Inventory File:  
Field type    # Bytes

Keyway           text    4
Number on Hand   integer  5
Reorder Number   integer  4

30 records X 13 bytes = 390 bytes

390 bytes / 2560 bytes/page = 1 page

In 1022, all fields are stored as text fields, even though treated mathematically as numeric fields. Therefore, space estimates may be determined according to the maximum number of characters a given field will occupy. 2,560 characters may be stored on a disk page. In the format previously listed, the files for the proposed project will require 570 disk pages, while it is estimated that the code itself will need 100 pages. Therefore, the total space required to implement the entire project on the DEC 2065 will be 670 disk pages. Approval of this amount of storage is necessary from the Computer Center, before development can proceed.
Access to the DEC 2065 is possible from the terminals already possessed by the Physical Plant. Furthermore, compatible printers are available in the department. Because of the amount of usage the DEC 2065 is exposed to, a delay in logon access time may occur. Once logged on, however, response time is satisfactory.

An advantage to considering this alternative is that the interface with other administrative programs would be of relative ease. Access to files utilized by other administrative departments would increase the accuracy of information used by the proposed system, by providing missing information. In particular, social security numbers would be accessible, thereby improving the possible return rate of keys. Also, support provided by the Computer Center would allow for future maintenance and enhancements, should these be necessary.
The major disadvantage to utilizing the DEC 2065 is that delays may be unavoidable when logging on. Periodic equipment downtime may occur, however, this is a difficulty encountered with any machine. Of course, maintenance on the DEC 2065 is provided by the Computer Center, whereas, departmentally owned hardware is the responsibility of that department.
VAX 11/785

A second mainframe computer is owned by the University of Montana and maintained by the Computer Center. This is the VAX 11/785. It was recently acquired through student computer fees, and has been installed on the condition that its use will be by students only, and that administrative programs would not be run on it. It is, therefore, not a viable alternative for the current key inventory control system.

TRS 80

As previously mentioned, a 64K TRS 80 micro-computer is located at the Physical Plant. Currently, use of this machine is quite high, however, the possibility exists that a new system will be purchased, thus freeing space on the TRS 80. Database software is available for this system, however, none of these packages are owned by the Physical Plant. The possibility exists for programming a database manager on the TRS 80, but
this is outside of the scope of the current project. Therefore, for this system to be feasible on the TRS 80, the purchase of a database package would be required.

Assuming that access difficulties are resolved, and database software becomes available, consideration of this system as an alternative may be made. A survey of available software reveals that database systems may be purchased with storage capacity from 700 records up to 65,536. These range in price from $200 to $700 and require two to four floppy disk drives, or an external Winchester hard disk drive. There are four floppy disk drives installed on the available TRS 80.

File structure on the TRS 80 would be different from that shown above for the DEC 2065. In this particular configuration, only three files would be necessary, the largest of these containing 19,872 records. The record width would be up to 102 characters wide. Available software will
handle records up to a width of 255 characters.
The following shows the breakdown of these three files.

<table>
<thead>
<tr>
<th>Name File:</th>
<th>Field</th>
<th>Type</th>
<th># Bytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Security #</td>
<td>integer</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>text</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Key Number</td>
<td>integer</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Date Out</td>
<td>date</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Deposit</td>
<td>integer</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Building</td>
<td>text</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Room/Lock</td>
<td>text</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Key Type</td>
<td>text</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

19,872 records X 102 bytes = 2,026,944 bytes

2,026,944 / 184K bytes/disk = 11 floppy disks

<table>
<thead>
<tr>
<th>Master File:</th>
<th>Field</th>
<th>Type</th>
<th># Bytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key Id Number</td>
<td>integer</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>text</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td># Out</td>
<td>integer</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Total #</td>
<td>integer</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Status</td>
<td>text</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>date</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

7500 records X 21 bytes = 157,500 bytes

157,500 / 184K bytes/disk = 1 floppy disk
Parts File:  Field Type   # Bytes

Keyway       text          4
# on Hand    integer        5
Reorder #    integer        4

30 records X 13 bytes = 390 bytes

390 / 184K bytes/disk = 1 floppy disk

From these figures, it can be seen that, although possible, swapping eleven disks to access the information in one file, may get rather tedious. The purchase of a Winchester Hard Disk would alleviate the problem, however, the cost could approach approximately $2,000.

The major advantages of using the TRS 80 are that security of the key inventory system would be enhanced by limited access. Access would be limited only to in-house users, as opposed to use by the entire university community of the DEC 2065.

The major disadvantages are that at present, access is limited because of the heavy use of the system. Furthermore, the prohibitive size of the
files creates a response time difficulty that could not be alleviated without major hardware purchase, even assuming the purchase of database software. Also, there would not be the access of additional information, through other administrative programs.

Combination

The possibility exists of dividing the proposed project between the two previously mentioned computers. The portion of the system that must interface with administrative programs is that of the key issue control, which could be implemented on the DEC 2065, while, the locksmith portion could be developed for the TRS 80. Five files would remain on the DEC 2065, these being the Name File, Key Id File, Master File, Master Key File, and Change Key File. A reduction in the size of the Master File would be realized because two fields would be eliminated. This would result in an overall page reduction from 670 pages to 642.
Two files would be required on the TRS 80, the Master File and the Parts Inventory File. Because it is no longer an integral system, the programs would not interface, therefore duplication of files would be necessary. One disk would be needed for both of the files on the TRS 80, necessitating only two floppy disk as opposed to the original 13 disks.

Assuming that the previously mentioned access problems are resolved, the locksmith may have faster access to his portion of the program on the TRS 80, as opposed to the DEC 2065. However, this also assumes that database software purchases will be approved in a timely manner.

The major disadvantage to this approach is that the key inventory system will be divided into two separate subsystems, necessitating both a duplication of files and information, and a lack of interface between the two systems. In addition, the assumptions of increased access time and
purchase of database software may not be realized.

HP 150

Hewlett Packard has a micro computer which could be purchased to fill the needs of the Physical Plant and the key inventory system. The HP 150 boasts a 15M hard disk with memory boards available for additional storage capacity. The hard disk would fill the needs of the key inventory system, and provide a back up on the floppy disks. The file structure, should this computer be purchased would be identical to the one suggested for the TRS 80. However, as there are up to 710K bytes of storage on a floppy disk, only 4 floppy disks would be needed to store the back up files. The cost of this system would be approximately $6,000 to $7,000. This would include any additional memory boards, the MSDOS operating system, and DBaseII, for the data base manager.

The major advantages of this system, should it be purchased, would be much the same as the TRS
in that the access to the files would be limited to only those individuals needing to use it. Also, as this computer has a much greater memory capacity in its hard disk, floppy disks would only be used for backup. This would alleviate the problem of constantly changing disks. The HP 150 also provides a unique new method of 'program' control in its TOUCHSCREEN option. This allows the novice user to simply point (touch) the screen where the change or option is wanted. This may make it easier for the new and/or novice user to manipulate the programs without having to deal with the sometimes threatening idea of a keyboard.

The major disadvantage of using the HP 150 is that by putting the key inventory system on a micro computer, all interfaces with other administrative programs would be extremely difficult, if not impossible. The additional information gained from these other programs would greatly enhance the Physical Plant's recovery rate of outstanding keys. Furthermore, the system would have
to be purchased, which can be a lengthy process in a state institution such as the University of Montana.

IBM XT

The IBM XT provides an alternative that could also be purchased within the same price range as the HP 150. The basic system with 10 Megabytes of memory on a hard disk would cost approximately $4500. Memory can be added in increments of 256k to 640K. This machine would require a one week order delay. The floppy disk, used by the IBM XT stores from 300K to 350K. Therefore, use of this system would require twice as many floppy disks to store the back up files as the HP 150 did. The purchase of this system, with the data base software, would run $6000 to $7000.

As mentioned above, the major advantage of the micro computer owned and operated by the Physical Plant is that access to the key inventory files could be limited to only those individuals
needing access. The ability to log on to the computer would not be a function of the number of individuals attempting to use the system. Therefore, access to programs could be more timely.

Disadvantages, also, would be seen, in the inability to interface with on-campus programs. Also, as the system would not be on a University Computer, maintenance of the programs and any problems which might arise would need to be resolved by the Physical Plant.
Apple IIe

The Apple IIe microcomputer is also available as an alternative hardware system for the key inventory control program. Its purchase price including database software (either DBaseII or DBMaster) and the DOS 3.3 operating system plus a dual disk drive and hard disk drive is approximately $3500 to $4000. The hard disk drive has 10 Megabytes of storage and each of its floppy disks may hold up to 150K bytes of information.

The advantages of using a microcomputer for the key inventory control system all apply to this alternative as they did to the HP 150 and IBM XT, however, because of the limited storage on the floppy disks for the Apple IIe, back up storage would be more of a problem. It would take twice as many disks to store the back up information on the Apple IIe as the IBM XT, and five times as many as the HP 150. Furthermore, the maintenance and lack of interface disadvantages also apply to this
alternative.

Recommendations and Justification

Based on the foregoing discussion, it is the recommendation of this study that the first alternative discussed, that of implementing the entire system on the DEC 2065 is the most feasible solution. Although some of the assumptions made concerning the TRS 80 may be realized at a future date, current conditions are such that a decision should not be based on these assumptions. The adoption of this alternative, of course, is contingent upon approval by the Computer Center.

Each of the microcomputers available on the market but not currently owned by the Physical Plant are viable alternatives to implementing the entire key inventory control system. However, even at $3500, the systems purchase price may be a difficulty, while the DEC 2065 is available for administrative use free of charge. Also, utilization of any of these alternatives would create
difficulties in interfacing with other University programs and would not be maintainable by the Computer Center.

While any of the microcomputers discussed would be a possible candidate for implementing a portion of the system on them, and the other portion on the DEC 2065, the interface problems still exist, and the disadvantage of needing to purchase the system is also a consideration. Furthermore, the disk space savings realized by moving a portion of the program to another computer is not enough to justify losing the interface between program portions, duplication of file information, and loss of guaranteed program maintenance.

Proposed Schedule of Development

Following is a projected schedule for the completion of the proposed project. These dates are approximate, due to the inexact art of estimation.
4/22/85 - System Feasibility
4/24/85 - Validation
5/6/85 - Software Plans and Requirements
5/8/85 - Validation
6/3/85 - Product Design
6/5/85 - Verification
6/26/85 - Detailed Design
6/28/85 - Verification
7/10/85 - Coding and Unit Testing
7/31/85 - Integration Testing
8/9/85 - Final Implementation and User Manual
REQUIREMENTS AND SPECIFICATION DOCUMENT

for CS 599

by

Robin Fauntleroy

Michele Miley

May 5, 1985
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    IV. Proposed Locksmith Functions and Internal Interfaces .......... 138
Introduction

The software requirements analysis attempts to satisfy the following objectives: (1). provide a foundation for software development by uncovering the flow and structure of information, (2). describe the software by identifying interface details, providing an in-depth description of functions; determining design constraints and defining software validation requirements, and (3) establish and maintain communication with the user and the requester so that the above two objectives may be satisfied. In the context of this document, then, the requirements and specifications of the key inventory control system for the Physical Plant at the University of Montana will be delineated.

There are two major divisions within the current key inventory control system. The first is the actual locksmith operation, in which not only are keys made, but records are kept of which keys open which locks. The locksmith must maintain records of key numbers currently in use, those available for use, those retired, and the
length of retirement. Furthermore, an inventory must be maintained of key blanks and other lock components. Presently, the locksmith is notified as particular keys are disbursed and supplies are depleted, thereby necessitating their duplication.

The second major portion of the key inventory system is key issue control. Records must be kept of all persons possessing a given key, the deposits received, keys issued to an individual, keys returned by an individual and deposit refunds. Although the procedure for this is relatively straightforward, the amount of information that must be processed is quite extensive. Accuracy is essential for university security. The only account of key distribution is maintained by this office.

Recently, an unofficial audit was performed by State of Montana auditors on the key inventory control system, which suggested improvements might be in order. Because of the large number of keys
involved, it has become extremely difficult and tedious to perform manual searches of records for desired information. Furthermore, much valuable employee time is consumed in this process. With the amount of transactions performed daily in the office, the possibility of an error exists. In addition, prompt service is often requested and may not be possible due to the current manual system.

The following subsystems are components of the key inventory system, listed in order of decreasing importance.

1. The database information would include files containing information on what keys an individual is issued, which individual had a particular key, what keys open what doors, what keys belong to a building, what locks (or doors) a master key would open, and how long a key has been out.
2. Deposit accounting would trace the deposits entering the system and the refund of deposits after the return of a key.

3. Interface with current administrative programs. An interface with payroll is possible to allow for tracking of keys when an employee, staff, or instructor, with a key leaves the university. Furthermore, an interface with the registrars office would provide lists of those persons graduating, to cross reference with outstanding keys.

4. Information security, providing for restricted access to the key inventory system. Accessibility of information within different parts of the system would be limited.

5. Correspondence generation, to provide for an automatic generation of form letters requesting the return of keys prior to graduation, or summer break, etc.
6. Key inventory control system, to provide instantaneous information regarding the number of any one key available to be issued, the number of those keys already issued, a threshold number for ordering the duplication of individual keys, and the number of duplications to be made.

7. Bit pattern generation of numbers available to use for any one lock, providing a number for the lock which would be compatible with the master keys opening the lock in question. This generation of numbers would also take into account any numbers which are on the retire list, and requirements concerning bit cuts.

8. A rekey history would provide a means for tracing the history of a lock which was rekeyed.

9. A parts inventory control, which would maintain a count of all key blanks for each keyway. Yearly, an inventory re-order list would be generated. In addition, account of lock components would also be maintained.
10. Expenditure accounting would provide the department with a trace of expenditures on inventory and other aspects of the system.
Requirements and Specifications

Requirements analysis is the last step in the initial planning phase of the software life-cycle. The analyst must evaluate the flow and structure of information, refine all software functions in detail, establish system interface characteristics, and uncover design constraints. This section introduces partitionings and definitions of current procedures and the partitioning of the proposed system via the use of graphic aids, data dictionaries, and functional descriptions of processes.

Data Flow Diagrams

The following pages comprise a graphic representation of the key inventory system as it currently operates. Circles indicate a process being performed, while arrows indicate the information flowing between the processes. Processes may be broken down into subprocesses, and will be labeled with a number to refer to the original
process. For example, subprocesses of process number two will be labeled 2.1, 2.2, and so on. The first section shows the diagrams for the current operation of both the front office and locksmith procedures, while the second section depicts those for the proposed operation of both systems.
FIGURE 1
LEVEL 0
CONTEXT DIAGRAM
(CURRENT)

PHYSICAL PLANT
KEY INVENTORY
SYSTEM

ISSUEES
REFUND
MAINTENANCE
REQUEST
U OF M
ADMINISTRATION

KEY
RECEIPT
REKEY
REQUEST
FUND
REQUEST
FUND
APPROVAL

BANK
DEPOSIT
INFO
REQUEST
PUBLIC

PART
ORDERS
SUPPLIERS

PARTS
FIGURE 3
LEVEL 1 FRONT OFFICE CONTEXT DIAGRAM (CURRENT)
FIGURE 4
LEVEL 2 FRONT OFFICE
PROCEDURES (CURRENT)
FIGURE 6
LEVEL 1 LOCKSMITH
CONTEXT DIAGRAM
(CURRENT)
FIGURE 7
LEVEL 2 LOCKSMITH
PROCEDURES (CURRENT)
FIGURE 8
LEVEL 3 REKEY LOCK
(CURRENT)
FIGURE 9
LEVEL 3 CONTROL INVENTORY
(CURRENT)
FIGURE 12
LEVEL 3: RETURN KEY
(PROPOSED)

CHECK ALL NAMES 1.4.1

DELETE FILES 1.4.2

INCREASE KEY AVAILABLE 1.4.3

END_RECORD

KEY RETURN

REFUND INFO

ID

KEY NUMBER

NAME

INVENTORY FILE

IND_RECORD

NAME

SSN
FIGURE 14
LEVEL 3: GENERATE CORRESPONDENCE
(PROPOSED)

GENERATE LETTERS 1.6.1

GENERATE REPORTS 1.6.2

PERSONNEL

TERMINATION

LIST

 QUERY

DOJ-RECORD

NAME

LETTER

REPORT

LOCATION

INVENTORY

KEY-HAY
FIGURE 15
LEVEL 3: BACKUP INFO
(PROPOSED)
FIGURE 17
LEVEL 2: LOCKSMITH PROCEDURES
(PROPOSED)
LEVEL 3: REKEY LOCK  
(PROPOSED)
FIGURE 19

LEVEL 3: CONTROL INVENTORY
(PROPOSED)
Data Structure Representation

This section describes the format of necessary files and other major data structures within the system. Because of the large amount of data contained within the key inventory control system, the format of stored information is of vital concern, both to maximize the efficiency of accessing the data, and to minimize the amount of disk storage required. The following description attempts to meet both of these goals.

I. Current Front Office Files

Currently, the front office files consist of three separate files. These can be seen in the data flow diagrams as the key file, the key record file, and the key card file. These files are described below, with an indication of the current information within each file. For the proposed files, the reader is referred to the section describing proposed front office data structures.
The key file is maintained for both front office and locksmith accessibility. It contains one or more keys for each building and room number available for issue and some master keys which are issued. Approximately 7,000 individual keys are maintained in this file.

The key record file is maintained on each individual who has a key issued to him. Please refer to the data dictionary for a complete description of what is contained in this file. The key record is maintained on the individual until all keys issued to him have been returned. There are approximately 20,000 key records maintained.

The key card file contains a card for each key which is issued to an individual. Each card is maintained in the file until the key has been returned. When a key is returned the key card is attached to the key record file. When all keys belonging to an individual have been returned,
then the key record and the key cards are removed from the file.

The master key record file contains a card for each individual who has been issued a master key. A card may contain information on more than one key issue. These cards are kept, and updated as keys are returned, until all master keys issued to an individual are returned.

II. Current Locksmith Files

Presently, there are seven areas where information is stored in the locksmith procedures. These are shown in the data flow diagrams as the key file, the pattern key file, the retired key file, the available key file, the part file, the generated key number file, and the salvage file. The structure listed below describes the current information residing in those files, with no attempt to optimize storage. For the proposed files, the reader is referred to the section describing proposed locksmith data structures.
The current key file is the same as the one described for the front office. Both front office and locksmith operations need access to this file. For each building and room number, it contains one or more keys, in addition to some master keys available for issue to authorized persons. Approximately 7,000 keys are maintained here.

The pattern key file is a physical file, and contains a copy of each possible key, including masters, grand masters, and great grand masters. These keys are never issued, and are only used as a pattern to make additional keys. Each key is associated with a building (or buildings for a great grand master), and a room number or room numbers. Again, there are approximately 7,000 keys kept in this file.

The retired key file, again a physical file, consists of keys that have been taken out of circulation after a lock has been rekeyed. Each key has a date associated with it to indicate when it
was taken out of service. It is stored here for one year before that particular pattern may be used again. The number of keys stored is variable.

The available key file consists of keys that have been retired for one year or more. These keys may now be used to rekey a lock. As with the retired key file, the number of keys stored here is variable.

The part file, a physical file, contains parts (locks, pinned locks, pins, and key blanks) which may be used for the construction of new locks or new keys. Each part has its own part number. The number of parts is variable, although a standard amount of stock is ordered on an annual basis.

The generated key number file is a repository for numbers available for use in rekeying a lock. The restrictions on these numbers is such that on at least one cut per key there must be a minimum
of two bits difference. This file must contain only those numbers that are sufficiently different from any key made previously, including those in use, those retired, and those already made and available for use. The amount of numbers available for use may vary.

The 'salvage file' is used to store parts that are no longer of use. This is a physical file. When a sufficient quantity is reached, the parts stored here are sold as scrap metal. It may contain any of the parts previously listed and is also used by other departments of the Physical Plant. No differentiation is made between any of the parts, and the amount of parts stored is variable.

III. Proposed Front Office Data Structures

The following files have been determined as being sufficient to store the data required to maintain the front office key issue procedures. There are four files required for the data base
information. Note that the Master Key Record File has been eliminated and the information contained there is stored within the Inventory File as a field indicating the 'type' (master, grand master, change, etc) of the key. These are:

### Ind_Record File:

<table>
<thead>
<tr>
<th>Field Type</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Security Number</td>
<td>integer 9</td>
</tr>
<tr>
<td>Key ID Number</td>
<td>text 10</td>
</tr>
<tr>
<td>Date Out</td>
<td>date 8</td>
</tr>
<tr>
<td>Deposit</td>
<td>integer 4</td>
</tr>
</tbody>
</table>

### Name File:

<table>
<thead>
<tr>
<th>Field Type</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Security Number</td>
<td>integer 9</td>
</tr>
<tr>
<td>Name</td>
<td>text 30</td>
</tr>
</tbody>
</table>

### Inventory File:

<table>
<thead>
<tr>
<th>Field Type</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key ID</td>
<td>text 10</td>
</tr>
<tr>
<td>Type</td>
<td>text 1</td>
</tr>
<tr>
<td>Quantity on Hand</td>
<td>integer 3</td>
</tr>
<tr>
<td>Total Number</td>
<td>integer 3</td>
</tr>
<tr>
<td>Status</td>
<td>text 1</td>
</tr>
<tr>
<td>Date</td>
<td>date 8</td>
</tr>
</tbody>
</table>
IV. Proposed Locksmith Data Structures

In the proposed locksmith portion of the key inventory control system, most of the files will remain the same with the exception of the parts file, the retired key file, and the available key file. The retired key and available key files will no longer be used, while the used keys formerly stored there will now be stored in the parts file. This is not a computer data file. An additional file will be used, that of the master file as described in the proposed front office data structure representation.

Data Dictionary

Entries in the following pages provide a concrete definition for the flow of data between system processes. Each piece of data describes an
item of information needed for a process to perform its function, or output desired by the users. Curly braces indicate that there may be a repetition of information within a data element, a plus sign indicates 'and', and a vertical bar indicates 'or'. Parentheses depict an item that is optional. Comments about legal data values are enclosed by a slash and an asterisk. Data flows for both the front office and locksmith procedures are defined together, and both the current and proposed system may be found in this section.

\[
\text{amount} = \text{dollar amount of deposit} \mid \text{dollar amount of refund}
\]

\[
\text{bank deposit} = \text{dollar amount} + \text{date} + \text{account number}
\]

\[
\text{date} = \text{date of deposit received}
\]
deposit = amount paid when key is issued

deposit refunds = name +
    date +
    dollar amount

fund approval = fund request +
    signature of approval

fund request = needed part count +
    estimated dollar amount

ID = name |
    social security number

info = information
info request = building + room number |
    key number |
    ID

information = keyholder |
    key number |
    location |
    bank deposit |
    inventory |
    keys held

information requests = room number |
    building |
    {key owners}

key = key blank +
    key number

key number = bit cut number +
    keyway number
key order = key number +
          amount needed

key request = ID +
             date +
             user's position +
             building +
             room number +
             approval signature +
             deposit amount

key return = ID +
            key number

letter = letter to terminated personnel |
        letter to graduating students

list = name +
      SSN +
      address
/* list of graduating students */
location = building +
    room number

lock number = key number

maintenance request = building number +
    room number +
    description of problem

name = /* name of keyholder */
    /* stored in Personnel,
    Registrar, or
    Name File */

needed part count = part +
    part number +
    amount needed
part = lock | pin | pinned lock | key blank

part count = part + part number + amount on hand

part number = lock number | keyway number | pin size

part order = needed part count + fund approval

pinned lock = lock + lock number
query = keyholder report
  inventory report
  locksmith report
  location report

receipt = receipt info

receipt info = name +
  amount +
  date

record info = ID +
  key number +
  date +
  amount

refund = refund info +
  dollar amount of refund

refund info = name +
  amount +
  date
rekey order = key order +
    building +
    room number

rekey request = building name +
    (room number)

request info = info request

requested = /* flag to indicate user
    request for
    maintenance program
    entry */
    /* value is true or false */

report = keyholder |
    inventory |
    locksmith |
    location

restore request = requested
room number = number assigned to given room

SSN = social security number

System Interface Description

This section describes the transactions that the system makes with outside entities, both data received and information that must be output. For a detailed definition of each of the interface data elements described here, the reader is referred to the data dictionary.

I. Current Front Office System Interfaces

The front office key issue system currently interfaces with two outside entities. These are the Physical Plant locksmith operation and a bank. The key orders are sent to the locksmith when the supply of a key is determined to be low, and keys are then received from the locksmith and stored in
the key file. Deposits are made regularly to a local bank which consist of the key deposits collected for each key issue.

II. Current Locksmith System Interfaces

There are presently three outside entities with which the locksmith operation interfaces. These are the Physical Plant front office, parts suppliers, and University of Montana administration. Key orders are received from the front office, and keys made according to those orders are then stored in the front office key file. Parts are ordered from suppliers for the most part on an annual basis, and then received from them. On occasion, parts must be ordered at irregular intervals rather than on the yearly order. Finally, maintenance and rekey requests are received from U of M administration, and either the necessary service is performed, or the appropriate part is distributed to the requester. Fund requests for parts orders are submitted to U
of M administration, and fund approvals are received back.

III. Proposed Front Office System Interfaces

The proposed front office key issue system will be adding several interfaces to those already existing. The new system will be combining the front office procedures with those of the locksmith. Therefore, the existing outside interface with the locksmith will cease to exist as such, and will become an internal interface. However, the interface with the bank will still remain unchanged. Additionally, there will be interfaces with U of M Personnel, and Student Records. These interfaces will provide the Physical Plant with two enhancements to the system that do not exist today. First, these files will be accessed for information which will correlate a social security number with a name. This will allow the data files necessary for the Physical Plant to be stored in a more economical and space
saving manner by not having to store the name. These files will be accessed at the initiation of the Key Inventory Control System to determine which records, as they exist now, can be stored with only the corresponding social security number. These files will then be used to access the proper record during general use of the system, by providing the corresponding social security number of an individual when given the individual's name. Secondly, these files may be used when personnel are leaving University payroll system, or when students are graduating. With this information, reminder letters may be sent to these persons, with the intent of greater return of issued keys.

IV. Proposed Locksmith System Interfaces

The proposed locksmith system interfaces will remain the same as was described in the current system interfaces. The outside entities receiving and submitting data are the parts supplier, the
Physical Plant front office, and University of Montana Administration. The exchange of information will also remain unchanged.
Functional Description

The functional description portion of this document describes each of the functions delineated in the data flow diagrams both in a narrative style, and then in an algorithmic or structured English version in order to clarify the procedures performed by the system. Data and control interfaces between processes within the system are also described. As with the system interface description, the reader is referred to the data dictionary for a more complete definition of each of the internal data flows, and to the data structure representation for detail on the data base and file structure. Each interface is described in terms of the data flow diagram processes, therefore the reader is referred to those pages while reading this section.
Functions and Internal Interfaces

I. Current Front Office Functions and Internal Interfaces

The current front office portion of the key inventory system utilizes four files. These are the key file, key record, master key record and key card file. The processes within the system can be divided as follows:

1.1 Record Control. This module currently maintains the records of all keys issued to individuals. This process consists of adding a key record or master key record and key card to the respective files, and decreasing quantity on hand from the key file when a key is being issued. When a key is then returned, the opposite procedure is followed. Information on money collected and disbursed is also maintained. This module may be then subdivided as follows:
1.1.1 Issue Key. This subsystem is activated by receipt of a key request. This consists of a card and an appropriate deposit. Currently, a key is retrieved from the key file, the key request form is separated and the appropriate parts are placed in the key record and key card files. If the request is for a master key, a master key card is filled out, or the information is added to an already existing card for that individual. A receipt is then written to reflect the deposit amount. This module interfaces with the Generate Deposit module, by means of the deposit amount.

1.1.2 Generate Deposit. This module is passed the deposit amount. As monies are collected a total is maintained. This total must agree with the checkbook.

1.1.3 Return Deposit. This module is used when a key is being returned. As a key is received in the Physical Plant, the key is
replaced within the key file, and the corresponding key card is retrieved from the key card file. The key record card is also retrieved from the key record file and marked returned. If the individual has no other key issued to him, then the key record is disposed of, however, if other keys are outstanding, the old record is stapled to the current ones and are maintained until all keys have been returned. This module will add to the refund list, the name and total amount of refund, as refund checks are not issued from the Physical Plant office. At the same time, the checkbook is decremented to reflect the refund. This module will access the information in all three files.

1.2 Order Keys. This subsystem interfaces only with the key file. As supplies of keys get low, an order for additional keys is made to the locksmith division of the Physical Plant. Currently, this subsystem is entirely manual, and relies on the user of the system to be aware of how often a key is needed and what additional
amount of keys might be necessary. There are approximately 7,000 keys in the key file.

1.3 Distribute Information. This subsystem interfaces with all three files and attempts to answer questions posed to the Physical Plant with reference to key situations and problems. Currently, to answer a question, the user must access the data in the files manually. This involves accessing the keys file, which contains around 7,000 keys and the key record file,

II. Current Locksmith Functions and Internal Interfaces

The top level of the locksmith operation can be divided into five processes. The first of these is Make Key which receives key orders from the front office and the Service Locks procedure, and rekey orders from the Rekey Lock process. From these orders, new keys are made, using a pattern key from the pattern key file as a model. Keys made are either returned to the front office key
file or the Service Locks process. In addition, periodically the Make Key function will make a new pattern key as old ones wear out or as locks are rekeyed, to be stored in the pattern key file.

Service Locks receives maintenance requests from the University of Montana Administration. The type of service necessary is determined, and the service performed. From time to time, it may be necessary to make a new key, at which time the Make Key process is sent a key order. Information concerning key numbers or lock numbers is obtained from the pattern key file.

Rekey Lock receives rekey requests from the University of Montana Administration. It accesses the available key file to determine if there is a valid key number already available, and places old keys in the retired key file. It receives necessary parts from the part file. Rekey Lock may be broken into four subprocesses. These are Generate Key Number, Determine Lock Number, Pin Lock, and
Install Lock.

Generate Key Number accesses the pattern key file, the available key file, and the retired key file to determine bit cut numbers that have not yet been used, and stores these in the generated key number file.

Determine Lock Number first checks the available key file for bit cuts fitting the key requirements as rekey requests are received. If no bit cuts are appropriate, then it accesses the generated key number file for an appropriate bit cut. Once a key number has been determined, the lock number is sent to the Pin Lock process while a rekey order is sent to the Make Key function.

The Pin Lock procedure takes locks and pins from the part file and installs the pins in the lock according to the lock number. The pinned lock is then passed along to the Install Lock procedure.
Install Lock, as the name implies, installs locks in doors. Old locks may be returned to the part file if still of use, otherwise, they are placed in the salvage file. Keys corresponding to the old lock are either put in the retired key file or the salvage file.

The Control Inventory function receives parts from suppliers, sends parts orders to suppliers, sends fund requests to the University of Montana Administration, and receives fund approvals. It accesses the part file to determine the amount of parts needed and to store received parts. It may be divided into four subprocedures, Store Part, Check Supply, Estimate Need, and Order Part.

Store Part receives parts from the supplier and places them in the part file. Check Supply checks the part file and counts the amount of parts on hand. The part count is then sent to the Estimate Need function.
Estimate Need determines the past need of a given part and future need in relation to possible projects, and estimates the amount to be ordered. This needed part count is sent to the Order Part process. An estimate is also made of the dollar amount required to purchase the parts, and this is sent out as a fund request the University of Montana Administration.

The Order Part procedure waits until fund approvals are received from the University of Montana Administration, and once received, sends a part order to the supplier.

Recycle Keys accesses the retired key file to determine which keys have been out of circulation for a year or more. These keys are then transferred to the available key file.

III. Proposed Front Office Functions and Internal Interfaces
1.1 Distribute Information. This module interfaces with the existing data base files. It will allow the user to query the files for specific information to respond to questions posed to the Physical Plant. This will provide access, quickly, to such questions as 'How many keys does an individual have issued to him?', or 'What key opens a particular room in a particular building?'. This module will also interface with the Find SSN module by way of the 'ID'.

1.2 The Find SSN module is used to find the correct file to access for key records. This module is passed a name, and will check both the University Personnel records and the University Student records for that name and the corresponding social security number. If the name is found, then the social security number can be used to access the Ind Record file, otherwise the original name is used to access the Name file. The Find SSN module receives the name to search for from either Distribute Information, Issue Keys, or
1.3 Issue Key. This module maintains the Ind Record file and the Name file to reflect the current state of keys issued. As a new key is issued to an individual, a new record is placed in either the Ind Record file or the Name file to indicate this transaction. Current figures must also be maintained to reflect the additional deposit acquired. This record keeping is done within the bookkeeping module. The Issue Key module interfaces with the Find SSN module through the individuals name, if available, and to the bookkeeping module by way of receipt information. This module can be broken down as follows:

1.3.1 Find Key #: This module is passed the key request information. It uses the room and building number to find the appropriate key number from the Location File. The only other module that Find Key # interfaces with is the Update Name File, which is passed the record information.
1.3.2 Update Name will interface with the Find SSN module to determine which file to access. It will add a record for the current transaction, reflecting the issue of a key.

1.3.3 Check Key Quantity. This module checks the master file to be sure that there is a key available to be issued to the requester.

1.3.4 Decrease Key Quantity Available. This module will decrement the record field that indicates how many keys are currently available (Quantity on Hand). This provides a measure of the number of keys available for issue and allows for a means of re-ordering keys (through the Order Key module).

1.4 Return Key. This module is passed the key return information (ID and key number). It passes to Find SSN the individuals ID, if needed to find the name to access the proper file. It will change the key status in the proper file to reflect the returned key. It will also search the
file for all occurrences of that individual to determine if he has returned all of the keys he has been issued. If so, all records will be removed from the files. This module also access the Inventory File, and increments the number of keys available, for the particular key number, that has been returned. It can be divided into the following functions:

1.4.1 Check All Names. This module will peruse the appropriate file for all records belonging to that particular user. It will then check to see if all the keys issued to that individual have been returned.

1.4.2 Delete Files will delete all records pertaining to that individual.

1.4.3 Increase Key Available will access the Inventory File and increase by one the amount of keys available for that particular key number.
1.5 Bookkeeping. This module does the general bookkeeping tasks for the key inventory system. It is passed the name, date and amount from either of two modules, the Issue Key module or the Return Key module. It will generate either a receipt or a refund check. It also maintains a 'checkbook', which contains a current total of monies available. This module can be divided into the following subsystems:

1.5.1 Generate receipt is passed the name, date and amount from issue key. It then generates a receipt for that amount.

1.5.2 Generate deposit is passed the date and amount and will increment the deposit total. It will generate a daily total.

1.5.3 Refund check is passed the name, date and total amount of refund. It adds this information to the refund list, as checks are not issued directly from the Physical Plant.
1.5.4 Update checkbook is passed an amount from either refund check, in which case it decreases the checkbook amount, or from generate deposit, where it will increment the checkbook by the 'amount'.

1.6 Generate Correspondence. This module will provide the Physical Plant with a means of generating correspondence. Input to this module will be of two possible types. One is a query to the data base files, which is possible in the 1022 data base language. The other type of input would be a list, possible generated by the University Administration, or Registrars office. For example, a list of graduating seniors could be compared with those individuals having been issued keys and letters written reminding the students to return keys prior to leaving the University. By use of a query, specific information may be extracted from the files. Informal reports may then be generated to relay this information to the user. This module may be broken down into the
following subsystems:

1.6.1 Generate Letters. This module will access the Ind Record file only as all names coming from the University system will have a social security number. The module will interface with the Find SSN module to determine the proper name to access.

1.6.2 Generate Reports. This module may access many files and modules depending on the information requested. It has access to the Ind_Record file, the Name file, the Location file and the Inventory file.

1.7 Order Keys. This module interfaces with the Inventory file. It will check the threshold number and the number of key available for issue and order new keys, if necessary.

1.8 Backup Info. This module provides a means of creating backup files for security of information and audit purposes. This module will
access the University tape drives, and simply store the files requested on the tape. The Restore request will move the files off the tape, restoring them to disk, but providing another name so as not to overwrite the current files.

1.9 Find Name. This module will find the name associated with the given SSN in the Personnel, Student, and Name files, and return this to the calling procedures.

IV. Proposed Locksmith Functions and Internal Interfaces

Many of the locksmith procedures are not amenable to computerization, therefore most of the processes remain unchanged from the current system to the proposed system. However, there are some changes as described below.

The available key file and retired key file no longer exist as such in the proposed system, while necessary information about these keys is
stored in the on-line master file. All previous mention of accesses to these files, then, are replaced with accesses to the master file. In addition, the Recycle Keys function is not necessary, but is replaced by the process Update Key Status. Update Key Status accesses the master file and checks the retired status and date of each key record. If the key has been retired for a year or more, its status is changed to available.

Furthermore, an on-line inventory file is kept of all keyway numbers. Each time a key blank is used, then, the on-line count must be decreased, and as parts are received from suppliers, the count must be increased by the amount received.

Processing Narratives

This section provides an unambiguous description of processes within the system in the form of a structured English or algorithmic method of specification. This allows for more clarity in the
understanding of how the system works, and how the proposed system will carry out the same tasks. These processing narratives correspond to those processes found at the lower levels of the entire system.

I. Current Front Office Processing Narratives

1.1.1 Issue Key

with key request do
find key in key file
give to requester
separate key request card
place key record in key record file
place key card in key card file
if key is a master key
then check master key file
for previous issues
if card exists
then add current key information to card
else create new card with current information
write receipt for amount
give receipt to requester
1.1.2 Generate Deposit

if date has not changed
then add deposit amount to bank
    deposit total
    adjust checkbook total to
        reflect new amount
else print bank deposit
    set bank deposit total to zero
    add deposit amount to bank
    deposit total
    adjust checkbook total to
        reflect new amount

1.1.3 Return Deposit

with a key return do
    place key in key file
    remove corresponding key
        card and dispose
    find corresponding key
        record card and
            mark returned
    find all key records for
        that individual
    if all are marked returned
        then dispose of all of them
    else staple returned key
        record to active key
        record
    if key was a master key
    then find appropriate card
        in master key card file
        mark key returned
    if all master keys have
        been returned
    then dispose of card
1.2 Order Key

check each key in key file
if key supply appears to be low
 order more

1.3 Distribute Information

for each information request
 determine appropriate file
 if information can be accessed
 then respond to request
II. Current Locksmith Processing Narratives
2.1 Make Key

as key order is received,
  for each entry on key order,
    match key number with
      key in pattern file
    select key blank from
      parts file with same
      keyway number as
      pattern key
  for each amount needed,
    cut key blank
      according to pattern
      key bit cut
  return pattern key to
    pattern key file.

as rekey order is received,
  for each entry on rekey order,
    select key blank from
      parts file with keyway
      number indicated on
      rekey order,
    cut key blank according to
      bit cut number
        indicated on rekey order,
    paint key red,
    put key in pattern key file,
    put old pattern key in
      retired file and
      mark date.

as needed,
  check pattern key file for worn keys,
  for each worn key found,
    select key blank from parts
      file with same
      keyway number as worn key,
    cut key blank according to
      worn key bit cut,
    paint key red,
    put key in pattern key file,
    put old key in salvage file.
2.2 Service Locks

as maintenance requests are received,

determine type of service necessary.

if new key is required,

    send key order to make
    key process,
    receive key,
    distribute key to requester.

else, if service necessary,

    perform required service.

2.5 Recycle Keys

once per month,

    check retired key file for dates
    older than one year,
    move these keys to the available
    key file.

2.3.1 Generate Key Number

check all existing key numbers in

    pattern key file,
    available key file,
    and retired key file.

determine key numbers not in use.

of these, select numbers fitting

    bit cut number
    requirements and put in
    generated key number
    file.
2.3.2 Determine Lock Number

as rekey request is received,
check available key file for
key number fitting
master, grand master,
and great grand
master requirements.
if found, select first one as
lock number,
else, check generated key
number file for key
number fitting master,
grand master, and great
grand master requirements.
select first one as lock
number.

2.3.3 Pin Lock

· for each number in lock number,
  determine size of pin needed,
  get pin from part file,
  place pin in lock in appropriate
  position.
2.3.4 Install Lock

as pinned lock is received,
install lock in door,
if parts are still usable,
place corresponding keys
in retired file,
place other parts in part
file,
else, place all parts in
salvage file.

2.4.1 Store Part

as parts are received,
separate according to type
and part number,
store in part file.

2.4.2 Check Supply

periodically,
for each part type,
for each part number,
count amount of
parts on hand.
2.4.3 Estimate Need

determine projects to be completed.
determine parts needed for projects.
subtract part count from parts
    needed to get needed
    part count.
estimate dollar amount of needed
    parts.
fill out fund request.

2.4.4 Order Part

as fund approval is received,
    mail part order to supplier.
III. Proposed Front Office Processing Narratives

1.1 Distribute Information

if info request refers to name of person, amount of keys, etc.
then check University Files for social security number
if found then find answer to question in Ind_Record file
respond to question
else look in Name file for appropriate social security number
map back to Ind_Record file
respond to question
else if info request refers to keys, key numbers, etc.
then find answer to question in master file
respond to question
else no response to question

1.2 Find SS#

check Personnel files for name
if found then return social security number
else check student files for name
if found then return social security number
else return not found
1.3.1 Find Key Number

while not found and not end of master key file
compare building and room numbers
if equal then found equals true
   return key number
else return invalid specifications

1.3.2 Check Key Quantity

while not found and not end of master file
compare current number with key number.
if equal then found equals true
   if key quantity is greater than zero
      return available
   else return not available

1.3.3 Decrease Key Quantity Available

with current key number
   decrease key quantity available by one
1.3.4 Update Name File

If accessing Ind_Record file
then create new record
  add social security number
  add key number
  add date
  add amount of deposit
  insert in Ind_Record file
else
  create new record
  add name
  if available add social security number
  add key number
  add date
  add amount of deposit
  insert in Name file

1.4.2 Delete Files

with the appropriate record
delete from file

1.4.3 Increase Key Available

with the appropriate master file record
increase the keys available by one
1.4.1 Check All Names

if ID is a name
then while there are more entries in the Name file
    check to see if record matches name
    if matches, map back to Ind_Record file
    check for key returned
    set flag
else if ID is a social security number
    then while there are more entries in the Ind_Record file
        check to see if record matches name
        if matches, check for key returned
        set flag

1.5.1 Generate Receipt

    print name
    print date
    print total amount of deposit

1.5.2 Generate Deposit

    if date is changed
        then print out yesterday's total
        set total to 0
        increment total by deposit amount
    else increment total by deposit amount
1.5.3 Refund Check

add name, date, and amount of refund to refund list

1.5.4 Update Checkbook

if amount is from generate deposit
then add amount to checkbook amount
store new amount in checkbook
else subtract amount from checkbook amount
store new amount in checkbook

1.6.1 Generate Letters

while there are names or social security numbers on the list
find appropriate records
print reminder letter

1.6.2 Generate Reports

find information pertinent to the query
print the information
1.7 Order keys

while there are more keys to check
compare the number of keys
available with
the threshold number
if the number is less than
threshold number
then order key made

1.8.1 Save Info

while there are more files to save
save the file on tape

1.8.2 Restore Info

while there are more files to restore
change name to 'file'.bak
restore the file to disk

1.9 Find Name

check Personnel Files for SSN
if found then return name,
ext else check student files for SSN
if found then return name,
ext else return not found
IV. Proposed Locksmith Processing Narratives
2.1 Make Key

as key order is received,
for each entry on key order,
match key number with key
in pattern file
select key blank from parts
file with same
keyway number as pattern
key
subtract key blank from
keyway file.
for each amount needed,
cut key blank according
to pattern key
bit cut
return pattern key to pattern
key file
add key to master file.
as rekey order is received,
for each entry on rekey order,
select key blank from parts
file with keyway
number indicated on rekey
order,
subtract key blank from keyway
file
cut key blank according to bit
cut number
indicated on rekey order,
paint key red,
put key in pattern key file,
put old pattern key in retired
file and mark date,
add key to master file.
as needed,
check pattern key file for worn keys,
for each worn key found,
select key blank from parts file
with same
keyway number as worn key,
subtract key blank from keyway
file
cut key blank according to worn
key bit cut,
paint key red,
put key in pattern key file,
put old key in salvage file.

2.2 Service Locks

as maintenance requests are received,
determine type of service necessary.
if new key is required,
send key order to make key
process,
receive key,
distribute key to requester.
else, if service necessary,
perform required service.

2.5 Update Key Status

once per month,
check master file for retired key
dates older
than one year,
change status on these to available.
2.3.1 Generate Key Number

check all existing key numbers in master file,
determine key numbers not in use.
of these, select numbers fitting bit cut number requirements and put in generated key number file.

2.3.2 Determine Lock Number

as rekey request is received,
check available key file for key number fitting master, grand master, and great grand master requirements.
if found, select first one as lock number,
else, check generated key number file for key number fitting master, grand master, and great grand master requirements.
select first one as lock number.
2.3.3 Pin Lock

for each number in lock number,
determine size of pin needed,
get pin from part file,
place pin in lock in appropriate
position.

2.3.4 Install Lock

as pinned lock is received,
install lock in door,
if parts are still usable,
add corresponding keys to
master file,
place parts in part file,
else, place all parts in salvage
file.

2.4.1 Store Part

as parts are received,
separate according to type and
part number,
store in part file.
if key blanks are received,
add amount to keyway file.
2.4.2 Check Supply

periodically,
check keyway file for amount of
key blanks in stock.
for each other part type,
for each other part number,
count amount of parts on
hand.

2.4.3 Estimate Need

determine projects to be completed.
determine parts needed for projects.
determine past amount used from
master file,
subtract part count from parts needed
to get needed
part count.
estimate dollar amount of needed parts.
fill out fund request.

2.4.4 Order Part

as fund approval is received,
mail part order to supplier.
Resources

Several different types of resources are necessary for the development of a software product. These include human, hardware and software resources. The subject of this section is to discuss the resources available to the completion of the proposed system, and those necessary for successful completion. In addition, availability windows are given to describe the time that each resource is needed and when each will be available for use.

Human Resources

During the course of development, certain tasks must be completed, requiring sufficient manpower at these points. A two member development team is available for the duration of the project to complete both the documentation and implementation of the system. In addition, a four member committee is necessary for the review and approval of results at given milestones in the course of
system development. The committee is composed of the chairman, a professor of computer science whose special expertise lies in the area of data processing application programming, another computer science professor who has specific knowledge concerning the development of sufficient specifications and requirements for the system, an employee of the Computer Center, who brings expertise on University of Montana administrative programs, and policy regarding their development, and finally, the requester of the system, who has intimate knowledge of the system for which the proposed project is being developed. Each of these members must be available to review the progress of the project at proposed dates of delivery as discussed in the feasibility document. It is anticipated that there will be times when all committee members will not be able to be present at certain progress meetings, therefore individual review of documentation may be necessary in addition to the traditional group review of progress.
However, each member must be present for the final review, or defense, of the system scheduled for the first week in August.

In addition to periodic review of the proposed system by committee members, end users must also be available to clarify current system operation and to verify the desired nature of the eventual software. In particular, it is necessary to have communication with the two primary end users of the system as questions concerning procedures arise. Finally, before the system is operationally complete, the files of the current system must be entered into the automated system, requiring the time of one or more persons to perform data entry tasks. One of the end users has discussed the possibility that she may be able to do this task or that temporary help may be hired. Because of the lightened work load during the summer quarter at the University of Montana Physical Plant, it has been decided that this would be the most feasible time to enter the data if space is available on
the target hardware system. Training of users on the proposed system once it is complete will be performed by the two member development team.

Hardware Resources

Several hardware alternatives were discussed in the feasibility document produced earlier, and it was the final recommendation to develop the system for the DEC 2065, a mainframe computer used for University of Montana administrative programs, because of program interface possibilities and ease of future maintenance. Based on this recommendation, this section will discuss those hardware resources available for use with the DEC 2065, and those necessary.

As previously discussed, the DEC 2065 is available for University of Montana administrative programs for which disk space has been allotted. It is currently being decided both whether and when disk space may be allocated for the key issue control data base and associated programs. The
availability of disk space in time for full implementation of the program by August 1985 is as yet, unknown. Other necessary hardware includes a tape drive to create back up storage of data base information, which is currently available on the DEC 2065, and access to the program via terminals and printers. The Physical Plant currently owns several compatible terminals, and at least one printer to be used for this interface.

Software Resources

One of the main advantages of using the DEC 2065, as discussed in the feasibility study, is the opportunity for the key inventory control system to interface with existing administrative programs and data base information to provide for better control and tracking of key holders. In particular, access to both personnel and registration files may provide an earlier indication of key holders leaving the University system so that key returns may be requested. In addition,
presently there are no records of key holder social security numbers, and these may be obtained via information already stored in administrative data bases. Addresses of key holders are also not maintained by the current system, but may be obtained by interfacing with available information on the DEC 2065, in order to initiate a letter sending function of the system which is anticipated to increase the return rate of keys. Therefore, the existence of these data bases is one of the software resources available to the proposed project.

Another advantage of the DEC 2065 is the presence of a sophisticated data base system, 1022. This software allows for both storage of large amounts of data, and for query concerning this data. It also provides a programming language to access the data base. The proposed system must interface with the 1022 software. A less noticeable, but highly important software resource is the TOPS 20 operating system implemented on the
DEC 2065, which provides a user friendly environment for future use of the proposed project, and a rich setting for program development.

Availability Windows

The following diagram depicts the time frame when each human, hardware, and software resource will be necessary, and when each will be available.
**FIGURE 20**  
**AVAILABILITY WINDOWS**

<table>
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<th>Unknown</th>
<th>Needed</th>
<th>Available</th>
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<td></td>
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<td>Disk space</td>
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<td>REVIEW COMMITTEE</td>
</tr>
<tr>
<td>MAY</td>
<td>JUNE</td>
<td>JULY</td>
</tr>
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<td>MAY</td>
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</tr>
<tr>
<td>MAY</td>
<td>JUNE</td>
<td>JULY</td>
</tr>
</tbody>
</table>
Cost/Benefit Appraisal

Several categories of cost may be incurred during the development of a software product. These are directly related to the resources necessary, and those already available. As seen in the previous section, all hardware resources are available, therefore, under the assumption of development proceeding on the DEC 2065, no funds will be required for the purchase of additional hardware. If, however, transition is made from the DEC 2065 to a microcomputer, hardware purchases will have to be made. From a survey of market availability, this figure would be approximately $5,000.00 to $8,000.00, depending on the sophistication and capabilities of the desired computer system.

Software resources are also available on the DEC 2065, therefore, no software purchases must be made for the present development effort. The cost of data base and operating system software for
microcomputer development is included in the hardware cost figure above, should this become a future option.

The final cost to be discussed is that of human resources. Because of the nature of this project as a coursework requirement for the development team members, team development effort will require no funding. However, should the proposed system be converted to a microcomputer system, it will be necessary to fund persons for conversion. The cost of data entry can be estimated by the amount of time it will take to enter all current records into the data base system. With an estimation of approximately 20,000 records of key holders, and another 27,000 records concerning inventory and control records, and with the assumption that 500 records may be entered daily, the cost for data entry may approach $2,500.00.
The cost saved by the proposed system is harder to estimate. Time will be saved by using an on-line system, however, the major source of savings will be realized by the increased return rate of keys because of the accuracy and interface possibilities of the proposed system. The money saved in this area will be realized by the reduction of the necessity to rekey buildings because of the loss or non-return of keys, which, as discussed in the proposal document of this system, may approach $7,000.00 to rekey a building. In addition, more efficient use of the locksmith's time may be gained by prediction of key use and the necessity to make more keys as supplies get low. Furthermore, front office procedures may be speeded up to allow office personnel more efficient use of their time.
Conclusion

In summary, this document provides the reader with an understanding of the processes of the current system, both physical and logical. Requirements for the implementation of the proposed system have been discussed and constraints on development have been described. System functions and data within the system have been defined, and necessary resources delineated. From the information contained within this narrative, progress may continue on the product design phase of development.
Schedule

Following is a projected schedule for the completion of remaining phases in the proposed project. These dates are approximate, due to both the inexact art of estimation and the difficulty of scheduling review meetings at the end of each phase.

5/13/85  -  Software Plans and Requirements
5/15/85  -  Validation
6/3/85   -  Product Design
6/5/85   -  Verification
6/26/85  -  Detailed Design
6/28/85  -  Verification
7/10/85  -  Coding and Unit Testing
7/31/85  -  Integration Testing
8/9/85   -  Final Implementation and User Manual
Bibliography


Administrative Development, University of Montana Computer C
DESIGN DOCUMENT

KEY INVENTORY CONTROL

by

Michele Miley
Robin Fauntleroy

June 26, 1985
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Introduction

The software design phase of the life-cycle attempts to determine 'how' to implement the 'what' that was specified in the requirements phase. This is considered the structural design of the program or system; that is, what are the appropriate subsystems, programs, or modules, and how are they interconnected? In other words, it describes an acceptable programming solution to the problem specified in the requirements document. This process will determine the major characteristics of the final system, establishes the upper bounds in performance and quality that the best implementation can achieve, and may even determine what the final cost may be. The overall technical objective function of the design phase is made up of varying amounts of emphasis on efficiency, maintainability, modifiability, generality, flexibility, and utility.

A good design specification shows the solution in two ways, in terms of function and logic. The functional description shows what the system is to do; the logic description shows how the sys-
tem is actually structured to provide those functions. Tools are used to describe to the reader how these requirements are to be fulfilled. A design document may include some or all of the following tools available:

- **flow chart** - a diagram that combines symbols and abbreviated narrative to describe a sequence of operations in a program system.

- **HIPO** - consists of (1) a set of diagrams which show the functional breakdown of a system in the form of traditional hierarchy charts and (2) separate diagrams which explode each box on the hierarchy chart into a set of three boxes showing inputs, processes, and outputs.

- **pseudo-code** - a notation similar in look, form, and meaning to both spoken language and programming languages; a bridge between the two.

- **structured charts** - a pictorial way of expressing program logic, or structure, in a rigorous way, readable from top to bottom.

- **data flow diagrams** - describes the system functionally, with symbols and text to describe a sequence of operations, but has no regard for the actual system structure.

- **decision tables** - a simple, convenient way of showing what action is to be taken if a given condition or set of
conditions exist.

coverage matrices - a means of showing the relationship between two kinds of information.

storage maps - pictures describing how the various storage devices are being utilized.

simulation models - the system being modeled is expressed in some computer language and the computer executes the resultant programs in imitation of the described system.

To establish criteria for evaluation of a 'good' design, the following guidelines are presented:

1) A design should exhibit a hierarchical organization that makes intelligent use of control among elements of software.

2) A design should be modular; that is, the software should be logically partitioned into elements that perform specific functions and subfunctions.

3) A design should lead to modules (e.g., subroutines or procedures) that exhibit independent functional characteristics.

4) A design should be derived using a repeatable method that is driven by information obtained during software requirements analysis.
This design document is written for the Key Inventory Control System for the Physical Plant at the University of Montana. For a complete description of this system as it exists today and the proposed system, the reader is referred to the proposal (written April 4, 1985) and the Feasibility Document (written April 18, 1985). However, a brief overview of the system will be presented here to refresh the reader with the system under design.

There are two major divisions within the current key inventory system control system. The first is the actual locksmith operation, in which not only are keys made, but records are kept of which keys open which locks. The locksmith must maintain records of key numbers currently in use, those available for use, those retired, and the length of retirement. Furthermore, an inventory must be maintained of key blanks and other lock components. Presently, the locksmith is notified as particular keys are disbursed and supplies are
depleted, thereby necessitating their duplication. The second major portion of the key inventory system is key issue control. Records must be kept of all persons possessing a given key, the deposits received, keys issued to an individual, keys returned by an individual and deposit refunds. Although the procedure for this is relatively straightforward, the amount of information that must be processed is quite extensive. Accuracy is essential for university security. The only account of key distribution is maintained by this office.

Recently, an unofficial audit was performed by State of Montana auditors on the key inventory control system, which suggested improvements might be in order. Because of the large number of keys involved, it has become extremely difficult and tedious to perform manual searches of records for desired information. Furthermore, much valuable employee time is consumed in this process. With the amount of transactions performed daily in the
office, the possibility of an error exists. In addition, prompt service is often requested and may not be possible due to the current manual system.
Design Decomposition

The principles of structured design were used to specify the design of the key inventory control system. Structured design has two main principles: modules should be weakly coupled to each other and should exhibit as strong a level of cohesion as possible.

Coupling is defined as a measure of the strength of interconnection between modules. Thus, "highly coupled" modules are joined by strong interconnections and "loosely coupled" by weak interconnections. In other words, the more that we must know about module B in order to understand module A, the more closely connected A is to B. The factors that influence coupling are:

- type of connection between modules;
- complexity of interface;
- type of information flow along the connection;
- and, binding time of the connection.
Cohesion of each module is defined as how tightly bound or related its internal elements are to one another. An uncohesive module is one that may perform several tasks, whereas a highly cohesive module performs only one task. There are seven levels of cohesion and are listed here in order of increasing strength of cohesion.

- coincidental cohesion
- logical cohesion
- temporal cohesion
- procedural cohesion
- communicational cohesion
- sequential cohesion
- functional cohesion

Cohesion and coupling are interrelated and generally, the greater the cohesion of individual modules in the system, the lower the coupling between modules will be. The major aim, then of structured design, is to produce modules which are functionally cohesive (execute one function only) and are loosely coupled (do their task with a minimum of information from other modules).
The method of transform analysis was used to derive an initial structural design. This method is a form of top-down strategy, which generally requires only a modest restructuring to arrive at a final design. Transform analysis consists of the following four steps:

restating the problem as a data flow graph  
(from Requirements document)

identifying the afferent and efferent data elements

first-level factoring

factoring of afferent, efferent, and transform branches

The following section of this design document specifies the design for the key inventory control system. Data flow diagrams follow (from the Requirements Document) with the afferent, efferent and transform elements identified. Next is included the data dictionary which defines all terms used in the data flow diagrams. The hierarchical charts are included next and are fol-
lowed by the overall description and interface specifications; and the algorithmic description. These two descriptions, written in both spoken English and pseudo-code should provide an unambiguous description of the modules. The last part of this section will include descriptions of the files necessary for storage of information within the system.

Data Flow Diagrams

The following pages contain a pictorial representation of the data flows present in the proposed system. They are marked too indicate the afferent, transform and efferent processes within the system.
LEVEL 2: FIND NAME & SSN

AFFERENT

PERSONNEL

REGISTRAR

NAME

FIND SSN
1.2

TRANSFORM

FIND NAME
1.9

SSN

NAME

EFFERENT
LEVEL 2: ORDER KEY

ORDER KEY
1.7

AFFERENT

INVENTORY

TRANSFORM

ORDER_DATE

EFFERENT

ORDER_KEY
LEVEL 3: RETURN KEY

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- Available
- Name
- ID
- Refund Info
- Ind_record
- Name
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REFUND INFO

AFFERENT

REFUND CHECK 1.5.3

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TRANSFORM AMOUNT

DATE, AMOUNT

RECEIPT

CHECKBOOK

BANK DEPOSIT

EFFERENT
TERMNAS: GENERATE CORRESPONDENCE

AFFERENT

LIST

TRANSFORM

QUERY

LOCATION

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PERSONNEL

GENERATE REPORTS 1.6.2

NAME

REPORT

DE-RECORD

LETTER

LOCATION INVENTORY KEYLAY

GENERATE LETTERS

GENERATE REPORTS

V.2
Data Dictionary

Entries in the following pages provide a concrete definition for the flow of data between system processes. Each piece of data describes an item of information needed for a process to perform its function, or output desired by the users. Curly braces indicate that there may be a repetition of information within a data element, a plus sign indicates 'and', and a vertical bar indicates 'or'. Parentheses depict an item that is optional. Comments about legal data values are enclosed by a slash and an asterisk. Data flows for both the front office and locksmith procedures are defined together, and both the current and proposed system may be found in this section. Descriptions of files and file layouts along with data structures to be used may be found in the appendixes.

allow entry = /* flag returned from Password */
/* value is true or false */
amount = dollar amount of deposit |
        dollar amount of refund

availability = /* flag to indicate key issue
        availability */
        /* value is true or false */

bank deposit = dollar amount +
        date +
        account number
building = Aber Hall | 
Alumni Center | 
Art Annex | 
Botany | 
Brantly Hall | 
Business Administration | 
Chemistry-Pharmacy | 
Corbin Hall | 
Craig Hall | 
Duniway Hall | 
Elrod Hall | 
Field House | 
Fine Arts | 
Forestry | 
Health Science | 
Health Service | 
Heating Plant | 
Jesse Hall | 
Journalism | 
Knowles Hall | 
Law | 
Lecture Hall | 
Liberal Arts | 
Library | 
Lodge | 
Mathematics | 
Men’s Gymnasium | 
Miller Hall | 
Music | 
North Corbin Hall | 
Pharmacy-Psychology | 
Physical Plant | 
Jeanette Rankin Hall | 
Science Complex | 
Social Sciences | 
Swimming Pool | 
Turner Hall | 
University Center | 
University Hall | 
McGill Hall | 
1010 Arthur | 
600 Beckwith |
date = date of deposit received

delete name flag = /* flag to indicate no keys held */
/* value is true or false */

deposit refunds = name +
date +
dollar amount

fund approval = fund request +
signature of approval
fund request = needed part count + 
estimated dollar amount

ID = name | 
social security number

info = information

info request = building + room number | 
key number | 
ID

information = keyholder | 
key number | 
location | 
bank deposit | 
inventory | 
keys held

information requests = room number | 
building | 
{key owners}
key = key blank +
       key number

key list = { key number }
    /* all entries refer to same building
        and room number */

keycard = ID +
       building number +
       room number +
       key number +
       date

key number = bit cut number +
              keyway number

key order = key number +
            amount needed
key request = ID +
  date +
  user's position +
  building +
  room number +
  approval signature +
  deposit amount

key return = ID +
  key number

letter = letter to terminated personnel |
  letter to graduating students

list = name +
  SSN +
  address
/* list of graduating students */

location = building +
  room number
lock number = key number

maintenance request = building number +
room number +
description of problem

married student housing = Garnet Court |
Bannack Court |
Rimini Court |
Yreka Court |
Pioneer Court |
Helena Court |
Craighead

menu choice = /* flag to indicate user's choice
of function */

name = /* name of keyholder */
/* stored in Personnel, Registrar, or
Name File */
name issue info = name +
    key number +
    deposit amount +
    date +
    (social security number)

name return info = name +
    key number +
    (social security number)

needed part count =
    part +
    part number +
    amount needed

new_key_number = key number

part = lock |
    pin |
    pinned lock |
    key blank
part count = part + part number + amount on hand

part number = lock number | keyway number | pin size

part order = needed part count + fund approval

password = /* word given to gain access to program portions */

pinned lock = lock + lock number

query = keyholder report | inventory report | locksmith report | location report
receipt = receipt info

receipt info = name +
              amount +
              date

record info = ID +
              key number +
              date +
              amount

refund = refund info +
         dollar amount of refund

refund info = name +
              amount +
              date

rekey order = key order +
              building +
              room number
rekey request = building name +
   (room number)

request info = info request

requested = /* flag to indicate user request for
    maintenance program entry */
    /* value is true or false */

report = keyholder |
        inventory |
        locksmith |
        location |

restore request = requested

room number = number assigned to given room
ssissue info = social security number +
   key number +
   deposit amount +
   date

SSN = social security number

ssreturn info = social security number +
   key number

temp list = SSN +
   { key number }

user choice = menu choice

Hierarchical Charts

The following pages contain a pictorial representation of the modular structure of the proposed program solution. Both flow of data and
flow of control are indicated.
FRONT OFFICE MAIN

ISSUE KEY
1.1.1

RETURN KEY
1.1.2

DISTRIBUTE INFO
1.1.3

GENERATE CORRESPONDENCE
1.1.4

AMOUNT
1.1.5

NAME
1.1.6

SSN
1.1.7
BOOKKEEPING,
FIND SSN,
FIND NAME
REKEY LOCK

A.
KEY_KEY,
AMT,
ORDER_AMT,
KEY_NUM

UPDATE FILES 1,2,3

REKEY LOCK 1,2,3

GET NEW NUMBER 1,2,3

NEW KEY

FOUND

CHECK APPLICABILITY 1,2,3

NEW KEY

GENERATE NEW NUMBER 1,2,3

NEW KEY

REKEY LOCK 1,2,3
REQUESTED

MAINTENANCE
MAIN

ORDER KEY

UPDATE KEY
STATUS

BACKUP INFO

1.3.1.1 1.3.1.2

1.3.1.1 1.3.1.2

1.3.2

1.3.3

1.3
Functions and Internal Interfaces

Main Driver and Password Modules

Module 1 of the Key Inventory Control System, Main, is the main driver module of the entire program. It allows the user to choose either the front office, locksmith, or maintenance functions of the system, and once a choice is entered, it calls the password routines to determine if the person attempting access should be allowed entry. Because there are different passwords to different portions of the system, the menu choice is passed to the password routines so they may determine if the correct password has been entered for that particular part of the system. Main receives a flag, allow_entry, back, and it is either true or false depending upon the correct entry of the appropriate password.

Module 1.0, Password, is the controlling module of the password routines. It calls Accept_Password, and receives the allow_entry flag
from this module. Depending on how this flag is set, it may or may not call Disallow_Access, and pass it the menu_choice. Accept_Password prompts the user for the appropriate password depending on the portion of the system to be accessed. If the user enters the password incorrectly the first time, he is allowed a second chance. However, a second mis-entry will result in setting the allow_entry flag to false, and Disallow_Access will be called by the main Password routine. Disallow_Access, module 1.0.2, calls Send_Mail, passing it the menu_choice, and Logout_User, both batch or system processes. Send_Mail will leave a message in the user area concerning the attempted access, and the portion of the system which was chosen, and Logout_User will allow the program to terminate normally, then log the illegal user off the system.

Front Office Modules
The front office portion of the program is controlled by module 1.1, Front Office Main. It displays the front office menu (shown in the user interface section), and calls the appropriate module depending on the user's choice of function. A password is required to enter this section of the system, however, once the user is in this area, any number of front office functions may be performed without re-entering a password. As with all menus in this program, if an incorrect choice is entered, an error message is displayed, and the user is asked to re-enter the desired choice.

Module 1.1.1, Issue Key, is the driver routine for entry of key issue information. When an individual requests a key from the Physical Plant, this program portion is used. Issue Key prompts the user for the necessary information, and then calls the appropriate Find Key Number, passing it the building and room number. Find Key Number, module 1.1.1.1, determines if the building and room number are valid, and if so, calls module
1.1.1.1, Check Inventory, passing it the list of possible key numbers. Check Inventory checks to make sure there is a key available for issue, of the key type requested, and returns the key number and availability status to Find Key Number. If a key is available for issue, Issue Key will then call module 1.1.1.2, Update Name Files, passing it record_info. Update Name Files calls Find SSN if the social security number has not been given, and enters the appropriate information in both the Ind_Record File and the Name File if necessary. In addition, Update Name Files calls the Bookkeeping module, passing it the amount of deposit paid by the individual requesting a key.

Module 1.1.2, Return Key, is called when a keyholder returns a key to the Physical Plant. It prompts the user for the keyholder's name and social security number, and if no social security number is given, it calls Find SSN to determine the correct number. It also requests the key number being returned. Check All Names, module
1.1.2.1, is then called, passing it the entire key return record. Check All Names checks the Ind_Record File and Name File for entries concerning the holding of that key, and if the correct entry is found, it calls Delete Files, module 1.1.2.1.1, passing it the keyholder ID, and a flag indicating whether the name may be deleted if the individual possesses no more keys. Increase Key Available is also called by Check All Names, and it increases the quantity on hand field of the Inventory File. It is passed the returned key id number.

Distribute Info, module 1.1.3, is called if the user requests the information access option of the front office portion of the program. It displays a menu allowing the user a choice of types of information that may be requested. Depending on the user choice, Display Keyholder, Display Key Number, Display Location, Display Deposit, Display Inventory, or Display Keys Held may be called. Display Keyholder, module 1.1.3.1,
displays a menu allowing the user to choose what information to enter to find the holders of a particular key. Building and room may be entered to find all holders of keys to that room, and key numbers may be entered to find all individuals possessing that particular combination of keys. All holders of a given key may be found by entering only one key number. This function calls Find Name in order to produce the name of an individual rather than a social security number.

Display Key Number, module 1.1.3.2, allows the user to enter a building and room number, and it will display all the key numbers fitting that particular lock. Module 1.1.3.3, Display Location, will use a key number to determine which door or doors it will open in which building. Module 1.1.3.4, Display Deposit, will display the balance of cash flow for that particular day, up to the time it is called. If it is being used for daily balancing purposes, the user has the option of clearing out the total when it is called. Display
Inventory, module 1.1.3.5, will display the number of keys on hand, the number out, and the total number, given a particular key number. Given a social security number or name, module 1.1.3.6, Display Keys Held, will list each key held by that individual, the date it was issued, and the deposit paid for each key.

Module 1.1.4, Generate Correspondence, is the controlling module for the generation of letters and reports. It displays a user menu, and dependent upon the user's choice, may call either Generate Letters or Generate Reports. Generate Letters will allow the user to generate letters to graduating students who still have keys, and to personnel leaving the University system. Module 1.1.4.1.1, Generate Student Letters, uses address labels to be provided by the Registrar's Office and manual input of the social security numbers on those labels to determine if a student possesses a key, and if so, it adds that student and the outstanding keys to a list. Generate Personnel Letters
accesses Personnel files to determine terminated employees and, if they have keys, puts their social security numbers and keys held in a list. It also prints address labels for those on the list. Module 1.1.4.1.3, Print Letters, uses the list produced by the previous two modules to print letters to each of the individuals on the list. Examples of the letter sent may be found in the appendix portion of this document.

Generate Reports, module 1.1.4.2, is the controlling module for the report generation function of the system. It displays a menu allowing the user to choose the desired report. Depending on user choice, it may call Keyholder Report, Inventory Report, Key Retirement Report, or Location Report. Module 1.1.4.2.1, Keyholder Report, produces a listing of all individuals holding keys, the keys in their possession, dates issued, and deposits paid. Inventory Report lists all key numbers, the quantity on hand, the quantity out, and the total number. Location Report, module
1.1.4.2.4, lists all key numbers and the buildings and room numbers that they will open. The Key Retirement module produces a report of all retired keys, the quantity on hand, quantity out, total number, and date of retirement. Sample reports may be found in the appendix section of this document.

Module 1.1.5, Bookkeeping, calls no other modules. It is passed an amount by either the Return Key or Issue Key functions, and it updates the current Checkbook balance. At the end of the day, this balance may be used to balance the cash drawer, and then cleared out for the following days transactions.

Module 1.1.6, Find SSN, uses a name to search Personnel and Registrar Files to find the matching social security number. It is called by a number of modules, including the support modules to be used during data entry. Find Name, module 1.1.7, performs the reverse function, in that, given a
social security number, it will search the appropriate files for the matching name.

Locksmith Modules

Module 1.2, Locksmith Main, is the controlling module for the locksmith portion of the program. This segment of the program is mostly menu run. A sample of the menu format can be seen in Appendix E. For further specification of the menus, the reader is referred to the section on the User Interface. The main locksmith module calls one of four modules, depending on the choice given by the user in response to the menu. These modules are: Complete Key Orders, Replace Key, Rekey Lock, and Inventory Control.

Module 1.2.1, Complete Key Orders allows the user flexibility with the Order Key file. It offers the user four choices. Module 1.2.1.1, List Orders, simply prints the list of orders, in order of priority and date, to the screen. This provides a means of determining what the keys to
be made are. Module 1.2.1.2, Change Orders, provides the user with a means of changing an existing order, whether it was input incorrectly or a need exists to change part of the order. This module calls Module 1.2.1.2.1, Number Order File, which takes the order file and lists it to the screen with numbers prefixing each order. To record the completion of an order, Module 1.2.1.3, Record Completion is called. This module also calls Number Order File, as it needs the orders listed to the screen. Finally, Print Orders, Module 1.2.1.4 prints to the line printer a copy of the Order Key file.

Module 1.2.2, Replace Key, is a means of acknowledging the fact that keys become broken and ineffective. It simply accesses the Inventory file and subtracts one from the total_amount and quantity_on_hand. (It assumes that as an individual returns a broken key, they will have that key replaced with another key with no paperwork involved in the transaction.)
Module 1.2.3, Rekey Lock, allows the user to either generate an entirely new number for a rekeying of a lock, or to determine if a key retrieved from the retired key file is eligible to be used. The user is prompted for the building and room number of the lock being rekeyed, and then Module 1.2.3.1, Get New Number is called. The user is prompted for the use of a new key or an existing, retired one. If the user requests a new key, Module 1.2.3.1.1, Generate New Number is called, and if an existing key is requested, the user is prompted for the existing key number. In either case, once a number has been requested for use, Module 1.2.3.1.2, Check Applicability, is called to determine whether that key number may be used. Once an eligible key number has been determined, the user is asked if he wishes to use that number. If so, Module 1.2.3.2, Update Files is called, which updates all the appropriate files.

Module 1.2.4, Inventory Control, is provided to allow the user access to the inventory files.
It provides the user five choices, dependent upon a choice made from a menu. Module 1.2.4.1, Change Inventory, will change the amount field in the Keyway file. Order_Parts, Module 1.2.4.4, will print a list of those items within the keyway file which need to be ordered (are below the threshold number). It calls Module 1.2.4.4.1, which checks each record in the keyway file for the amount and checks that against the threshold number. It will create an internal file of keyway numbers to be ordered, and passes that file back up to Order_Parts to be printed. Add_Item, Module 1.2.4.2, allows the user to add new items to the inventory list. It will prompt for the new keyway number and an amount if it exists. It then calls Update File, Module 1.2.4.2.1, which inserts a new record in the keyway file with the appropriate keyway number and amount. Module 1.2.4.3, Print Inventory, prints to the line printer a copy of the information stored in the Keyway file. Delete Item, Module 1.2.4.5, prompts the user for an item
which needs to be removed permanently from the Keyway file. It then deletes that record from the file.

Maintenance Modules

Module 1.3, Maintenance Main, is the controlling module for the maintenance portion of the program. For the most part, this portion of the program runs automatically, with the exception that a user may request that desired files stored on magnetic tape be retrieved. This module calls Backup Info, Order Key and Update Key Status, although the actual execution of these modules depends on the current system date and the date they were last executed. Backup Info is passed the flag "requested" to indicate whether the user has requested entry to the maintenance portion of the program or whether it is being called automatically. Backup Info controls the storage and retrieval of information on magnetic tape. It calls Save and Restore. The function of Save is to
back up current files weekly. Restore is a user requested process which will pull the desired files from magnetic tape and put them in the user area.

Process 1.3.2, Order Key, is designed to search the Inventory File daily, and if keys are below the threshold level, it will place a record of this in the Order Key File to be accessed by the locksmith portion of the program.

Module 1.3.3, Update Key Status, is executed periodically. Its purpose is to increment through the Inventory file, checking for keys which have been retired. If the key status is retired, but the date of retirement is greater than one year from that date, the status field is then set to available.

Data Entry Modules

Module 2, Data Entry Main, is the controlling module for the support processes to be used during
initial data entry. It calls Accept Name and Enter Info. Accept Name, module 2.1, prompts the user for the keyholder name, and calls Find SSN to determine the correct social security number. Both name and social security number are passed to the calling procedure. Enter Info accepts the name and social security number passed to it from Data Entry Main and enters these in the appropriate files. The user is then prompted for additional information to be entered and this information is also entered in the appropriate file.
Module Name: l Main
Parameters:
   In: none
   Out: menu_choice, allow_entry
   In/Out: none
Module Description:

display main menu
set allow_entry to false
prompt user for menu_choice
if not a valid choice, then
   repeat
      display error message
      prompt for choice
      until menu_choice is valid
set requested to false
call Maintenance_Main(requested)
if menu_choice is quit, then
   terminate program run
call Password(menu_choice)
if allow_entry is true, then
   repeat
      if menu_choice is front office, then
         call Front_Office_Main
      else, if menu_choice is locksmith, then
         call Locksmith_Main
      else, if menu_choice is maintenance, then
         set requested to true
         call Maintenance_Main(requested)
until menu_choice is quit
else, terminate program run.
Module Name: 1.0 Password
Parameters:
  In: menu_choice
  Out: allow_entry
  In/Out: none
Module Description:

if menu_choice is for front office, then
  prompt for front_office_password
  call Accept_Password(front_office_password)
else, if menu_choice is locksmith, then
  prompt for locksmith_password
  call Accept_Password(locksmith_password)
else, if menu_choice is maintenance, then
  prompt for maintenance_password
  call Accept_Password(maintenance_password)
if allow_entry is false,
  print incorrect password message
  prompt user for password re-entry
  call Accept_Password(password)
if allow_entry is false,
  call Disallow_Entry(menu_choice).
Module Name: 1.01 Accept Password
Parameters:
  In: none
  Out: password, allow_entry
  In/Out: none
Module Description:

if menu_choice is front office
  and front_office_password is correct,
  OR menu_choice is locksmith
  and locksmith_password is correct,
  OR menu_choice is maintenance
  and maintenance_password is correct,
  then set allow_entry to true
else,
  set allow_entry to false.

Module Name: 1.0.2 Disallow Access
Parameters:
  In: none
  Out: none
  In/Out: none
Module Description:

call Send_Mail

call Logout_User
Module Name: 1.0.2.1 Send Mail
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

Send mail about system entry attempt.

Module Name: Logout User
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

delay for program termination
log user off system.
Module Name: 1.1 Front Office Main
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

repeat
  display Front Office Menu
  /* see user interface section */
  prompt for menu_choice
  if menu_choice is not valid, then
      repeat
          display error message
          prompt for menu_choice
          until menu_choice is valid
  if menu_choice is issue key, then
      call Issue_Key
  else, if menu_choice is return key, then
      call Return_Key
  else, if menu_choice is distribute info, then
      call Distribute_Info
  else, if menu_choice is generate correspondence, then
      call Generate_Correspondence
  until menu_choice is quit.
Module Name: 1.1.1 Issue Key
Parameters:
  In: none
  Out: none
  In/Out: none
Module Description:

set available to false
prompt for name
prompt for social security number
if social security number is unknown, then
  set social security number to negative number
prompt for building abbreviation
prompt for room number
call Find_Key_Number(building, room)
if available is true, then
  call Update_Name_Files(record_info)
else,
  display insufficient supply message.

Module Name: 1.1.1.1 Find Key Number
Parameters:
  In: building, room number
  Out: key number, availability
  In/Out: none
Module Description:

open Location File
find all entries matching building
find all entries matching room number
if found, then
  call Check_Inventory(key_list)
else,
  display invalid building/room message
close Location File.
Module Name: 1.1.1.1 Check Inventory

Parameters:
   In: key list
   Out: availability, key number
   In/Out: none

Module Description:

open Inventory File
prompt user for key_type requested
repeat
   find record matching top entry on key list
   if key_type matches, then
      if quantity_on_hand greater than 0, then
         set found to true
         set key_number to key_id_number field
      else,
         discard top item on key_list
      end if
   until found or key_list is empty
if found, then
   decrease quantity_on_hand by one
else,
   display insufficient supply message
   set available to false
close Inventory File.
Module Name: 1.1.1.2 Update Name Files  
Parameters:  
   In: record_info  
   Out: none  
   In/Out: none  
Module Description:  

open Ind_Record File and Name File  
if social security number is less than 0, then  
call Find_SSN(name)  
if social security number is less than 0, then  
add name and social security number to Name File  
add social security number, key_number, deposit,  
   to Ind_Record File  
call Bookkeeping(deposit)  
close Ind_Record and Name Files.

Module Name: 1.1.2 Return Key  
Parameters:  
   In: none  
   Out: none  
   In/Out: none  
Module Description:  

prompt for keyholder name  
prompt for social security number  
if social security number is unknown, then  
call Find_SSN(name)  
if social security number is unknown, then  
open Name File  
   find name in Name File  
   set social security number to SSN in Name File  
   close Name File  
prompt for key_number  
call Check_All_Names(key_number).
Module Name: 1.1.2.1 Check All Names
Parameters:
  In: key return
  Out: refund_info
  In/Out: none
Module Description:

open Ind_Record File
find all entries matching ID
if Sysnrec is 1, then
  set delete_name_flag to true
repeat
  match key_id number in file to key_number in top record
  if they match, then
    set found to true
    with refund_info record, do
      set amount to (-1 * deposit)
      set date to Sysdate
      call Bookkeeping(amount)
  until found or no records left
if found, then
  call Delete_Files(ID, delete_name_flag)
else,
  display no record found message
close Ind_Record File
call Increase_Key_Available(key_number).
Module Name: 1.1.2.1.1 Delete Files
Parameters:
   In: ID, delete_name_flag
   Out: none
   In/Out: none
Module Description:

   in Ind_Record File /* file is already open */
   delete current record
   if delete_name_flag is true, then
      open Name File
      find matching name or social security number
      delete that record
      close Name File.

Module Name: 1.1.2.1.2 Increase Key Available
Parameters:
   In: key_number
   Out: none
   In/Out: none
Module Description:

   open Inventory File
   find record matching key_number
   increment quantity_on_hand by one
   close Inventory File.
Module Name: 1.1.3 Distribute Info
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

display Information Access Menu
   /* see user interface section */
repeat
   prompt for menu_choice
   if menu_choice is keyholder, then
      call Display_Keyholder
   else, if menu_choice is key numbers, then
      call Display_Key_Number
   else, if menu_choice is building and room number, then
      call Display_Location
   else, if menu_choice is cash balance, then
      call Display_Deposit
   else, if menu_choice is key inventory, then
      call Display_Inventory
   else, if menu_choice is keys held, then
      call Display_Keys_Held
   else, if menu_choice is quit, then
      do nothing for now
   else,
      display invalid choice message
until menu_choice is quit.
Module Name: Display Keyholder
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

display Keyholder Menu
repeat
   prompt for menu_choice
   if menu_choice is building/room, then
      prompt for building and room number
      open Ind_Record File
      find all records matching building and room
      make temporary list of social security numbers
      close Ind_Record File
      for each social security number on the list,
      call Find_Name(social_security_number)
      put name in list
      display name_list
   else, if menu_choice is key_numbers, then
      repeat
      prompt for key_number
      put key_number in list
      until no key_numbers given (CR)
      open Ind_Record File
      find all entries matching each key_number in list
      put social security numbers in temporary list
      close Ind_Record File
      for each social_security_number in list,
      call Find_Name(social_security_number)
      put name in name_list
      display name_list
   else, if menu_choice is quit, then
      do nothing
   else,
      display invalid choice message
until menu_choice is quit

Module Name: 1.1.3.2 Display Key Number
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

   prompt user for building
   prompt user for room number
   open Location File
   find all records matching building and room
   for each record,
     display key_id_number
   close Location File.

Module Name: 1.1.3.3 Display Location
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

   prompt user for key_number
   open Location File
   find all records matching key_number
   for each record,
     display building
     display room number
   close Location File.
Module Name: 1.1.3.4 Display Deposit
Parameters:
    In: none
    Out: none
    In/Out: none
Module Description:

open Checkbook File
display balance in file
ask user if end of day
if yes, then
    set balance to 0
close Checkbook File.

Module Name: 1.1.3.5 Display Inventory
Parameters:
    In: none
    Out: none
    In/Out: none
Module Description:

prompt user for key_number
open Inventory File
find all records matching key_number
for each record /* there should only be one */
    display quantity_on_hand
    set total_out to
        (total_number - quantity_on_hand)
display total_out
display total_number
close Inventory File.
Module Name: 1.1.3.6 Display Keys Held

Parameters:
   In: none
   Out: none
   In/Out: none

Module Description:

  prompt for social_security_number
  if none (CR), then
     prompt for keyholder name
     call Find_SSN(name)
     set social_security_number to SSN returned
  open Ind_Record_File
  find all records matching social_security_number
  for each record,
     display key_id_number
     display date_out
     display deposit
  close Ind_Record_File.
Module Name: 1.1.4 Generate Correspondence
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

repeat
   prompt user for letter or report
   if choice is letter, then
      call Generate_Letters
   else, if choice id report, then
      call Generate_Report
   else, if (CR), then
      do nothing
   else,
      display invalid choice message
until choice is quit (CR).
Module Name: 1.1.4.1 Generate Letters
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

repeat
    prompt user for student or personnel letters
    if choice is student, then
       call Generate_Student_Letters
       call Print_Letters(temp_list)
    else, if choice is personnel, then
       call Generate_Personnel_Letters
       call Print_Letters(temp_list)
    else, if choice is quit (CR), then
       do nothing
    else,
       display invalid choice message
until choice is quit (CR).
Module Name: 1.1.4.1.1 Generate Student Letters
Parameters:
  In: none
  Out: temp_list
  In/Out: none
Module Description:

open Ind_Record File
repeat
  prompt user for social security number
  find all records matching social security number
  if no records, then
    display no keys outstanding message
  else,
    put social security number in temp_list
    for each record,
      put key_id_number in temp_list
    put end_of_keys flag in temp_list
    display found outstanding keys message
  until no more social security numbers (CR)
close Ind_Record File.
Module Name: 1.1.4.1.1 Generate Personnel Letters

Parameters:

   In: none
   Out: temp_list
   In/Out: none

Module Description:

open Terminated File
for each entry in Terminated File,
   put social security number in ssn_list
close Terminated File
open Ind_Record File
for each entry in ssn_lit,
   find matching record in Ind_Record File
   if none, then
      delete social security number from ssn_list
   else,
      put social security number in temp_list
      for each record,
         put key_number in temp_list
         put end_of_keys flag in temp_list
   close Ind_Record File
open Personnel File
for each entry on ssn_list
   find matching entry in Personnel File
   with name and address fields,
      print address label
close Personnel File.
Module Name: 1.1.4.1.3 Print Letters
Parameters:
    In: temp_list
    Out: none
    In/Out: none
Module Description:

for each social security number in temp_list,
    print letter heading
    for each key_number under ssn in temp_list,
        print key_number
    print letter closing
/* see Appendix for sample letter format */
Module Name: 1.1.4.2 Generate Reports
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

display Generate Report Menu
   /* see user interface section */
repeat
    prompt user for menu_choice
    if menu_choice is keyholder, then
       call Keyholder_Report
    else, if menu_choice is inventory, then
       call Inventory_Report
    else, if menu_choice is locksmith, then
       call Locksmith_Report
    else, if menu_choice is location, then
       call Location_Report
    else, if menu_choice is quit, then
       do nothing
    else,
       display invalid choice message
until menu_choice is quit.
Module Name: 1.1.4.2.1 Keyholder Report
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

open Ind_Record File
print keyholder report heading
sort file by social security number
for each unique social security number in file
   call Find_Name(ssn)
   print name
   for each record with same social security number,
      print key number
      print date issued
      print deposit paid
close Ind_Record File.

Module Name: 1.1.4.2.2 Inventory Report
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

print inventory report heading
open Inventory File
sort by key number
for each entry,
   print key number
   print quantity on hand
   print (total_number - quantity_on_hand)
   print total number
close Inventory File.
Module Name: 1.1.4.2.3 Key Retirement Report
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

print key retirement report heading
open Inventory File
sort by key number
for each retired key,
   print key number
   print quantity on hand
   print (total_number - quantity_on_hand)
   print total number
   print date retired
close Inventory File.

Module Name: 1.1.4.2.4 Location Report
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

print location report heading
open Location File
sort by key number
for each unique key number,
   print key number
   for each entry with same key number,
      print building
      print room number
close Location File.
Module Name: 1.1.5 Bookkeeping
Parameters:
  In: amount
  Out: none
  In/Out: none
Module Description:

open Checkbook File
add amount to balance in Checkbook File
close Checkbook File.

Module Name: 1.1.6 Find SSN
Parameters:
  In: name
  Out: SSN
  In/Out: none
Module Description:

open Personnel File
find record matching name
if none, then
  close Personnel File
  open Registrar File
  find record matching name
  if none, then
    display not found message
  else,
    set social security number to SSN field
    in Registrar record
  close Registrar File
else,
  set social security number to SSN in
  Personnel File
close Personnel File.
Module Name: 1.1.7 Find Name
Parameters:
   In: SSN
   Out: name
   In/Out: none
Module Description:

if social security number is less than zero, then
   open Name File
   find record matching social security number
   if none, then
      display not found record
   else,
      set name to name in Name File
else,
   open Personnel File
   find record matching social security number
   if none, then
      close Personnel File
      open Registrar File
      find record matching social security number
      if none, then
         display not found message
      else,
         set name to name in Registrar File
      close Registrar File
   else,
   set name to name in Personnel File
   close Registrar File.
Module Name: 1.2 Locksmith Main
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

display Locksmith Main Menu
   /* see user interface section */
repeat
   prompt for menu_choice
   if menu_choice is Complete Key Orders, then
      call Complete Key Orders
   else if menu_choice is Replace Key, then
      call Replace Key
   else if menu_choice is Rekey Lock, then
      call Rekey Lock
   else if menu_choice is Inventory Control, then
      call Inventory Control
   else, if menu_choice is quit, then
      do nothing
   else, display invalid choice message
until menu_choice is quit
Module Name: 1.2.1 Complete Key Orders
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

display Complete Key Orders Menu
repeat
   prompt for menu_choice
   if menu_choice is List Orders, then
call List Orders
else if menu_choice is Change Orders, then
call Change Orders
else if menu_choice is Record Completion, then
call Record Completion
else if menu_choice is Print Orders, then
call Print Orders
else if menu_choice is quit, then
do nothing
else display invalid choice message
until menu_choice is quit

Module Name: 1.2.1.1 List Orders
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

sort order file on date
sort order file on priority
list all orders that currently exist (on screen)
Module Name: 1.2.1.2 Change Orders
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

Number_Order_File
while not done
   prompt user for order number or symbol to quit
   if quit symbol
      then done set equal to true
   else if proper order number
      then prompt for new priority
         replace existing priority with new priority
         prompt for new amount
         replace existing amount with new amount
      else print error message

Module Name: 1.2.1.2.1 Number Order File
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

set counter to 1
open key order file
sort on date
sort on priority
while there are records in the file
   list the counter (to the screen)
   list the corresponding record (to the screen)
   increment the counter
Module Name: 1.2.1.3 Record Completion
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

Number_Order_File
while not done
prompt for order number completed or symbol to quit
if a correct order number
then map to Inventory file via key ID number
   increase total_amount by amount
   increase quantity_on_hand by amount
   return to order file
   delete record
else if quit symbol
   then done set equal to true
else display error message

Module Name: 1.2.1.4 Print Orders
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

sort order file on date
sort order file on priority
print all (line printer)
Module Name: 1.2.2 Replace Key
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

   prompt for key number
   find key number in Inventory file
   subtract 1 from quantity_on_hand
   subtract 1 from total_amount

Module Name: 1.2.3 Rekey Lock
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

   prompt for building
   prompt for room number
   call Get New Number
   if accept_number is true, then
     call Update Files
Module Name: 1.2.3.1 Get New Number
Parameters:
   In: building, room number
   Out: accept_number, new_key_number, amount,
        order_amount, key_number
   In/Out: none
Module Description:

open Location File
find record matching building and room number
if it exists, then
   let key_number equal KIN
else,
   print message,
   prompt for key_number
prompt user for new or existing key
repeat
   if new then
      call Generate_New_Number(key_number,
                               new_key)
   else,
      prompt for new key
      call Check_Applicability(new_key, found)
until found
display new_number
prompt user for acceptance
if acceptance equal true, then
   if existing, then
      prompt for amount on hand
   prompt for amount needed
Module Name: 1.2.3.1.1 Generate New Number
Parameters:
  In: key_number
  Out: new_key_number
  In/Out: none
Module Description:

in Inventory file
find all records with corresponding keyway number
within that selection set
while not done
  choose first record
    increment the key number by 2
    check new number with all numbers in
      selection set
    if not duplicated, then found
  else choose next record

Module Name: 1.2.3.1.2 Check Applicability
Parameters:
  In: new_key_number
  Out: found
  In/Out: none
Module Description:

in Inventory file
find all records with corresponding keyway number
if number is not present or
  number is found and status is available
then return found
Module Name: 1.2.3.2 Update Files
Parameters:
   In: new_key_number, amount, order_amount, key_number
   Out: none
   In/Out: none
Module Description:

open Inventory File
retire old key number
find new key number
if it exists, then
    "unretire" it,
else,
    change quantities to amount
    add record
open Location File
find record matching key_number, building, and room
if it exists, then
    change to new_key_number,
else,
    add new record
open Order File
    add new record
Module Name: 1.2.4 Inventory Control
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

display Inventory Control Menu
repeat
   prompt for menu_choice
   if menu_choice  is Change Inventory, then
call Change Inventory
else if menu_choice is Order Parts, then
   call Order Parts
else if menu_choice is Add Item, then
   call Add Item
else if menu_choice is Print Inventory, then
   call Print Inventory
else if menu_choice is Delete Item, then
   call Delete Item
else if menu_choice is quit, then
   do nothing
   else display invalid choice message
until menu_choice is quit
Module Name: 1.2.4.1 Change Inventory
Parameters:
   In: none  
   Out: none  
   In/Out: none  
Module Description:

   prompt for keyway number  
   access keyway file  
   find keyway number  
   if number exists  
      prompt for new_amount  
      substitute new_amount for amount  
      display changed entry  
   else display error message

Module Name: 1.2.4.2 Add Item
Parameters:
   In: none  
   Out: none  
   In/Out: none  
Module Description:

   while there are more entries  
      prompt for keyway number  
      prompt for new_amount  
      Update_file
Module Name: 1.2.4.2.1 Update File
Parameters:
    In: key_number, new_amount
    Out: none
    In/Out: none
Module Description:

access Keyway File
find keyway number
if number exists
    add new_amount to amount
else request verification of number
    if verified
        then add new record with keyway number
            and new_amount for amount

Module Name: 1.2.4.3 Print Inventory
Parameters:
    In: none,
    Out: none
    In/Out: none
Module Description:

access Keyway File
print all
Module Name: 1.2.4.4 Order Parts
Parameters:
  In: none
  Out: none
  In/Out: none
Module Description:

Check_File
Print Order_Parts_File

Module Name: 1.2.4.4.1 Check File
Parameters:
  In: none
  Out: none
  In/Out: none
Module Description:

for each record in keyway file
if amount is less than threshold number
then add keyway number to Order_Parts_File
Module Name: 1.2.4.5 Delete Item
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

   while there are more items to delete
   prompt for keyway number
   find number in keyway file
   if it exists
      verify number
      delete record
   else print error message

Module Name: 1.3 Maintenance Main
Parameters:
   In: requested
   Out: none
   In/Out: none
Module Description:

   call Backup_Info(requested)
   call Order_Key
   call Update_Key_Status.
Module Name: 1.3.1 Backup Info
Parameters:
   In: requested
   Out: none
   In/Out: none
Module Description:

if not requested, then
   open Last_Save File
   if date last saved is less than sysdate - 7 days, then
      call Save
else,
   display File Restoration Menu
repeat
   prompt user for menu_choice
   if valid menu_choice,
      call Restore(menu_choice)
   else,
      display invalid choice message
until menu_choice is quit.

Module Name: 1.3.1.1 Save
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

save Ind_Record File on tape
save Name File on tape
save Location File on tape
save Inventory File on tape.
save Keyway File on tape
save Order Key File on tape.
Module Name: 1.3.1.2 Restore
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

if menu_choice is Ind_Record File, then
   copy Ind_Record File from tape to user area
else, if menu_choice is Name File, then
   copy Name File from tape to user area
else, if menu_choice is Location File, then
   copy Location File from tape to user area
else, if menu_choice is Inventory File, then
   copy Inventory File from tape to user area
else, if menu_choice is Keyway File, then
   copy Keyway File from tape to user area
else, if menu_choice is Order Key File, then
   copy Order Key File from tape to user area
else, if menu_choice is All Files, then
   copy all Files from tape to user area.
Module Name: 1.3.2 Order Key
Parameters:
  In: none
  Out: none
  In/Out: none
Module Description:

open Order Date File
if last_order_date does not equal sysdate, then
  set last_order_date to sysdate
open Inventory and Order Key Files
find all quantity_on_hand less than 6 in
  Inventory File
for each record,
  find matching key_number in Order Key File
  if found, then
    if (6 - quantity_on_hand) is greater
      than amount, then
        change amount to
          (6 - quantity_on_hand)
      else,
        do nothing
  else,
    add priority, key_id_number, amount
      record to Order Key File
close Order Key and Inventory Files
close Order Date File.
Module Name: 1.3.3 Update Key Status
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

   for each record in Inventory file
       if status is unavailable
           then if date is older than one year
               then change status to available

Module Name: 2 Data Entry Main
Parameters:
   In: none
   Out: none
   In/Out: none
Module Description:

   repeat
       call Accept_Name
       call Enter_Info
   until user_choice is quit.
Module Name: 2.1 Accept Name

Parameters:
  In: none
  Out: name, SSN
  In/Out: none

Module Description:

repeat
  prompt user for name or quit (CR)
  call Find_SSN(name)
  set social security number to ssn found
until user choice is quit
if social security number is not found, then
  open Dummy_SS File
  set social security number to dummy_ssn
  decrement dummy_ssn by one
  close Dummy_SS File.
Module Name: 2.2 Enter Info
Parameters:
  In: name, SSN
  Out: user_choice
  In/Out: none
Module Description:

if social security number is less than zero, then
  open Name File
  enter name in name field
  enter social security number in ssn field
  close Name File
open Ind_Record File
enter social security number in ssn field
repeat
  prompt for key_number
  prompt for deposit_amount
  if deposit_amount (CR), then
    set deposit_amount to 2
  display key_number and deposit_amount
  ask user if correct
until correct
enter key_number in key_id_number field
enter deposit_amount in deposit field
close Ind_Record File.
File Descriptions

The following files have been determined as being sufficient to store the data required to maintain the key inventory control system. There are six external files used throughout the system. The keyway file is used exclusively in the locksmith operation, the Ind_Record file and Name file are used exclusively in the front office operation, and the remaining files; Inventory file, Order Key file, and Location file are used by both operations.

**Ind_Record File:**

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Type</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Security Number</td>
<td>integer</td>
<td>9</td>
</tr>
<tr>
<td>Key ID Number</td>
<td>text</td>
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<tr>
<td>Date Out</td>
<td>date</td>
<td>8</td>
</tr>
<tr>
<td>Deposit</td>
<td>integer</td>
<td>4</td>
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</table>

**Name File:**

<table>
<thead>
<tr>
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<th>Type</th>
<th>Length</th>
</tr>
</thead>
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<tr>
<td>Name</td>
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<td>30</td>
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<td>Field Type</td>
<td>Length</td>
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<td>-------------------</td>
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<td>Inventory File:</td>
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<tr>
<td>Key ID</td>
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<tr>
<td>Type</td>
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</tr>
<tr>
<td>Quantity on Hand</td>
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</tr>
<tr>
<td>Total Number</td>
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<td>Location File:</td>
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<td>Key ID</td>
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<td>Building</td>
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<tr>
<td>Lock/Room</td>
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<td>Quantity On Hand</td>
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<td>Order Key File:</td>
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<tr>
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</tbody>
</table>

Requirements Mapping
A requirements mapping is included here to indicate to the reader and the user that all requirements have been addressed. For each requirement specified in the requirement document, an entry is made and a cross-reference is indicated to the appropriate modules within the design. The purpose of this cross-reference matrix is to (1) establish that all functional requirements (listed in the left hand column) are satisfied by the software design and indicate which modules (listed across the top row) are critical to the implementation of specific requirements.

Requirements Table

The following is a listing of all the requirements specified in the Requirements Document. The reader is referred to the Requirements Document in case of questions, as some of the requirements specified below are not automated and therefore will have no requirements cross-
reference.

1.1 Distribute Information
1.2 Find SSN
1.3 Issue Key
   1.3.1 Find Key Number
   1.3.2 Update Name
   1.3.3 Check Key Quantity
   1.3.4 Decrease Key Quantity Available
1.4 Return Key
   1.4.1 Flag Record
   1.4.2 Check All Names
   1.4.3 Delete Files
   1.4.4 Increase Key Quantity
1.5 Bookkeeping
   1.5.1 Generate Receipt
   1.5.2 Generate Deposit
   1.5.3 Refund Check
   1.5.4 Update Checkbook
1.6 Generate Correspondence
   1.6.1 Generate Letters
   1.6.2 Generate Reports
1.7 Order Keys
1.8 Backup Information
2.1 Make Key
2.2 Service Locks
2.3 Rekey Lock
   2.3.1 Generate Key Number
   2.3.2 Determine Lock Number
   2.3.3 Pin Lock
   2.3.4 Install Lock
2.4 Control Inventory
   2.4.1 Store Part
   2.4.2 Check Supply
   2.4.3 Estimate Need
   2.4.4 Order Part
2.5 Recycle Keys
## Requirements Cross Reference

### Design Modules

<table>
<thead>
<tr>
<th>REQUIREMENTS</th>
<th>1.1</th>
<th>1.2</th>
<th>1.3</th>
<th>1.4</th>
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## REQUIREMENTS CROSS REFERENCE

### DESIGN MODULES

| REQUIREMENTS | 1.1 | 1.2 | 1.3 | 1.3.1 | 1.3.2 | 1.3.3 | 1.3.4 | 1.4 | 1.4.1 | 1.4.2 | 1.4.3 | 1.4.4 | 1.5 | 1.5.1 | 1.5.2 | 1.5.3 | 1.5.4 | 1.6 | 1.6.1 | 1.6.2 | 1.7 | 1.8 | 2.1 | 2.2 | 2.3 | 2.3.1 | 2.3.2 | 2.3.3 | 2.3.4 | 2.4 | 2.4.1 | 2.4.2 | 2.4.3 | 2.4.4 | 2.5 | 3.0 | 4.0 |
|--------------|-----|-----|-----|-------|-------|-------|-------|-----|-------|-------|-------|-------|-----|------|-------|-------|-------|-----|------|-------|-----|-----|-------|-------|-------|-------|-----|-------|-------|-------|-------|-----|-----|-----|
|              |     |     |     |       |       |       |       |     |       |       |       |       |     |      |       |       |       |     |      |       |     |     |       |       |       |       |     |       |       |       |       |     |     |     |

The table above cross-references requirements to design modules, indicating which modules are associated with each requirement. The columns represent different modules, and the rows represent requirements. An 'X' indicates an association between a requirement and a module.
User Interface

The following state transition diagram shows the various states that the Key Inventory Control system will undergo as various menu options are chosen. This should provide the user with the ability to trace the movements of the working program throughout the user interface.
STATE TRANSITION DIAGRAM
MAIN

(MAIN MENU)

START

STOP

EXIT PROGRAM

EXIT

EXIT

EXIT

EXIT

EXIT

EXIT

FRONT OFFICE PROCEDURES

LOCKSMITH MAIN

LOCKSMITH MAIN

BACKUP INFO

MAINTENANCE PROCEDURES

FRONT OFFICE MAIN

LOCKSMITH PROCEDURES
STATE TRANSITION DIAGRAM

GENERATE CORRESPONDENCE

GENERATE REPORTS

GENERATE CORRESPONDENCE

GENERATE REPORTS

KEYHOLDER REPORT

INVENTORY REPORT

LOCATION REPORT

EXIT

EXIT

EXIT

EXIT

EXIT

EXIT

EXIT

EXIT

EXIT

EXIT

EXIT

EXIT

REPORT

LETTER

LOCKSMITH REPORT
(LOCKSMITH MAIN MENU)

LOCKSMITH MAIN

- REPLACE KEY
- COMPLETE KEY ORDERS
- EXIT

- INVENTORY CONTROL
  - EXIT

- COMPLETE KEY ORDERS
- REKEY LOCK

302
STATE TRANSITION DIAGRAM
INVENTORY CONTROL

(INVENTORY CONTROL MENU)

INVENTORY CONTROL

CHANGE INVENTORY

EXIT

ORDER PARTS

ADD ITEM

DELETE ITEM

PRINT INVENTORY

ORDER PARTS

EXIT

ADD ITEM

DELETE ITEM

EXIT
Menu Descriptions

The following is a brief overview of the user interface and proposed menu selections.

Front Office Menus

The first menu the Key Inventory Control System user will encounter is the main menu, giving the choices of subprograms that the user may choose to enter. Each of these expects a separate password, however, so indiscriminate access to all portions of the program is not allowed.

**********************************************************
**                                                       *
**         MAIN MENU                                    *
**                                                       *
**********************************************************
** Enter program choice:                                *
**  A Front Office Procedures                           *
**  B Locksmith Procedures                              *
**  C Maintenance Procedures                            *
**  D Exit Program                                      *
**                                                       *
**********************************************************
If the Front Office Procedure was chosen at the main program level and the password for that section was entered correctly, the next menu the user will encounter is that of the Front Office. It allows the user of front office function choices. These functions may be chosen in any order, and any number of times until the user indicates a desire to exit the front office portion of the program.

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* *
* FRONT OFFICE MENU *
* *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* *
* Enter function choice: *
* A Key Issue *
* B Key Return *
* C Information Access *
* D Report or Letter Generation *
* E Exit *
* *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

If information access was the function chosen from the front office menu, then the Information
Access menu will be displayed. This allows the user to choose the type of information he would like to obtain.

**********************************************************************
* *
* INFORMATION ACCESS MENU *
* *
**********************************************************************
* *
* Enter information topic option: *
*  A  Keyholder Information *
*  B  Key Number Information *
*  C  Building and Room Number *
*  D  Information on Keys Held *
*  E  Key Inventory Information *
*  F  Daily Cash Balance *
*  G  Exit *
* *
**********************************************************************

Selection of the option of Keyholder Information in the Information Access menu will result in the display of the Keyholder Information Menu. This menu will allow the user to choose which information to enter in order to obtain information concerning key holders.
If the user had entered the Report or Letter Generation function at the Front Office Menu, and then indicated (from a single prompt) the desire to generate reports, then the Report Generation Menu would appear. This menu indicates which reports the user may produce.
If, at the Main Menu level, the user had chosen the Maintenance Program option, and entered the password correctly, this would allow access to the file restoration function. This function allows the user to pull previously stored files from magnetic tape to be accessed via interactive 1022 commands. The menu provided for this function allows the user to choose which files he wishes to restore.
Locksmith Menus

The following menu is presented at the onset of the locksmith portion of the program. It controls all the options available at the high level. The user can choose any one of the four options.
The following menu is presented to the user with the choice of 'A' above.
The following menu is displayed following the choice of 'D', (Inventory Control) in the main menu. The choice of 'B' or 'C', does not provide the user with a menu, as there is only one function to perform and no menu is needed.

***************INVENTORY CONTROL MENU***************

Choose Option:
A Change Inventory
B Order Parts
C Add Item
D Delete Item
E Print Inventory
F Exit
Memory Use

The memory usage of this system has been estimated at 400 pages. Needless to say, at this time the exact number of pages required to implement this system cannot be established. Although the amount of space needed for storage of files can be fairly accurately estimated, only a rough estimate of program length can be arrived at. This can be attributed to the inexact art of estimation (especially of lines of code), but also to the inexperience of the developers in the fields of large program development and estimation skills.

Memory usage is composed of two separate categories. These are file storage and program length (lines of code). Currently, the following figures have been calculated for the amount of storage required for the various files needed for information storage. The reader is referred to the section on File Descriptions for a complete
description and field breakdown of all the files listed here.

**Ind_Record File**

*length: 31*

19,872 records X 31 bytes = 616,032 bytes

616,032 bytes / 2560 bytes/page = 231 pages

**Name File**

*length: 39*

1,000 records X 39 bytes = 39,000 bytes

39,000 bytes / 2560 bytes/page = 16 pages

**Inventory File**

*length: 26*

7500 records X 26 bytes = 195,000 bytes

195,000 bytes / 2560 bytes/page = 77 pages

**Location File**

*length: 17*

5000 records X 17 bytes = 85,000 bytes

85,000 bytes / 2560 bytes/page = 34 pages
Order Key File
length: 14
50 records X 14 bytes = 700 bytes
700 bytes / 2560 bytes/page = 1 page

Keyway File
length: 7
15 records X 7 bytes = 105 bytes
105 bytes / 2560 bytes/page = 1 page

The total number of pages required for file storage is therefore estimated to be 360 pages. The estimate for program storage is estimated to be 40 pages. This figure was arrived by taking the number of modules in the program (calculated from the hierarchical charts) and multiplying this figure by an average figure of 70 lines of code per module. Obviously, this figure is not, and will not follow throughout the program, but is only an average. Following the concepts of structured design, the smaller the module is, the easier to modify and to understand. We, therefore,
will strive to keep module size as small as possible, however, as this system is highly user interactive and must include error checking, we estimate that the average module size will be larger than non-user-interactive programs. The approximate lines of code necessary is:

$$71 \text{ (modules)} \times 70 \text{ (statements/module)} = 4970$$

The memory use needed by this program will consist of a combination of the amount needed for file storage and that needed for program storage. This figure is estimated to be:

$$360 \text{ (files)} + 40 \text{ (program)} = 400 \text{ (total)}$$

Hardware Considerations

The Physical Plant has currently several terminals and printers which will provide them with access to the Dec 2065, upon which the Key Inventory Control system will be developed.
Access to the Dec 2065 is imperative to the development of this system. Currently, space has been guaranteed for the development of the program and the files necessary. However, the amount of space necessary to store all the information within the data files has been calculated to be approximately 360 pages. This amount of space cannot be guaranteed at this time, by the Computer Center.

Performance Considerations

The Dec 2065 was chosen as host computer for several reasons. The Dec 2065 is operated by the University of Montana Computer Center and is the host machine for many of the campus administrative programs. Access has been provided to several of these files, providing not only for less storage space within the files, but for access to additional information, hopefully allowing for greater traceability of keys. Additionally, support of these programs and the Key Inventory Control System is provided by the Computer Center. Also, due
to the amount of information contained within the data base files, accessing information could be somewhat time consuming. Use of the Dec 2065, a mainframe, will provide a satisfactory response time.

Use of structured design principles and documented testing procedures will provide the Physical Plant with a reliable program. This is essential, as the data base will contain information on the whereabouts of the keys and thus, the security of the University.
Development Projections

Following is a projected schedule for the completion of the remaining phases in the proposed project. These dates are approximate, due to both the inexact art of estimation and the difficulty of scheduling review meetings at the end of each phase.

6/26/85 - Detailed Design
6/28/85 - Verification
7/10/85 - Coding and Unit Testing
7/31/85 - Integration Testing
8/9/85 - Final Implementation and User Manual
Maintenance Considerations

Maintainability is the ease with which a software system can be corrected when errors or deficiencies occur, and can be expanded or contracted to satisfy new requirements. This is one of several characteristics sought in a high-quality software system. Maintainability can be thought of as a product of the following characteristics:

- testable
- understandable
- modifiable
- portable
- reliable
- efficient
- usable

Of these characteristics, perhaps understandability is the most important, and if a program is understandable it tends to naturally have some of the other characteristics. If a program is not understood it is virtually impossible to maintain
in any sort of efficient or effective manner. Understandable programs have many of the following properties:

- modularity
- consistency of style
- avoidance of obscure code
- use of meaningful data and procedure names
- structuredness

Use of structured design leads to these properties. Structuredness and modularity are concepts of structured design and direct the systems towards a more easily maintained and modified system. It also provides for a means of generating test cases and, it follows, greater testing and higher reliability.

The reader is referred to the Appendixes where several standardizations have already been specified. This helps to provide the consistency of style mentioned above. As this enhances readability, and understandability, it therefore,
enhances maintainability.
Acknowledgements

At this point we would like to express our appreciation to Mr. Philip Bain of the Registrar's Office and Ms. Linda Brown of the Personnel Office, whose cooperation has been most helpful in establishing the interfaces between the various existing university database programs and the creation of the Physical Plant Key Inventory Control system. Without their support, many of the proposed functions would not be possible to implement.

We would also like to thank those people in the Physical Plant which have donated their time and expertise to help with the development of the Key Inventory Control system. Harry Simon, locksmith, Patty Gibson and Marlice McMahon, administrative aide, have offered invaluable assistance, without which our task would have been much more difficult.
References


Appendix A: Layout of DMD Files

The following file formats are those to be used within the actual program in order to store the necessary data base information. All fields are laid out in the order shown, and these will be used as the 1022 definition files.

********************************************************************
!
! IND_RECORD.DMD
!
SOCIAL_SECURITY_NUMBER SSN INTEGER KEYED 9
KEY_ID_NUMBER KIN TEXT KEYED 10
DATE_OUT DO DATE-OF-ENTRY 8
DEPOSIT DEP INTEGER 4

********************************************************************
!
! NAME.DMD
!
SOCIAL_SECURITY_NUMBER SSN INTEGER KEYED 9
LAST_NAME LNM TEXT 17
FIRST_NAME FNM TEXT 13
! INVEN.DMD!

KEY_ID_NUMBER KIN TEXT KEYED 10
KEY_TYPE KY TEXT 1
QUANTITY_ON_HAND QON INTEGER 3
TOTAL_NUMBER TN INTEGER 3
STATUS ST TEXT 1
DATE_RETIRED DR DATE 8

! LOCATE.DMD!

KEY_ID_NUMBER KIN TEXT KEYED 10
BUILDING BLD TEXT 3
ROOM_NUMBER RN TEXT 4

! KEYWAY.DMD!

KEYWAY_NUMBER KYN TEXT KEYED 4
QUANTITY_ON_HAND QON INTEGER 4
! ORDER.DMD
!

!!! PRIORITY PR TEXT 1
KEY_ID_NUMBER KID TEXT KEYED 10
AMOUNT AMT INTEGER 3
ENTRY_DATE ED DATE OF ENTRY 8
Appendix B: Data Structure Layout

This section describes the layout of internally used files rather than the external ones previously defined. These files are not included in the file relationship diagram because they are used only to store information from one program run to the next. They do not map to any other files, and for the most part have only one field and one entry in that field.

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!  DUMMY_SS.DMD                          \!
SOCIAL_SECURITY_NUMBER SSN INTEGER KEYED 9

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!  CHECKBOOK.DMD                          \\
BALANCE BAL INTEGER KEYED 6
ORDER_DATE.OD DATE-OF-ENTRY 8

DATE_LAST_SAVED DLS DATE OF ENTRY 8

KEYWAY_NUMBER KYN INTEGER 4
AMOUNT_QON INTEGER 4

SOCIAL_SECURITY SSN INTEGER KEYED 9
KEY_NUMBER_KIN TEXT 10
APPENDIX C:
FILE RELATIONSHIPS

PERSONNEL

REGISTRAR

INVENTORY

KEY NUMBER

IND_Record

NAME

DUMMY SSN

LOCATION

KEY NUMBER

KEYWAY

ORDER KEY
Appendix D: Standard Module Heading Information

The following is a pictorial representation of the module heading information that will be included within the code of the program to identify each module, its parameters, and its function. It is included to make future maintenance work easier in identifying particular parts of the entire program.

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!
!! Module Name:                       !!
!! Parameters:                       !!
!!   In Only:                        !!
!!   Out Only:                       !!
!!   In/Out:                         !!
!! Coded By:                         !!
!! Date Last Modified:               !!
!! Reason Modified:                  !!
!! Module Description:               !!
!!   (functional description)        !!
!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

The length of the module heading may vary dependent upon the amount of information to be included within the functional description.
Appendix E: Standard Menu Format and Prompt Layout

The following is a pictorial representation of the standard menu layout to be used within the entire key inventory control system. It is standardized so that all menus encountered by the user will be of the same format, and require the same type of user response form one section of the program to another. The width of the menu display will remain constant, however, dependent upon the number of choices available to the user, the length may vary. In addition, a prompt will be included at the end of the menu to remind the user to make a choice, and any additional instructions necessary will be included here.
User prompt:

In addition to the standardized user menu, a standardized form of prompt will be used to obtain information from the user other than that obtained from the menu. Whenever a user must enter information into the system, a prompt indicating the type of information will appear on the screen, and blanks over which the user may type the information. If there are a finite number of responses possible to a question such as Yes/No, the user will be given a list of the possible choices. The format for the user prompt is as follows.

Instruction/Question (possible answers):
Appendix F: Sample Letter

The following letter shows the content of letters sent out to personnel and students leaving the University system if they still possess keys. The letter itself will be kept in a separate file so that it will be easily changed should another format be desirable in the future.

Date

Dear Student/University Employee,

It has come to our attention that you will soon be leaving the University system, and that you still possess one or more keys from the Physical Plant. Please return these to the Physical Plant prior to leaving, and your deposit will be refunded. The keys we show that you have are:

Key Number 1
Key Number 2
...
Key Number n

Thank you for your cooperation!

University of Montana Physical Plant
Appendix G: Sample Reports

Several kinds of reports may be generated by the report generation function of the Key Inventory Control System. The format of these reports is shown below. Each sample is a greatly abbreviated representation of the actual report, but may be used to understand the layout of each.

### Keyholder Report

<table>
<thead>
<tr>
<th>Keyholder Name:</th>
<th>Key Number:</th>
<th>Date Issued:</th>
<th>Deposit:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doe, John E.</td>
<td>3K68179</td>
<td>2/12/85</td>
<td>2.00</td>
</tr>
<tr>
<td></td>
<td>3K65132</td>
<td>3/15/84</td>
<td>2.00</td>
</tr>
<tr>
<td>Smith, Mary L.</td>
<td>3K63128</td>
<td>6/18/75</td>
<td>2.00</td>
</tr>
</tbody>
</table>
Inventory Report

<table>
<thead>
<tr>
<th>Key Number</th>
<th>Quantity on Hand</th>
<th>Quantity Out</th>
<th>Total Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>3K68179</td>
<td>10</td>
<td>25</td>
<td>35</td>
</tr>
<tr>
<td>2F43289</td>
<td>3</td>
<td>17</td>
<td>20</td>
</tr>
<tr>
<td>3K63219</td>
<td>18</td>
<td>5</td>
<td>23</td>
</tr>
</tbody>
</table>
Location Report

<table>
<thead>
<tr>
<th>Key Number:</th>
<th>Building:</th>
<th>Room Number:</th>
</tr>
</thead>
<tbody>
<tr>
<td>3K68179</td>
<td>UH</td>
<td>315</td>
</tr>
<tr>
<td>3K47328</td>
<td>UH</td>
<td>22</td>
</tr>
<tr>
<td>2F53728</td>
<td>LA</td>
<td>103</td>
</tr>
</tbody>
</table>

Key Retirement Report

<table>
<thead>
<tr>
<th>Key Number:</th>
<th>Quantity on Hand:</th>
<th>Quantity Out:</th>
<th>Total Number:</th>
<th>Date Retired:</th>
</tr>
</thead>
<tbody>
<tr>
<td>3K68179</td>
<td>33</td>
<td>2</td>
<td>35</td>
<td>1/15/85</td>
</tr>
<tr>
<td>2F34287</td>
<td>12</td>
<td>17</td>
<td>29</td>
<td>5/14/85</td>
</tr>
</tbody>
</table>
APPENDIX H:
FILE NAMING CONVENTIONS:
RESTORE

RESTORE: LOADS TAP<FILE> TO TMP<FILE>
Appendix E: Test Run

[RECORDING INITIATED AT 21:38:10] 30
LINK FROM CS.GRAD.MILEY, TTY 25

TOPS-20 Command processor 5(712)
$01022
7/30/85
System 1022A 116A(436)

* use keys

TOPS-20 Command processor 5(712)
@SH$J

******************************************************************************

* KEY INVENTORY CONTROL MENU *

******************************************************************************

* Enter Program Choice: *
* A Front Office Procedures *
* B Locksmith Procedures *
* C Maintenance Procedures *
* D Exit Program *

Enter Choice: c"H$Kx
Invalid Choice

TOPS-20 Command processor 5(712)
@SH$J

******************************************************************************

* KEY INVENTORY CONTROL MENU *

******************************************************************************

* Enter Program Choice: *
* A Front Office Procedures *
* B Locksmith Procedures *
* C Maintenance Procedures *
* D Exit Program *

Enter Choice: a

Enter Password:
1234449

TOPS-20 Command processor 5(712)
@SH$J
@ Incorrect Password
Please Re-enter Password
1234567"H$K9

TOPS-20 Command processor 5(712)
@SH$J
@

TOPS-20 Command processor 5(712)
@Job MTF. Queued. Request-To: 163. Time: 0:05:00
Enter Program Choice:
A Front Office Procedures
B Locksmith Procedures
C Maintenance Procedures
D Exit Program

Enter Choice: a

Enter Password: 1234567

Enter Program Choice:
A Front Office Procedures
B Locksmith Procedures
C Maintenance Procedures
D Exit Program

Enter Choice: a

Enter Function Choice:
A Key Issue
B Key Return
C Information Access
D Report or Letter Generation
E Exit Program

Enter Choice: a

Please enter 9-digit social security number,
If not available, simply type a 0 (zero).
SSN: 516745486

Is this correct? (Y/N) y

There is no corresponding record for that SSN.

Please enter issuee's last name: buck

Please enter issuee's first name and middle initial: david f.

Is this correct? (Y/N) v
Please enter building abbreviation, (maximum 3 characters).
Bldg: lib

Please enter room number, (maximum 4 characters).
Room No: 110
Bldg: lib
Room No: 110
Is this correct? (Y/N)  y

Enter deposit amount
If amount is other than standard, type in new amount, otherwise type a carriage return:

The following record will be entered into the files:
Name: david f. buck
Bldg & Room:  lib 110
Key Number: 36H444444
Deposit Amt:  $2.00
Is this correct? (Y/N)  y
That record has been entered.
Do you have another entry for this individual (Y/N)  n

TOPS-20 Command processor 5(712)
@SH$J

Enter Choice: a

Please enter 9-digit social security number.
If not available, simply type a 0 (zero).
SSN: 728418899

SSN: 728418899
Is this correct? (Y/N)  y

NAME: GLENDA BARNES

Please enter building abbreviation, (maximum 3 characters).
Bldg: uh

Please enter room number, (maximum 4 characters).
Room No: 118
Bldg: uh
Room No: 118
Is this correct? (Y/N) n

Please enter building abbreviation, 
(maximum 3 characters).
Bldg: ma

Please enter room number, 
(maximum 4 characters).
Room No: 118

Bldg: ma
Room No: 118

Is this correct? (Y/N) y

You have an invalid building and room combination. 
Please check your numbers.  
(Type a carriage return <cr> to continue)

Do you have another entry for this individual (Y/N) y

Please enter building abbreviation, 
(maximum 3 characters).
Bldg: ma

Please enter room number, 
(maximum 4 characters).
Room No: "H5K"H5K0o"H5K"H5K001

Bldg: ma
Room No: 001

Is this correct? (Y/N) y

Enter deposit amount
If amount is other than standard, type in 
new amount, otherwise type a carriage return: 8800

The following record will be entered into the files: 
Name: GLENDA BARNES 
Bldg & Room: ma 001 
Key Number: 2P246814 
Deposit Amt: $***.**

Is this correct? (Y/N) n

Do you have another entry for this individual (Y/N) y

Please enter building abbreviation, 
(maximum 3 characters).
Bldg: ma

Please enter room number, 
(maximum 4 characters).
Room No: 001

Bldg: ma
Room No: 001

Is this correct? (Y/N) y

Enter deposit amount
If amount is other than standard, type in 
new amount, otherwise type a carriage return: 800

The following record will be entered into the files:
Name: GLENDA BARNES
Bldg & Room: ma 001
Key Number: 2F246834
Deposit Amt.: $800.00

Is this correct? (Y/N) y

That record has been entered.
Do you have another entry for this individual (Y/N) n

TOPS-20 Command processor 5(712)
$SHSJ

FRONT OFFICE MENU

Enter Function Choice:
A Key Issue
B Key Return
C Information Access
D Report or Letter Generation
E Exit Program

Enter Choice: c

INFORMATION ACCESS MENU

Enter information topic option:
A Keyholder Information
B Key Number Information
C Building and Room Number Information
D Information on Keys Held
E Key Inventory Information
F Daily Cash Balance
G Exit

Enter Choice: a

KEYHOLDER INFORMATION MENU

Enter option for which you have information:
A Building and room number
B Key numbers
C Exit
Please enter menu choice. a

Please enter the building abbreviation (maximum 3 characters):
Bldg: ma

Please enter the room number (maximum 4 characters):
Room No: 00"HSK"HSK001

Bldg: ma
Room No: 001
Is this correct? (Y/N) y
NAME: RHEA ASHMORE
NAME: GERRY BAERTSCH
NAME: GLENDA BARNES

Do you have another request? (Y/N) y

Please enter the building abbreviation (maximum 3 characters):
Bldg: f

Please enter the room number (maximum 4 characters):
Room No: 301

Bldg: f
Room No: 301
Is this correct? (Y/N) n

Please enter the building abbreviation (maximum 3 characters):
Bldg: la

Please enter the room number (maximum 4 characters):
Room No: 103

Bldg: la
Room No: 103
Is this correct? (Y/N) y
NAME: WILLIAM DERRICK
NAME: JOHN SMITH
NAME: KEN MILLER

Do you have another request? (Y/N) y

TOPS-20 Command processor 5(712)
@SHJ
@

**********************************************************************************
* KEYHOLDER INFORMATION MENU
**********************************************************************************
* Enter option for which you have information:
*   A Building and room number
*   B Key numbers
*   C Exit

**********************************************************************************

Please enter menu choice. c
Enter Choice: F

Deposit Total
$4949.00

Do you wish to have the total cleared? (Y/N) Y

Deposit total is now $0.00.

Type a carriage return <cr> to continue

Enter Choice: D

Please enter the individual's SSN. (9 digits).
(or a carriage return <cr> if none)

Please enter the individual's last name.
Last Name: BUCK

Please enter the individual's first name.
First Name: DAVID

LAST NAME: BUCK
FIRST NAME: DAVID
Is this correct? (Y/N) Y
Key Number Date Out Deposit Amount
36H444444 7/30/1985 $2.00

Do you have another request? (Y/N) N

TOPS-20 Command processor 5(712)
@SH$J

INFORMATION ACCESS MENU

Enter information topic option:
A Keyholder Information
B Key Number Information
C Building and Room Number Information
D Information on Keys Held
E Key Inventory Information
F Daily Cash Balance
G Exit

Enter Choice: E
Please enter the Key Number.
Key Number: 3K123460

KEY NUMBER QUANTITY ON HAND TOTAL OUT TOTAL NUMBER
3K123460 32 8 40

Do you have another request? (Y/N) N

TOPS-20 Command processor 5(712)
@SH$J

INFORMATION ACCESS MENU

Enter information topic option:
A Keyholder Information
B Key Number Information
C Building and Room Number Information
D Information on Keys Held
E Key Inventory Information
F Daily Cash Balance
G Exit

Enter Choice: A

KEYHOLDER INFORMATION MENU
Please enter menu choice. B

Invalid choice. Please try again.

Please enter menu choice. B

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: 36H66666

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: Q

Do you have another request? (Y/N) Y

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: 3K123462

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: Q

NAMP: VTCTK ANZFR
NAME: JOAN RADANDT
NAME: VIRGINIA REESMAN
NAME: WILLIAM EVANS
NAME: JULIETTE CRUMP
NAME: ANN SMITH
NAME: JOE ANDERSON
NAME: STEVE ANDERSON
NAME: MARY SMITH

Do you have another request? (Y/N) Y

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: 62K123464

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: 62K1234647

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: 66666666666666666666666666666666666
71022 INPUT ERROR, FIELD 1; PLEASE RETYPE LINE...
555555555

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: 3

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: Q
Do you have another request? (Y/N) Y

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: Q

There is no one who has all those keys issued to them
Do you have another request? (Y/N) Y

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: 2F246824

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: Q
NAME: SALLY SMITH
NAME: DAVID ALT
NAME: FRANK ANDERSON
NAME: STEPHEN BALOGH
NAME: BRUCE BARRETT
NAME: ROBERT REAM
NAME: LORETTA EDWARDS
NAME: CHARLES EYER

Do you have another request? (Y/N) N

TOPS-20 Command processor 5/71/71
Enter option for which you have information:
A Building and room number
B Key numbers
C Exit

Please enter menu choice. C

Enter information topic option:
A Keyholder Information
B Key Number Information
C Building and Room Number Information
D Information on Keys Held
E Key Inventory Information
F Daily Cash Balance
G Exit

Enter Choice: G

Enter Function Choice:
A Key Issue
B Key Return
C Information Access
D Report or Letter Generation
E Exit Program

Enter Choice: D

The following types of correspondence are available:
1. Letter
R: Report
Q: Quit

Please enter choice: L

The following types of letters are available:
S: Student
P: Personnel
Q: Quit

Please enter choice: S
NOT IMPLEMENTED YET
IN PRINT LETTERS.

The following types of letters are available:
S: Student
P: Personnel
Q: Quit

Please enter choice: P
IN GEN PERS LETTERS.
NOT IMPLEMENTED YET
IN PRINT LETTERS.

The following types of letters are available:
S: Student
P: Personnel
Q: Quit

Please enter choice: Q
Leaving letter generation

TOPS-20 Command processor 5(712)
$SH$J

The following types of correspondence are available:
L: Letter
R: Report
Q: Quit

Please enter choice: R

TOPS-20 Command processor 5(712)
$SH$J

*******************************************************************************
** REPORT GENERATION MENU **
*******************************************************************************

Enter report option:
* A Keyholder Report
* B Inventory Report
* C Location Report
* D Key Retirement Report
* E Exit

*******************************************************************************

Please enter option choice: C
Please choose one of the following:
T: Total Location Report
   (sorted by either keyway number or building number)
I: Individual Report
   (report by individual keyways or building numbers)
Q: Quit

Please enter your choice: I

Would you like a report based upon a Keyway Number
or Building Number? (K/B): B

Please enter building abbreviation for report.
Building Number: MA

Your report has been sent to the line printer
and can be picked up at the computer center
Type a carriage return <cr> to continue:

REPORT GENERATION MENU

Please enter option choice: A

Please choose one of the following:
T: Report on Total Keyholders
I: Individual Report
   (report by individual keyways)
Q: Quit

Please enter your choice: I

Please enter keyway number for report.
Keyway Number: 88

Your report has been sent to the line printer
and can be picked up at the computer center
Type a carriage return <cr> to continue:
Please enter option choice: B

Please choose one of the following:
T: Report on Total Inventory
I: Individual Report
   (report by individual keyways)
Q: Quit

Please enter your choice: T

Your report has been sent to the line printer
and can be picked up at the computer center
Type a carriage return <cr> to continue:

TOPS-20 Command processor 5(712)
$SHSJ

*******************************************************************************

REPORT GENERATION MENU

*******************************************************************************

Enter report option:

A  Keyholder Report
B  Inventory Report
C  Location Report
D  Key Retirement Report
E  Exit

*******************************************************************************

Please enter option choice: E

TOPS-20 Command processor 5(712)
$SHSJ

The following types of correspondence are available:

L: Letter
R: Report
Q: Quit

Please enter choice: Q

TOPS-20 Command processor 5(712)
$SHSJ

*******************************************************************************

FRONT OFFICE MENU

*******************************************************************************

Enter Function Choice:

A  Key Issue
R  Key Return
Enter Choice: C

Enter information topic option:
A Keyholder Information
B Key Number Information
C Building and Room Number Information
D Information on Keys Held
E Key Inventory Information
F Daily Cash Balance
G Exit

Enter Choice: F

Deposit Total
$.00

Do you wish to have the total cleared? (Y/N) N

Enter Choice: A

Enter option for which you have information:
Please enter menu choice. B

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: Q

There is no one who has all those keys issued to them
Do you have another request? (Y/N) Y

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: 6666666

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: Q

There is no one who has all those keys issued to them
Do you have another request? (Y/N) Y

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: 999999999

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: Q

There is no one who has all those keys issued to them
Do you have another request? (Y/N) Y

71022 INPUT ERROR, FIELD 1; PLEASE RETYPE LINE... Y

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: 62K123464

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: Q

NAME: HARRY RAY
NAME: JULIETTE CRUMP
NAME: KEN MILLER
Do you have another request? (Y/N) Y

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: 36H444666

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
There is no one who has all those keys issued to them.
Do you have another request? (Y/N) N

Enter option for which you have information:
A Building and room number
B Key numbers
C Exit

Please enter menu choice. C

Enter information topic option:
A Keyholder Information
B Key Number Information
C Building and Room Number Information
D Information on keys held
E Key Inventory Information
F Daily Cash Balance
G Exit

Enter Choice: D
Please enter the individual’s SSN. (9 digits).
( or a carriage return <cr> if none ) 516545186

That individual does not have any keys issued to him.
Do you have another request? (Y/N) Y
Please enter the individual’s SSN. (9 digits).
( or a carriage return <cr> if none ) 516745186

That individual does not have any keys issued to him.
Do you have another request? (Y/N) 251457199
?1022 INPUT ERROR, FIELD 1; PLEASE RETYPE LINE...

Y
Please enter the individual’s SSN. (9 digits).
( or a carriage return <cr> if none ) 251457199
NAME: DFT.DRFS RFN?
Do you have another request? (Y/N) N

TOPS-20 Command processor 51712
@$H$J

Enter information topic option:
A  Keyholder Information
B  Key Number Information
C  Building and Room Number Information
D  Information on Keys Held
E  Key Inventory Information
F  Daily Cash Balance
G  Exit

Enter Choice: E
Please enter the Key Number.
Key Number: 62K123464

KEY NUMBER  QUANTITY ON HAND  TOTAL OUT  TOTAL NUMBER
---------  -----------------  ---------  ----------
62K123464  9                 4          13

Do you have another request? (Y/N) B
Please enter the Key Number.
Key Number: 888888888
Invalid key number given.

Do you have another request? (Y/N) G
Please enter the Key Number.
Key Number: 7777777777
Invalid key number given.

Do you have another request? (Y/N) TYHUJ
71022 INPUT ERROR, FIELD 1; PLEASE RETYPE LINE...

71022 INPUT ERROR, FIELD 1; PLEASE RETYPE LINE...

Do you have another request? (Y/N) H
Please enter the Key Number.
Key Number: LKJUVH???
Invalid key number given.

Do you have another request? (Y/N) N
Please enter the Key Number.
Key Number: 000000000

Invalid key number given.

Do you have another request? (Y/N) K
Please enter the Key Number.
Key Number: 8UV8YUV7

Invalid key number given.

Do you have another request? (Y/N) F
Please enter the Key Number.
Key Number: N

Invalid key number given.

Do you have another request? (Y/N) N

TOPS-20 Command processor 5(712)
@$H$J

*******************************************************
******* INFORMATION ACCESS MENU ***********************
*******************************************************

Enter information topic option:
A Keyholder Information
B Key Number Information
C Building and Room Number Information
D Information on Keys Held
E Key Inventory Information
F Daily Cash Balance
G Exit

Enter Choice: G

TOPS-20 Command processor 5(712)
@$H$J

*******************************************************
******* FRONT OFFICE MENU ****************************
*******************************************************

Enter Function Choice:
A Key Issue
B Key Return
C Information Access
D Report or Letter Generation
E Exit Program

Enter Choice: A

Please enter 9-digit social security number.
If not available, simply type a 0 (zero).
SSN: n
SSN: 0
Is this correct? (Y/N) G
Please enter 9-digit social security number. If not available, simply type a 0 (zero).
SSN: 0

SSN: 0
Is this correct? (Y/N) Y
There is no corresponding record for that SSN.

Please enter issuee's last name: BUCK
Please enter issuee's first name and middle initial: DAVID F.

LAST NAME: BUCK
FIRST NAME: DAVID F.
Is this correct? (Y/N) T'HSKY

Please enter building abbreviation, (maximum 3 characters).
Bldg: MA

Please enter room number, (maximum 4 characters).
Room No: 001
Bldg: MA
Room No: 001
Is this correct? (Y/N) Y

Enter deposit amount
If amount is other than standard, type in new amount, otherwise type a carriage return: 896

The following record will be entered into the files:
Name: DAVID F. BUCK
Bldg & Room: MA 001
Key Number: 2F246834
Deposit Amt: $896.00
Is this correct? (Y/N) Y

That record has been entered.
Do you have another entry for this individual (Y/N) N

TOPS-20 Command processor 5(712)
@$H$J

*****************************************************
*                                                  *
*          FRONT OFFICE MENU                        *
*                                                  *
*****************************************************
*                                                  *
* Enter Function Choice:                           *
*    A Key Issue                                  *
*    B Key Return                                 *
*    C Information Access                         *
*    D Report or Letter Generation                *
*                                                  *
*****************************************************
Enter Choice: B

Please enter SSN or a 0 <zero> if not available: 0

SSN: 0
Is this correct? (Y/N) Y

Please enter the individual's last name.
Last Name: MILEY

Please enter individual's first name and middle initial if known.
First Name: MICHELE NONE

Last Name: MILEY
First Name: MICHELE NONE
Is this correct? (Y/N) Y

The matching SSN could not be found

There is no record for that individual.
This operation is aborted.
(Type carriage return <cr> to continue).

TOPS-20 Command processor 5(712)
@SH$J

Enter Choice: B

Please enter SSN or a 0 <zero> if not available: 516745486

SSN: 516745486
Is this correct? (Y/N) Y

Please enter the individual's last name.
Last Name: BUCK

Please enter individual's first name and middle initial if known.
First Name: DAVID F.

Last Name: BUCK
First Name: DAVID F.
Is this correct? (Y/N) Y
Enter the key number of the returned key.
Key Number: 8

Key Number: 8
Is this correct? (Y/N) N

Enter the key number of the returned key.
Key Number: 8

Key Number: 8
Is this correct? (Y/N) Y
The record corresponding to that individual and key number could not be located.
(type carriage return <cr> to continue)

Do you have more keys to return for this individual? (Y/N) Y

Enter the key number of the returned key.
Key Number: 62K123464

Key Number: 62K123464
Is this correct? (Y/N) Y
The record corresponding to that individual and key number could not be located.
(type carriage return <cr> to continue)

Do you have more keys to return for this individual? (Y/N) Y

Enter the key number of the returned key.
Key Number: 0

Key Number: 0
Is this correct? (Y/N) Y
The record corresponding to that individual and key number could not be located.
(type carriage return <cr> to continue)

Do you have more keys to return for this individual? (Y/N) N

TOPS-20 Command processor 5(712)
@SHSJ

Enter Choice: A

Front Office Menu

Enter Function Choice:
A Key Issue
B Key Return
C Information Access
D Report or Letter Generation
E Exit Program

Enter Choice: A

Please enter 9-digit social security number,
If not available, simply type a 0 (zero).
SSN: 0

SSN: 0
Is this correct? (Y/N) Y
There is no corresponding record for that SSN.

Please enter issuee's last name: MILEY

Please enter issuee's first name and middle initial: MICHELE NONE

LAST NAME: MILEY
FIRST NAME: MICHELE NONE

Is this correct? (Y/N) Y

The matching SSN could not be found

Please enter building abbreviation, (maximum 3 characters).
Bldg: MA

Please enter room number, (maximum 4 characters).
Room No: 001

Bldg: MA
Room No: 001

Is this correct? (Y/N) Y

Enter deposit amount
If amount is other than standard, type in new amount, otherwise type a carriage return: 99

The following record will be entered into the files:
Name: MICHELE NONE MILEY
Bldg & Room: MA 001
Key Number: 2F246834
Deposit Amt: $99.00

Is this correct? (Y/N) Y

That record has been entered.

Do you have another entry for this individual (Y/N) N

TOPS-20 Command processor 5(712)
$SHSJ
*
*****************************************************************************
** FRONT OFFICE MENU **
*****************************************************************************
*
* Enter Function Choice: *
* A Key Issue *
* B Key Return *
* C Information Access *
* D Report or Letter Generation *
* E Exit Program *
*
*****************************************************************************
Enter Choice: C

TOPS-20 Command processor 5(712)
$SHSJ
*
*****************************************************************************
*
Enter Choice: A

TOPS-20 Command processor 5(712)
@S$J
@

Enter option for which you have information:
* A Building and room number
* B Key numbers
* C Exit

Please enter menu choice. A

Please enter the building abbreviation
(maximum 3 characters):
Bldg: MA

Please enter the room number
(maximum 4 characters):
Room No: 001

Bldg: MA Room No: 001
Is this correct? (Y/N) Y

NAME: RHEA ASHMORE
NAME: GERRY BAERTSCH
NAME: GLENDA BARNES
NAME: MICHELE NONE MILEY

Do you have another request? (Y/N) N

TOPS-20 Command processor 5(712)
@S$J
@
Please enter menu choice. B

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: 62K123464

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: Q
NAME: BARBARA BAIN
NAME: HARRY RAY
NAME: JULIETTE CRUMP
NAME: KEN MILLER
Do you have another request? (Y/N) N

TOPS-20 Command processor 5(712)
@$HSJ

**************************************************

KEYHOLDER INFORMATION MENU

**************************************************

Enter option for which you have information:
A Building and room number
B Key numbers
C Exit

**************************************************

Please enter menu choice. C

TOPS-20 Command processor 5(712)
@$HSJ

**************************************************

INFORMATION ACCESS MENU

**************************************************

Enter information topic option:
A Keyholder Information
B Key Number Information
C Building and Room Number Information
D Information on Keys Held
E Key Inventory Information
F Daily Cash Balance
G Exit

**************************************************

Enter Choice: A

TOPS-20 Command processor 5(712)
@$HSJ

**************************************************

KEYHOLDER INFORMATION MENU
Please enter menu choice. C

TOPS-20 Command processor 5(712)
$SHSJ

************** INFORMATION ACCESS MENU **************

Enter information topic option:
A Keyholder Information
B Key Number Information
C Building and Room Number Information
D Information on Keys Held
E Key Inventory Information
F Daily Cash Balance
G Exit

Enter Choice: E
Please enter the Key Number.
Key Number:
Invalid key number given.

Do you have another request? (Y/N) N

TOPS-20 Command processor 5(712)
$SHSJ

************** INFORMATION ACCESS MENU **************

Enter information topic option:
A Keyholder Information
B Key Number Information
C Building and Room Number Information
D Information on Keys Held
E Key Inventory Information
F Daily Cash Balance
G Exit

Enter Choice: F
Deposit Total
$995.00

Do you wish to have the total cleared? (Y/N) N
TOPS-20 Command processor 5(712)

Enter Choice: G

Enter Choice: A

Please enter 9-digit social security number,
If not available, simply type a 0 (zero).
SSN: 516745486

Is this correct? (Y/N) Y

There is no corresponding record for that SSN.

Please enter issuee's last name: BUCK

Please enter issuee's first name and middle initial: DAVID F.

LAST NAME: BUCK
FIRST NAME: DAVID F.

Is this correct? (Y/N) Y

Please enter building abbreviation,
(maximum 3 characters).
RIdo: MA 001
Please enter room number, (maximum 4 characters).
Room No: 001
Bldg: MA
Room No: 001
Is this correct? (Y/N) Y
Enter deposit amount
If amount is other than standard, type in new amount, otherwise type a carriage return: 8

The following record will be entered into the files:
Name: DAVID F. BUCK
Bldg & Room: MA 001
Key Number: 2F246814
Deposit Amt: $8.00
Is this correct? (Y/N) Y
That record has been entered.
Do you have another entry for this individual (Y/N) Y
Please enter building abbreviation, (maximum 3 characters).
Bldg: LIB
Please enter room number, (maximum 4 characters).
Room No: 114
Bldg: LIB
Room No: 114
Is this correct? (Y/N) Y
Enter deposit amount
If amount is other than standard, type in new amount, otherwise type a carriage return: 4

The following record will be entered into the files:
Name: DAVID F. BUCK
Bldg & Room: LIB 114
Key Number: 36H6666666
Deposit Amt: $4.00
Is this correct? (Y/N) Y
That record has been entered.
Do you have another entry for this individual (Y/N) N

TOPS-20 Command processor 5(712)
@SH$3

***********************************************

                   FRONT OFFICE MENU

***********************************************

Enter Function Choice:
  A Key Issup

#
Enter Choice: C

TOPS-20 Command processor 5(712)  
@$SHSJJ

INFORMATION ACCESS MENU

Enter information topic option:
A Keyholder Information
B Key Number Information
C Building and Room Number Information
D Information on Keys Held
E Key Inventory Information
F Daily Cash Balance
G Exit

Enter Choice: B

Please enter the building abbreviation
(maximum 3 characters)
Bldg: LIB

Please enter the room number
(maximum 4 characters)
Room No: 114

LIB 114 36H666666

Do you have another request? (Y/N) N

TOPS-20 Command processor 5(712)
@$SHSJJ

INFORMATION ACCESS MENU

Enter information topic option:
A Keyholder Information
B Key Number Information
C Building and Room Number Information
D Information on Keys Held
E Key Inventory Information
F Daily Cash Balance
G Exit

Enter Choice: D

Please enter the individual’s SSN (9 digits).
(or a carriage return <cr> if none) 516745486
Key Number | Date Out   | Deposit Amount
---------- |----------- |-----------------
36H444444  | 7/30/1985  | $2.00
2F246834   | 7/30/1985  | $896.00
2F246834   | 7/30/1985  | $8.00
36H666666  | 7/30/1985  | $4.00

Do you have another request? (Y/N) N

TOPS-20 Command processor 5(712)

Enter Choice: F

Deposit Total
$1007.00

Do you wish to have the total cleared? (Y/N) N

Type a carriage return <cr> to continue

Enter Choice: A

TOPS-20 Command processor 5(712)

Enter Choice: A
**Please enter menu choice. A, B, C or Y/N.**

Please enter the building abbreviation (maximum 3 characters):
Bldg: LIB

Please enter the room number (maximum 4 characters):
Room No: 114

Bldg: LIB
Room No: 114
Is this correct? (Y/N) Y
NAME: SHARON BARRETT
NAME: HARRY RAY
NAME: GLEN READ
NAME: EVAN Denny
NAME: SURESH VADHVA

Do you have another request? (Y/N) K

Please enter the building abbreviation (maximum 3 characters):
Bldg: MA

Please enter the room number (maximum 4 characters):
Room No: 001

Bldg: MA
Room No: 001
Is this correct? (Y/N) Y
NAME: RHEA ASHMORE
NAME: GERRY BAERTSCH
NAME: GLENDA BARNES
NAME: MICHELE NONE MILEY

Do you have another request? (Y/N) M

Please enter the building abbreviation (maximum 3 characters):
Bldg: K

Please enter the room number (maximum 4 characters):
Room No: 99

Bldg: K
Room No: 99
Is this correct? (Y/N) N

Please enter the building abbreviation (maximum 3 characters):
Bldg: O
Please enter the room number (maximum 4 characters):
Room No: ;
Bldg: 0
Room No: ;
Is this correct? (Y/N) Y
You have an invalid building and room number
Do you have another request? (Y/N) N

TOPS-20 Command processor 5(712)
@SH$J

KEYHOLDER INFORMATION MENU

Enter option for which you have information:
A Building and room number
B Key numbers
C Exit

Please enter menu choice. B

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: 2F246834

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: 36H666666

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: 36H444444

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: Q
Do you have another request? (Y/N) N

TOPS-20 Command processor 5(712)
@SH$J
Please enter menu choice. B

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: 36H666666

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: Q
NAME: SHARON BARRETT
NAME: HARRY RAY
NAME: GLEN READ
NAME: EVAN DENNY
NAME: SURESH VADHVA

Do you have another request? (Y/N) Y

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: 2F246834

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: Q
NAME: RHEA ASHMORE
NAME: GERRY BAERTSCH
NAME: GLENDA BARNES
NAME: MICHELE NONE MILEY

Do you have another request? (Y/N) Y

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: 36H444444

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: Q
NAME: SALLY SMITH
NAME: HOWARD JONES
NAME: DAVID ALT
NAME: AARON ANDREASON
NAME: GERRY BAERTSCH
NAME: BARBARA BAIN
NAME: GREGORY BARRETT
NAME: JOAN RADANDT
NAME: JULIA RADTKE
NAME: JAMES RANNEY
NAME: HARRY RAY
NAME: MARLYN EGGE
NAME: IRENE EVERS
NAME: BETTINA ESCUDERO
NAME: JULIETTE CRUMP
NAME: ANN SMITH
NAME: SURESH VADHVA

Do you have another request? (Y/N) N

TOPS-20 Command Processor S/370
Please enter menu choice. C

TOPS-20 Command processor 5(712)

Enter Choice: D

Please enter the individual's SSN. (9 digits).
(or a carriage return <cr> if none) 516745486

Key Number       Date Out    Deposit Amount
-----------------------------------------------------------------------------------
36H4444444        7/30/1985    $2.00
2F246834          7/30/1985    $896.00
2F246834          7/30/1985    $8.00
36H6666666        7/30/1985    $4.00

Do you have another request? (Y/N) H

Please enter the individual's SSN. (9 digits).
(or a carriage return <cr> if none) 777808999

That individual does not have any keys issued to him.

Do you have another request? (Y/N) F

Please enter the individual's SSN. (9 digits).
(or a carriage return <cr> if none) MMMMMMMMMMM
21022 INPUT ERROR, FIELD 1; PLEASE RETYPE LINE...
7777777777777
21022 INPUT ERROR, FIELD 1; PLEASE RETYPE LINE...
That individual does not have any keys issued to him.

Do you have another request? (Y/N) N

TOPS-20 Command processor 5(712)
@$SHSJ

INFORMATION ACCESS MENU

Enter information topic option:
  A Keyholder Information
  B Key Number Information
  C Building and Room Number Information
  D Information on Keys Held
  E Key Inventory Information
  F Daily Cash Balance
  G Exit

Enter Choice: A

TOPS-20 Command processor 5(712)
@$SHSJ

KEYHOLDER INFORMATION MENU

Enter option for which you have information:
  A Building and room number
  B Key numbers
  C Exit

Please enter menu choice. B

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: Q

There is no one who has all those keys issued to them. Do you have another request? (Y/N) Y

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: 2P246834

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: Q
NAME: RHEA ASHMORE
NAME: GERRY BAERTSCH
NAME: GLINDA RARNES
NAME: MICHELE NONE MILEY
Do you have another request? (Y/N) N

TOPS-20 Command processor 5(712)

***********************************************************
* KEYHOLDER INFORMATION MENU *
***********************************************************
Enter option for which you have information:
* A Building and room number
* B Key numbers
* C Exit

Please enter menu choice. C

TOPS-20 Command processor 5(712)

***********************************************************
* INFORMATION ACCESS MENU *
***********************************************************
Enter information topic option:
* A Keyholder Information
* B Key Number Information
* C Building and Room Number Information
* D Information on Keys Held
* E Key Inventory Information
* F Daily Cash Balance
* G Exit

Enter Choice: G

TOPS-20 Command processor 5(712)

***********************************************************
* FRONT OFFICE MENU *
***********************************************************
Enter Function Choice:
* A Key Issue
* B Key Return
* C Information Access
* D Report or Letter Generation
* E Exit Program

Enter Choice: B

Please enter SSN or a 0 <zero> if not available: 516745486

SSN: 516745486
Is this correct? (Y/N) Y

Please enter the individual's last name.
Last Name: BUCK

Please enter individual's first name and middle initial if known.
First Name: DAVID F.

Last Name: BUCK
First Name: DAVID F.
Is this correct? (Y/N) Y

buck  david f.  516745486
BUCK  DAVID F.  516745486
BUCK  DAVID F.  516745486

With the information given the correct individual cannot be determined. All the above records apply. Do you have additional information to distinguish between entries (Y/N) Y

Enter the corresponding SSN. 516745486

SSN: 516745486

Is this correct? (Y/N): Y

Enter the key number of the returned key.
Key Number: 2F246834

Key Number: 2F246834
Is this correct? (Y/N) Y

The following record will be deleted from the files:
Name: DAVID F. BUCK
Key Number: 2F246834
Bidg: MA
Room Num: 001
Deposit Amount: $896.00
Deposit Amount: $8.00

Is this correct? (Y/N) Y
The record has been deleted.

Do you have more keys to return for this individual? (Y/N) N

TOPS-20 Command processor 5(712)
@SH$J
@
Enter Social Security Number:

SSN: 

Is this correct? (Y/N) Y

Please enter issuee's last name: BUCK

Please enter issuee's first name and middle initial: DAVID F.

LAST NAME: BUCK
FIRST NAME: DAVID F.

Is this correct? (Y/N) Y

buck david f. 516745486
BUCK DAVID F. 516745486
BUCK DAVID F. 516745486

With the information given the correct individual cannot be determined. All the above records apply. Do you have additional information to distinguish between entries (Y/N) N

Please enter building abbreviation, (maximum 3 characters).
Bldg: MA

Please enter room number, (maximum 4 characters).
Room No: 001

Bldg: MA
Room No: 001

Is this correct? (Y/N) Y

Enter deposit amount
If amount is other than standard, type in new amount, otherwise type a carriage return: 666

The following record will be entered into the files:

Name: DAVID F. BUCK
Bldg & Room: MA 001
Key Number: 2F246834
Deposit Amt: $666.00
Is this correct? (Y/N) Y

That record has been entered.

Do you have another entry for this individual (Y/N) Y

?1022 INPUT ERROR, FIELD 1; PLEASE RETYPE LINE...

Y

Please enter building abbreviation, (maximum 3 characters).
Bldg: LTR
Please enter room number, (maximum 4 characters).
Room No: 110

Bldg: LIB
Room No: 110

Is this correct? (Y/N) Y

Enter deposit amount
If amount is other than standard, type in new amount, otherwise type a carriage return: 2

The following record will be entered into the files:
Name: DAVID F. BUCK
Bldg & Room: LIB 110
Key Number: 3666444444
Deposit Amt: $2.00
Is this correct? (Y/N) Y

That record has been entered.
Do you have another entry for this individual (Y/N) N

TOPS-20 Command processor 5(712)
@$H$J

*******************************
*  *
* FRONT OFFICE MENU *
*  *
****************************

Enter Function Choice:
A Key Issue
B Key Return
C Information Access
D Report or Letter Generation
E Exit Program

Enter Choice: E

TOPS-20 Command processor 5(712)
@$H$J

*******************************
*  *
* KEY INVENTORY CONTROL MENU *
*  *
****************************

Enter Program Choice:
A Front Office Procedures
B Locksmith Procedures
C Maintenance Procedures
D Exit Program

Enter Choice: B

Enter Password: 7144678
TOPS-20 Command processor 5(712)
@$HSJ  

TOPS-20 Command processor 5(712)
@$HSJ

Customer Menu
*******************************************
Choose Option:
A Complete Key Orders
B Replace Key
C Rekey Lock
D Inventory Control
E Exit

Enter choice: D

TOPS-20 Command processor 5(712)
@$HSJ

INVENTORY CONTROL MENU

Choose Option:
A Change Inventory
B Order Parts
C Add Item
D Delete Item
E Print Inventory
F Exit

Enter choice: E

TOPS-20 Command processor 5(712)
@$HSJ

Keyway Number | Quantity on Hand
---------------|-----------------|
3K             | 332             |
2F             | 95              |
3GH            | 89              |
62K            | 206             |
4K3F           | 73              |

Type carriage return <cr> to continue:

TOPS-20 Command processor 5(712)
@$HSJ

INVENTORY CONTROL MENU
Choose Option:
A Change Inventory
B Order Parts
C Add Item
D Delete Item
E Print Inventory
F Exit

Enter choice: F

TOPS-20 Command processor 5(712)
®5HSJ

LOCKSMITH MENU

Choose Option:
A Complete Key Orders
B Replace Key
C Rekey Lock
D Inventory Control
E Exit

Enter choice: E

TOPS-20 Command processor 5(712)
®5HSJ

KEY INVENTORY CONTROL MENU

Enter Program Choice:
A Front Office Procedures
B Locksmith Procedures
C Maintenance Procedures
D Exit Program

Enter Choice: C

Enter Password:
999000

TOPS-20 Command processor 5(712)
®5HSJ
@ Incorrect Password
Please Re-enter Password
3456789

TOPS-20 Command processor 5(712)
®5HSJ
@
Please enter the file to be restored: B

TOPS-20 Command processor 5(712)

@?
Unrecognized command - File not found - "NAME.CTL"
@A?
Unrecognized command - Ambigious - "A"

#USE KEYS
Unrecognized command - Does not match switch or keyword - "USE"

@1 "HSK022
7/30/85
System 1022A 116A(436)

* USE KEYS

TOPS-20 Command processor 5(712)

#SH$J

* KEY INVENTORY CONTROL MENU

Enter Program Choice:
A Front Office Procedures
B Locksmith Procedures
C Maintenance Procedures
D Exit Program

Enter Choice: A

Enter Password:
1234567

TOPS-20 Command processor 5(712)

@SH$J

TOPS-20 Command processor 5(712)

@SH$J

* FRONT OFFICE MENU
Enter Function Choice:
A Key Issue
B Key Return
C Information Access
D Report or Letter Generation
E Exit Program

Enter Choice: E

TOPS-20 Command processor 5(712)
@SH$J

KEY INVENTORY CONTROL MENU

Enter Program Choice:
A Front Office Procedures
B Locksmith Procedures
C Maintenance Procedures
D Exit Program

Enter Choice: A
Enter Password:
1234567

TOPS-20 Command processor 5(712)
@SH$J

TOPS-20 Command processor 5(712)
@SH$J

FRONT OFFICE MENU

Enter Function Choice:
A Key Issue
B Key Return
C Information Access
D Report or Letter Generation
E Exit Program

Enter Choice: C

TOPS-20 Command processor 5(712)
@SH$J

INFORMATION ACCESS MENU

Enter information topic option:
Enter Choice: B

Please enter the building abbreviation
( maximum 3 characters)
Bldg: LIB

Please enter the room number
( maximum 4 characters)
Room No: 110

LIB 110 36H444444

Do you have another request? (Y/N) Y

Please enter the building abbreviation
( maximum 3 characters)
Bldg: MA

Please enter the room number
( maximum 4 characters)
Room No: 001

MA 001 2P246834

Do you have another request? (Y/N) N

TOPS-20 Command processor 5(712)
@$H$ J
0

*****************************************************************************

INFORMATION ACCESS MENU

*****************************************************************************

Enter information topic option:
A Keyholder Information
B Key Number Information
C Building and Room Number Information
D Information on Keys Held
E Key Inventory Information
F Daily Cash Balance
G Exit

*****************************************************************************

Enter Choice: B

Please enter the building abbreviation
( maximum 3 characters)
Bldg: LIB

Please enter the room number
( maximum 4 characters)
Room No: 110

LIB 110 36H444444
Do you have another request? (Y/N)  N

TOPS-20 Command processor 5(712)
@$HSJ
@

******************************************************************************

*   INFORMATION ACCESS MENU   *
*
******************************************************************************

* Enter information topic option: *
*   A  Keyholder Information   *
*   B  Key Number Information  *
*   C  Building and Room Number Information  *
*   D  Information on Keys Held  *
*   E  Key Inventory Information  *
*   F  Daily Cash Balance  *
*   G  Exit  *
******************************************************************************

Enter Choice: A

TOPS-20 Command processor 5(712)
@$HSJ
@

******************************************************************************

* KEYHOLDER INFORMATION MENU *
*
******************************************************************************

* Enter option for which you have information: *
*   A  Building and room number  *
*   B  Key numbers  *
*   C  Exit  *
******************************************************************************

Please enter menu choice. B

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: 2P246834

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: Q

NAME: RHEA ASHMORE
NAME: GERRY BAERTSCH
NAME: GLENDA BARNES
NAME: MICHELE NONE MILEY

Do you have another request? (Y/N)  Y

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number: 36H666666

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys.
Key Number:  


NAME: SHARON BARRETT
NAME: HARRY RAY
NAME: GLEN READ
NAME: EVAN DENNY
NAME: SURESH VADHVA

Do you have another request? (Y/N) Y

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys. Key Number: 36H444444

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys. Key Number: Q
NAME: SALLY SMITH
NAME: HOWARD JONES
NAME: DAVID ALT
NAME: GREGORY BARRETT
NAME: JOAN RADANDT
NAME: JULIA RADTKE
NAME: JAMES RANNEY
NAME: HARRY RAY
NAME: MARILYN EGGE
NAME: IRENE EVERS
NAME: BETTINA ESCUDERO
NAME: JULIETTE CRUMP
NAME: ANN SMITH
NAME: SURESH VADHVA

Do you have another request? (Y/N) Y

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys. Key Number: 2F246834

Please enter a key number or a 'q' to indicate no more keys. If no names appear then no one has been issued that group of keys. Key Number: Q
NAME: RHEA ASHMORE
NAME: GERRY BAERTSCH
NAME: GLENDA BARNES
NAME: MICHELE NONE MILEY

Do you have another request? (Y/N) N

TOPS-20 Command processor 5(712)
@SH$J

********************************************************************
* KEYHOLDER INFORMATION MENU                                     *
*                                                                *
* Enter option for which you have information:                   *
* A Building and room number                                     *
* B Key numbers                                                   *
********************************************************************
Please enter menu choice. C

TOPS-20 Command processor 5(712) @$H$J

*****************************************************************************
*****************************************************************************

INFORMATION ACCESS MENU

*****************************************************************************

Enter information topic option:
A Keyholder Information
B Key Number Information
C Building and Room Number Information
D Information on Keys Held
E Key Inventory Information
F Daily Cash Balance
G Exit

Enter Choice: G

*****************************************************************************
*****************************************************************************

FRONT OFFICE MENU

*****************************************************************************

Enter Function Choice:
A Key Issue
B Key Return
C Information Access
D Report or Letter Generation
E Exit Program

Enter Choice: E

*****************************************************************************
*****************************************************************************

KEY INVENTORY CONTROL MENU

*****************************************************************************

Enter Program Choice:
A Front Office Procedures
B Locksmith Procedures
C Maintenance Procedures
D Exit Program

Enter Choice: C
Enter Password: 3456789

TOPS-20 Command processor 5(712)
@SHSJ @

TOPS-20 Command processor 5(712)
@SHSJ @

FILE RESTORATION MENU

Enter file to be restored:
A Individual Record File
B Name File
C Inventory File
D Location File
E Keyway File
F Order File
G All Files
H Exit

Please enter the file to be restored: B

TOPS-20 Command processor 5(712)
@
Unrecognized command - File not found - "NAME.CTL"
@BUCK, D
Unrecognized command - Does not match switch or keyword - "BUCK"
@POP

TOPS-20 Command processor 5(712)
@SHSJ @

FILE RESTORATION MENU

Enter file to be restored:
A Individual Record File
B Name File
C Inventory File
D Location File
E Keyway File
F Order File
G All Files
H Exit

Please enter the file to be restored: BUCK, DAVID F.
21022 INPUT ERROR, FIELD 1; PLEASE RETYPE LINE...
BUCK
21022 INPUT ERROR, FIELD 1; PLEASE RETYPE LINE...
C
TOPS-20 Command processor 5(712)

*Unrecognized command - File not found - "INVENTORY.CTL"

7/30/85

System 1022A 116A(436)

* EXIT

EXIT

TOPS-20 Command processor 5(712)

FILE RESTORATION MENU

Please enter the file to be restored: H

TOPS-20 Command processor 5(712)

KEY INVENTORY CONTROL MENU

Enter Program Choice:

Enter Choice: D

TOPS-20 Command processor 5(712)
FILE RESTORATION MENU

Enter file to be restored:
A  Individual Record File
B  Name File
C  Inventory File
D  Location File
E  Keyway File
F  Order File
G  All Files
H  Exit

Please enter the file to be restored: G

TOPS-20 Command processor 5(712)
$@Unrecognized command - File not found - "RESTORE.CTL"
$@POP

TOPS-20 Command processor 5(712)
$@SH$J

FILE RESTORATION MENU

Enter file to be restored:
A  Individual Record File
B  Name File
C  Inventory File
D  Location File
E  Keyway File
F  Order File
G  All Files
H  Exit

Please enter the file to be restored: H

TOPS-20 Command processor 5(712)
$@SH$J

FILE RESTORATION MENU

Enter file to be restored:
A  Individual Record File
B  Name File
C  Inventory File
D  Location File
E  Keyway File
F  Order File
G  All Files
H  Exit

KEY INVENTORY CONTROL MENU

Enter Program Choice:
A  Front Office Procedures
B  Locksmith Procedures
C  Maintenance Procedures
D  Exit Program

Enter Choice: D
EXIT
CONN <CS. GRAD. ROBMICH>
?No such directory or structure not mounted
POP

[RECORDING TERMINATED AT 23:57:54]
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395
LOCATE.FIL.3

KEY BLDG ROOM
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2F246826 F 201
2F246828 MA 305
2F246830 MA 304
2F246832 MA 214
2F246834 MA 001
36H444444 LIB 110
36H666666 LIB 114
36H888888 LIB 118
3K123456 UH 315
3K123458 UH 214
3K123460 UH 22
3K123462 UH 2A
3K222222 UH UH
3K654324 LA 11
3K654326 LA 203
3K654328 LA 304
4K3F864286 UC CC
4K3F864288 UC WRC
4K3F864290 UC OPC
4K3F864292 UC BS
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NAME.FIL.3

SOCIAL
SECURITY LAST NAME FIRST
NUMBER NAME

-123456799 SMITH JOHN
-123456796 VADHVA SURESH
-123456795 ANDERSON ROBIN
-123456794 PAUXTLEROV ROBIN
-123456793 MILLER KEN
-123456792 ANDERSON JOE
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-123456789 SMITH JOHN
796349876 JACKSON ROBINSON

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KEY INVENTORY CONTROL SYSTEM

USER MANUAL

by

Robin Fauntleroy

Michele Miley
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Introduction

The Key Inventory Control System is a "menu-driven" program, meaning that when you run the program, and you are at a point that you may make one of many choices, those choices will be listed on the screen with a brief description of each choice, and a letter corresponding to that choice. To choose one of the displayed choices, simply type its corresponding letter followed by a carriage return. Should the user inadvertently type an invalid choice, the menu will be redisplayed and another opportunity will be given to enter the desired option. There are parts of the program that will require typing a response, but no menu will be displayed. This happens when the program needs some information from you in order to carry out the function that you have selected from the menu. In each of these cases, a "prompt" will be shown on the screen, or a question concerning the data the program needs. If the response must be entered in a special format, the "prompt" will
explain this also. Furthermore, if there are a limited number of responses to be made, such as "yes or no", these responses will be listed after the prompt.

In response to a prompt, there may be a time when you inadvertently type the wrong answer. After each prompt or series of prompts, the information you have typed in will be redisplayed, and you will be asked if the response you typed is the correct one. If it is not, simply answer "N" for no, and you will be given another chance to retype the information. If the information is correct, type "Y" for yes, and the program will carry out the function you requested, or if needed, will ask you for more information.

This manual is designed to walk through the program with you in the order that menu choices are displayed. Each function will be discussed and explained, and examples of the information you will see on the screen are shown. Each section is
System Description

The following pages provide a walkthrough of each of the available functions within the Key Inventory Control program. You may either read this section while working at the terminal, or prior to experimenting with the program. Examples of what you will encounter in the program are provided so that if you are not working at the terminal, you will know what to expect of each section.

The Key Inventory Control System is divided into three major parts, the Front Office Procedures, Locksmith Procedures, and Maintenance Procedures. The functions under the Front Office Procedures include Key Issue, Key Return, Information Access, and Report or Letter Generation. Under the Locksmith portion of the system you will find Key Order Completion, Key Replacement, Lock Rekeying, and Inventory Control. Finally, the
Maintenance subsystem contains the File Restoration function in addition to several automatic program maintenance procedures.

"Logging On" to the System

When you first turn on the terminal, you will see a blank screen. When you type a carriage return, the line:

```
WELCOME TO THE UNIVERSITY OF MONTANA
enter class
```

will appear on the screen. The class refers to the particular computer you have an account on, and for this program, that is "deca", so at this time type "deca" (without the quotation marks) and type a carriage return. Another message will be displayed on the terminal followed by the "@" sign. Next to the @ sign, type:

```
LOG CS.GRAD.ROBMICH KICS
```
When you type KICS, it will not show up on the screen. This is the password to enter the system, and should not be given to those not authorized to use the Key Inventory Control System. Several messages will be displayed, and finally an asterisk ("*") will appear on the screen. At the asterisk, type "use keys", and the program will begin running.

The Key Inventory Control Menu

Once you are in the Key Inventory Control System, the main menu will be displayed on the screen. It looks like:

******************************************************************************
* *
* KEY INVENTORY CONTROL MENU *
* *
******************************************************************************
* *
** Enter program choice: **
* A Front Office Procedures *
* B Locksmith Procedures *
* C Maintenance Procedures *
* D Exit Program *
* *
******************************************************************************
To choose the Front Office Procedures, simply type A in either upper or lower case followed by a carriage return. Likewise, to choose any of the other options, type the letter preceding it followed by a carriage return. If you choose option D, Exit Program, you will leave the program, and may then log off of the system. Choosing option A will result in the prompt:

Enter Password:

At this point you should enter the password for the Front Office Procedures, which is currently "1234567", however, you may change that to any password as long as it is seven letters/characters or less. If the wrong password is entered at this point, the message will appear:

Incorrect Password
Please Re-enter Password:
If the password is entered incorrectly again, you will not be allowed access to the program. Mail will be sent to the account administrator concerning the unauthorized attempted access. The password is displayed on the screen as you type it in, then the screen is cleared, however, this may be a slow process at times, therefore you should take care that unauthorized personnel do not witness this process.
The Front Office Menu

Once the password has been correctly entered for the Front Office Procedures, the Front Office Menu will be displayed. The menu appears as:

**********************************************************
*                                                        *
*        FRONT OFFICE MENU                               *
*                                                        *
**********************************************************
*                                                        *
* Enter Function Choice:                                 *
*   A  Key Issue                                        *
*   B  Key Return                                       *
*   C  Information Access                               *
*   D  Report or Letter Generation                      *
*   E  Exit                                            *
*                                                        *
**********************************************************

This menu lists the major functions within the Front Office portion of the system. Key Issue is chosen when an individual requests a key, whereas Key Return is the choice when an individual returns a key. The function of Information Access is to provide the user with a means of accessing a variety of information stored within the system.
Report of Letter Generation is utilized when the user wishes to generate letters to keyholders leaving the University system or when a specific report is desired. Exit will return you to the Main Menu.

The Key Issue Option

If the Key Issue function was chosen from the Front Office Menu, you will be prompted for the social security number of the individual requesting a key issue. If this number is not known, then you will be prompted to type in a zero. The prompt is as follows:

Please enter 9-digit social security number, If not available, simply type a 0 (zero). Social Security Number:

You will be asked if this is the correct entry and provided with an opportunity to change the number if it is not correct. Once you are satisfied that the entry is accurate, the program will attempt to
find the name associated with that social security number. If it is found, then it will be displayed on the screen and you may verify that with the individual, however, if it is not found you will be prompted to enter the last name, first name, and middle initial. The prompt will appear as follows:

Please enter issuee's last name:

Please enter issue's first name and middle initial:

In the case that there are several individuals with the same last name within the University records, these names and social security numbers will be displayed for the user to attempt to distinguish between the various records. If the user can determine the correct record, the program will prompt for the corresponding social security number. Otherwise, a unique identification number will be assigned to that individual by the program for the exclusive use of the Key Inventory Control
System. Following correct entry of the issuee's name, or verification of the name displayed by the program, you will be prompted for the building and room number that the individual wishes to be issued a key for. This will be displayed as:

Please enter building abbreviation (maximum 3 characters):

Please enter room number (maximum 4 characters):

Finally, you will be prompted for the deposit amount. If the deposit amount is the standard $2.00, no response is required except a carriage return <cr>. However, any other amount must be entered at this point. Entry must be an integer value. For example, $1.00 should be entered as 1.

This prompt will appear as:

Enter deposit amount
If amount is other than standard, type in new amount, otherwise type a carriage return <cr>:
This completes the key issue process for that particular key. You will be asked if there is another key to issue for that particular individual. If so, you will be asked to enter the building and room number and deposit amount. This will continue until you respond 'N', there are no more keys to issue to that individual and you will then be returned to the Front Office Menu.

The Return Key Function

If choice "B", Key Return, was selected from the Front Office Menu, information about the individual returning the key must be obtained. This procedure will follow that which was discussed previously under Issue Key regarding the issuee's social security number and/or name. Following this procedure, rather than requesting a building and room number, the program will request the number of the key being returned. This will be displayed as:
Enter the key number of the returned key:

After completing this process, you will again have the opportunity to continue returning keys for that individual. You will then be returned to the Front Office Menu.

The Information Access Menu

If Information Access was the function chosen from the Front Office Menu, then the Information Access Menu will be displayed. This allows you to choose the type of information you would like to obtain.
The selection of option "A", Keyholder Information, is used for obtaining a list of persons possessing keys for a particular building and room number or key number. Option "B", Key Number Information, requires the input of building and room number and will provide you with the corresponding key number. Selection "C", Building and Room Number Information, will display the corresponding building and room number, once a key number is entered. Option "D", Information on Keys Held will list all keys possessed by a given
individual. Key Inventory Selection, selection "E", provides you with a summary of the number of keys on hand, the number issued, and the total number. Option "F", Daily Cash Balance, will print out the current balance of cash received and refunded. It may be cleared upon request. The choice of option "G", Exit, will return you to the Front Office Menu.

The Keyholder Information Menu

Selection of the option of Keyholder Information in the Information Access Menu will result in the display of the Keyholder Information Menu. This menu will allow the user to choose which information to enter in order to obtain information concerning key holders.
Depending upon the information available to you, you may determine persons possessing a particular key or keys. Selection of option "A" will result in the prompt:

Please enter the building abbreviation (maximum 3 characters):

Please enter the room number (maximum 4 characters):

Those persons possessing the key for that building and room will then be displayed. However, should you have a key number or numbers, choice of option
"B" will then prompt you for those numbers as follows:

Please enter a key number or a 'q' to indicate there are no more keys:

This will result in a list of all persons who have been issued that group of keys. Choice "C" will return you to the Information Access Menu.

The Key Number Information Function

Selection of this option, "B", will provide you with the key number which corresponds to a particular building and room number. You will be prompted for this information as option "A" of the Key Holder Information Menu above.

Building and Room Number Information

Option "C", will display the building and room number corresponding to a given key number. You will be prompted for the key number in the
following manner:

Please enter the key number:

The Information on Keys Held Function

This function, "D", within the Information Access Menu, will display all keys held by a particular individual. You will be prompted, as in Issue Key, for a social security number, or, if not available a last and first name. Please see the section under Issue Key for more specific information on these prompts.

The Key Inventory Information Function

Option "E", given a valid key number, will display a summary of the quantity on hand, number issued, and total number of keys. This prompt will be identical to that seen in Option "C".

The Daily Cash Balance Function
This function, "F", on the Information Access Menu, will display the current balance of all cash received and refunded throughout the chosen time period. This may be used to balance the cash on hand for the daily deposit. An option is provided within this function to clear the total. Choice "G", Exit will return you to the Front Office Menu.

The Report or Letter Generation Function

If the user had entered the Report or Letter Generation function at the Front Office Menu, option "D", and then indicated (from a single prompt) the desire to generate reports, then the Report Generation Menu would appear. This menu indicates which reports the user may produce.
REPORT GENERATION MENU

Enter report option:
A Keyholder Report
B Inventory Report
C Location Report
D Key Retirement Report
E Exit

The report generation function allows the user to choose among a variety of reports available. The keyholder report will list keyholders and the corresponding keys that they have issued to them. The inventory report is a summary of the inventory available, and includes such information as total number of keys, amount issued, amount available, etc. The location report is a cross reference between the key numbers and the building and room numbers. Finally, the key retirement report is a list of all keys which have been 'retired' and the date of retirement.
The Keyholder Report Option

This option will allow the you to choose whether you would like a report consisting of the entire information, (a large report), or a "individual report", which consists of a subset of the information. Should you choose the "Total" report at the prompt, you will be asked whether you would like the information sorted by the social security number of the individuals or the key numbers. After responding to this prompt, the report will be generated and you will be returned to the menu. The final report will be stored in a file called "Keyholder.txt". The individual reports are subdivided by keyways. Should you choose this option, you will be prompted for the keyway number which you want the report based upon. As there are many keys under a particular keyway number, you will then have the same option of sorting on either social security number of key number.
The Inventory Report Option

This report option will also provide you with the opportunity of subdividing the report into smaller divisions. You will see the same prompt for either a "Total" report or an "Individual" report. If you choose the "Individual" report, you will be asked for the keyway number you wish the report to be based upon. The final report will be stored in a file called "Inven.txt".

The Location Report Option

This report will provide a cross reference between key numbers and building and room numbers. It also can be divided into particular keyway numbers, to allow for a more concise report. The final report may be found in a file called "Locat.txt".

The Key Retirement Option

The key retirement report will simply print a report of all keys that have been put on the
"retired" list and the date of retirement. The final report will be located in a file called "Retire.txt".

The Letter Generation Function

The letter generation function is not implemented at this time, however, sample letters can be found in the Appendix. A choice of any of the options, except "Q", will display a "Not Implemented Yet" message. Choice of "Q", will return you to the Front Office Menu.

If you chose option, "E", from the Front Office Menu, you will return to the Key Inventory Control Menu.
The Locksmith Menu

If selection "B", Locksmith Procedures is chosen at the Key Inventory Control Menu, the program will prompt you for a password in exactly the same manner encountered in the Front Office Procedures. The present password for this portion of the program is "2345678", however this may be changed if desired. Once the password has been entered correctly, the following menu is presented at the onset of the locksmith portion of the program.

******************************************************************************
* *
* LOCKSMITH MENU *
* *
******************************************************************************
* *
* Choose option: *
* A Complete Key Orders *
* B Replace Key *
* C Rekey Lock *
* D Inventory Control *
* E Exit *
* *
******************************************************************************
The Complete Key Orders function, option "A", provides the user with access to the orders received for keys from the Front Office Procedures. Orders may be viewed, completed, printed, and changed from this selection. Selection "B", Replace Key, records the return and subsequent replacement of a damaged or ineffective key. Option "C", Rekey Lock is designed to record the retirement of a key, and to generate the new key number to be used for that lock. Inventory Control, selection "D", allows the viewing, manipulation, and recording of keyway inventory levels. Option "E" will return you to the Key Inventory Control Menu.

The Complete Key Orders Menu

The following menu is presented to the user with the choice of 'A' on the Locksmith Menu.
Option "A", List Orders, will display all the orders needed by the Front Office to maintain an adequate supply of keys available for issue for each building and room. Change Orders, selection "B", allows you to change the priority and/or amount of keys in the key order list. Selection "C", Record Completion, will adjust key inventory levels as orders are completed. Print Orders, option "D", will produce a printed copy of the order list. Finally, option "E", Exit, will return you to the Locksmith Menu.
The List Orders Function

No input is required from you when this choice is selected from the Complete Key Orders Menu. The list of orders produced by the Front Office Procedures and the Rekey Lock Function will be displayed on the screen at this time.

The Change Orders Function

When this option is chosen from the Complete Key Orders Menu, a list of orders is displayed as in the List Orders Function, however, each order is preceded by a number to indicate its position in the list. You will be prompted for the order that you wish to change. The prompt is as follows:

Please type the number of the record you wish to change. (Enter a 0 (zero) if you wish to exit this portion of the program.)
Order Number:

What is the new priority you would like to assign?
Priority:

What is the new amount to be assigned?
Amount:
As with Front Office Procedures, if an incorrect entry is made, you will be given the opportunity to re-enter the correct data. The new amount and priority will be entered into the order file, replacing the existing values.

The Record Completion Function

Selection of choice "C", Record Completion, will display the order file as in the Change Order Function, with the preceding number. Once all keys have been made for a particular order, you may choose this option to delete that entry from the list. This will update the Front Office inventory file and the Locksmith keyway inventory file. You will again be prompted for the order number as follows:

Please type the number of the record which has been completed. (Enter a 0 (zero) if you wish to exit this portion of the program.)
Order Number:
The Print Orders Function

Choice "D" of the Complete Orders Menu will print a paper copy of the order list. To get a printout, simply type the 'print' key on the keyboard.

The Replace Key Function

Selection "B" from the Locksmith Menu, Replace Key, allows you to record the return of an irreparably damaged key. This will update the appropriate files. You will be prompted for the key number in the following way:

Enter the key number of the returned key. (If you wish to exit without entering the key number, type E for Exit.)
Key Number:

The Rekey Lock Function

Option "C" of the Locksmith Menu, the Rekey Lock Function, is used when a particular room is
being rekeyed. It will determine the new bit cut number to be used, whether an already existing and retired key, or an entirely new key. Upon entry to this portion of the program, you will be prompted as follows:

Do you wish to continue with the lock rekeying process? (Y/N)

At this point you may exit this section by typing "N", or proceed by typing "Y". If you exit, you will be returned to the Locksmith Menu, and if you continue, you will be prompted for the building and room number as follows:

Please enter the building and room number that are being rekeyed.  
Building:
Room Number:

As in other parts of the system, the program will ask you if this information is correct before performing any functions. If it is correct, the fol-
lowing prompt will appear:

Do you wish to use a new key number or an existing one? Type N for New, and E for Existing:

The choice of "E" is used when you have a retired key that you would like to use to rekey the lock, but are unsure if it has been in retirement long enough. Otherwise, you may enter "N", and the program will generate a new number with the same keyway that is two bit cuts away from any other number and is not in use. If you have decided to choose the "E" option, the following prompt will appear:

Please enter the old key number you wish to use. Old Key Number:

Again, the information you have entered will be verified, and if correct, will check whether that key is available for use. If it is available for
use, the following prompt will appear:

Enter the amount you have on hand.
Amount:

In response to this, you should enter the number of the retired keys you have on hand. An order will automatically be generated and placed on the order list as described in the Complete Key Orders Menu section of this document. In addition, the old key will be listed as retired, and the new key number to be used will be listed as the key opening that particular building and door.

The Inventory Control Menu

If you selected choice "D", Inventory Control, from the Locksmith Menu, the Inventory Control Menu will be displayed. It appears as:
Option "A", Change Inventory, is used to manually change the quantity on hand of key blanks listed in the inventory records, rather than rely on the automatic generation of order amounts. Order Parts, option "B", will generate the order amounts needed for each key blank and print these out on the printer. Selection "C", Add Item, is chosen when you receive an order and wish to increase the inventory levels listed. Delete Item, selection "D", is used to delete the record for a keyway that is no longer being used. Option "E", Print
Inventory, will produce a paper copy of the amounts on hand of each key blank. Finally, option "F", Exit, will return you to the Locksmith Menu.

The Change Inventory Function

When you enter the Change Inventory Function, you will be prompted with:

Do you wish to continue with the inventory change process? (Y/N)

If you choose "N", you will be returned to the Inventory Control Menu, however, if you choose "Y", the following prompt will appear:

Please enter the keyway number for which you wish to make a change.
Keyway Number:

Once you have entered the keyway number and verified that it is correct, you will be prompted with:
What is the new amount you would like to enter?  
Amount:

Again, once you've entered the amount and verified that it is correct, both the keyway number and the new amount listed will be displayed on the screen.

The Order Parts Function

The Order Parts Function, selection "B" on the Inventory Control Menu, is used to produce a listing of the number of key blanks to be ordered to bring the inventory levels of each blank to the threshold level.

The Add Item Function

If you chose option "C" at the Inventory Control Menu, this is the function you will be performing. This is used when an order is received and inventory levels must be increased to reflect that. You will be prompted as follows:
Please enter the keyway number for which you have received inventory.
Keyway Number:

What is the amount received?
Amount Received:

The amount you type in as amount received will be added to the current quantity on hand once you have indicated that it is correct. You will next be prompted with:

Do you have more entries to add? (Y/N)

A choice of "Y" will repeat the process you have just completed, while the choice of "N" will return you to the Inventory Control Menu.

The Delete Item Function

If a keyway number is no longer in use, it may be deleted from the files with this function.
You will be prompted with:
Please enter the keyway number for the record to be deleted.
Keyway Number:

If there are no records with that keyway number, a message will appear on the screen informing you of this, and no change will be made to the files, however, if that number does exist, it will be deleted from the files.

The Print Inventory Function

The Print Inventory function prints a paper copy of the amounts on hand for each keyway number. To activate the printer, simply type the `print` key.
The Maintenance Function

If, at the Key Inventory Control Menu level, you had chosen the Maintenance Program option, and entered the password correctly, this would allow access to the file restoration function. This function allows you to pull previously stored files from magnetic tape to be accessed via interactive 1022 commands. The menu provided for this function allows you to choose which files you wish to restore. In addition to the file restoration function, the Maintenance Function performs other maintenance routines automatically, such as weekly saving of all files on magnetic tape, and checking threshold levels of Front Office keys and placing those needed into the Locksmith order list.

The File Restoration Menu

If you selected the Maintenance Program at the Key Inventory Control Menu, you would see the following menu:
FILE RESTORATION MENU

Enter file to be restored:

A Individual Record File
B Name File
C Inventory File
D Location File
E Keyway File
F Order File
G All Files
H Exit

Each of the choices listed represents a file that has been automatically saved weekly by the Maintenance Function, and which, should anything happen to your current files, could be restored so that a minimum of data would be lost. You may choose to only restore one file, perhaps to view historical data, or you may choose to restore them all. Because there is no current tape at the Computer Center for the Physical Plant, it is suggested that you do not run these modules at present,
although they are implemented and tested.

"Logging Off" of the System

When you are finished running the Key Inventory Control System, and you have selected the Exit Program option from the Key Inventory Control Menu, you will see an asterisk ("*") displayed on the screen. At this point type "exit" and a "@" sign will appear. Type "logout" at the "@" sign, and this will disengage your connection to the computer. Now you may turn off your terminal and Gandalf switch.
Appendix A: Sample Letters

The following letter shows the content of letters sent out to personnel and students leaving the University system if they still possess keys. The letter itself will be kept in a separate file so that it will be easily changed should another format be desirable in the future.

Date

Dear Student/University Employee,

It has come to our attention that you will soon be leaving the University system, and that you still possess one or more keys from the Physical Plant. Please return these to the Physical Plant prior to leaving, and your deposit will be refunded. The keys we show that you have are:

- Key Number 1
- Key Number 2
- ...
- Key Number n

Thank you for your cooperation!

University of Montana Physical Plant
Appendix B: Sample Reports

Several kinds of reports may be generated by the report generation function of the Key Inventory Control System. The format of these reports is shown below. Each sample is a greatly abbreviated representation of the actual report, but may be used to understand the layout of each.

Keyholder Report

<table>
<thead>
<tr>
<th>Keyholder Name</th>
<th>Key Number</th>
<th>Date Issued</th>
<th>Deposit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doe, John E.</td>
<td>3K68179</td>
<td>2/12/85</td>
<td>2.00</td>
</tr>
<tr>
<td></td>
<td>3K65132</td>
<td>3/15/84</td>
<td>2.00</td>
</tr>
<tr>
<td>Smith, Mary L.</td>
<td>3K63128</td>
<td>6/18/75</td>
<td>2.00</td>
</tr>
</tbody>
</table>

Inventory Report

<table>
<thead>
<tr>
<th>Key Number</th>
<th>Quantity on Hand</th>
<th>Quantity Out</th>
<th>Total Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>3K68179</td>
<td>10</td>
<td>25</td>
<td>35</td>
</tr>
<tr>
<td>2F43289</td>
<td>3</td>
<td>17</td>
<td>20</td>
</tr>
<tr>
<td>3K63219</td>
<td>18</td>
<td>5</td>
<td>23</td>
</tr>
</tbody>
</table>
Location Report

<table>
<thead>
<tr>
<th>Key Number:</th>
<th>Building:</th>
<th>Room Number:</th>
</tr>
</thead>
<tbody>
<tr>
<td>3K68179</td>
<td>UH</td>
<td>315</td>
</tr>
<tr>
<td>3K47328</td>
<td>UH</td>
<td>22</td>
</tr>
<tr>
<td>2F53728</td>
<td>LA</td>
<td>103</td>
</tr>
</tbody>
</table>

Key Retirement Report

<table>
<thead>
<tr>
<th>Key Number:</th>
<th>Quantity on Hand:</th>
<th>Quantity Out:</th>
<th>Total Number:</th>
<th>Date Retired:</th>
</tr>
</thead>
<tbody>
<tr>
<td>3K68179</td>
<td>33</td>
<td>2</td>
<td>35</td>
<td>1/15/85</td>
</tr>
<tr>
<td>2F34287</td>
<td>12</td>
<td>17</td>
<td>29</td>
<td>5/14/85</td>
</tr>
</tbody>
</table>
Module Name: 10 PASSWORD MAIN
Parameters:
  In Only:
  Out Only:
  In/Out: GI_ALLOW_ENTRY
  GI_MAIN_MENU_CHOICE
Coded By: Robin FauntLeRoy
Date Last Modified: July 9, 1985
Reason Modified:

Module Description: This module controls the password functions. It calls ACCEPT_PASSWORD and receives the GI_ALLOW_ENTRY flag from this module. Depending on the flag it may or may not call DISALLOW_ACCESS.

DEFINE TEXT 7 PASSWORD.

IF GI_MAIN_MENU_CHOICE EQ ('A', 'a', 'B', 'b', 'C', 'c') THEN
  PRINT "Enter Password:"
  ACCEPT PASSWORD.
  PUSH USING BL
  POP END.
  CALL ACCEPT_PASSWORD.
ENDIF.

IF GI_ALLOW_ENTRY EQ "F" THEN
  PRINT "Incorrect Password."
  PRINT "Please Re-enter Password."
  ACCEPT PASSWORD.
  PUSH USING BL
  POP END.
  CALL ACCEPT_PASSWORD.
ENDIF.

IF GI_ALLOW_ENTRY EQ "P" THEN
  CALL DISALLOW_ACCESS.
ENDIF.
RETURN.

ACCEPT_PASSWORD: @R101_ACCEPT_PASSWORD.DMC
DISALLOW_ACCESS: @R102_DISALLOW_ACCESS.DMC

SHOW
Module Name: 101 ACCEPT PASSWORD

Parameters:

In Only: PASSWORD
Out Only: 
In/Out: G1 MAIN MENU CHOICE

Coded By: Robin FauntLeRoy
Date Last Modified: July 9, 1985
Reason Modified:

Module Description: This module compares the value of the password accepted with the appropriate password for the system requested and sets the G1_ALLOW_ENTRY flag accordingly.

DEFINE TEXT 7 FRONT_PASSWORD
DEFINE TEXT 7 LOCK_PASSWORD
DEFINE TEXT 7 MAINT_PASSWORD.

LET FRONT_PASSWORD EQ "1234567".
LET LOCK_PASSWORD EQ "2345678".
LET MAINT_PASSWORD EQ "3456789".

IF G1_MAIN_MENU_CHOICE EQ ('A', 'a') AND PASSWORD EQ FRONT_PASSWORD OR
    G1_MAIN_MENU_CHOICE EQ ('B', 'b') AND PASSWORD EQ LOCK_PASSWORD OR
    G1_MAIN_MENU_CHOICE EQ ('C', 'c') AND PASSWORD EQ MAINT_PASSWORD THEN
    LET G1_ALLOW_ENTRY EQ "T".
ELSE
    LET G1_ALLOW_ENTRY EQ "F".
ENDIF.
RETURN.
Module Name: Disallow_Access
Parameters:
In Only:
Out Only:
In/Out:
Coded By: Robin FauntLeRoy
Date Last Modified: July 9, 1985
Reason Modified:

Module Description:
This module is the controller module for the processes that execute with an attempt by someone who doesn't know the correct password to enter the system.

CALL SEND_MAIL.
CALL LOGOUT_USER.
RETURN.

SEND_MAIL: 0R1021 SEND_MAIL.DMC
LOGOUT_USER: 0R1022 LOGOUT_USER.DMC
 tengo
Module Name: 1021 SEND_MAIL

Parameters:
In Only:
Out Only:
In/Out:

Coded By: Robin FauntleRoy
Date Last Modified: July 9, 1985
Reason Modified:

Module Description:
This module simply pushes out to the monitor level,
submits a batch job, which sends mail to the user notifying
them of an unauthorized entry attempt and then pops to return
to 1022.

PUSH USING SUBMIT MAIL/OUTPUT:ERRORS
POP END.
RETURN.
@
Module Name: 1022 Logout User
Parameters:
In Only: none
Out Only: none
In/Out: none
Coded By: Robin FauntLeRoy
Date Last Modified: July 17, 1985
Reason Modified:

Module Description:
This module is called if someone attempts to use the keys
system and does not have the proper passwords. It simply calls
the program end which closes all the files and exits 1022.

CALL PROGRAM_END.
Module Name: 11 Front Office Main
Parameters:
In Only: none
Out Only: G11_LAST_NAME
G11_FIRST_NAME
G11_NAME
G11_SS_NUMBER
In/Out: none
Coded By: Robin FauntLeRoy
Date Last Modified: July 9, 1985
Reason Modified:
Module Description:
The Main module is the controlling module for the front office and displays a menu asking the user to choose between the functions provided. It passes no parameters and accesses no files.

DEFINE TEXT 1 L1_FRONT_OFFICE_MENU_CHOICE
TEXT 17 G11_LAST_NAME
TEXT 30 G11_NAME
TEXT 13 G11_FIRST_NAME.
DEFINE INTEGER G11_SS_NUMBER.
REPEAT
REPEAT
PUSH USING BL
POP END.
PRINT " Enter Function Choice:"
PRINT " A Key Issue"
PRINT " B Key Return"
PRINT " C Information Access"
PRINT " D Report or Letter Generation"
PRINT " E Exit Program"
PRINT "***************
PRINT FMT $ "Enter Choice: " END.
ACCEPT L1_FRONT_OFFICE_MENU_CHOICE.
  IF L1_FRONT_OFFICE_MENU_CHOICE NEQ ( 'A', 'a', 'B', 'b', 'C', 'c', 'D', 'd', 'E', 'e' ) THEN
    PRINT "Invalid Choice, please try again.".
  ENDIF.
UNTIL L1_FRONT_OFFICE_MENU_CHOICE EQ ( 'A', 'a', 'B', 'b', 'C', 'c', 'D', 'd', 'E', 'e' ).
  IF L1_FRONT_OFFICE_MENU_CHOICE EQ ( 'A', 'a' ) THEN
    CALL ISSUE_KEY.
  ELSEIF L1_FRONT_OFFICE_MENU_CHOICE EQ ( 'B', 'b' ) THEN
    CALL RETURN_KEY.
  ELSEIF L1_FRONT_OFFICE_MENU_CHOICE EQ ( 'C', 'c' ) THEN
    CALL INFORMATION_ACCESS.
  ELSEIF L1_FRONT_OFFICE_MENU_CHOICE EQ ( 'D', 'd' ) THEN
    CALL GENERATE_CORRESPONDENCE.
  ELSE
    PRINT " ".
  ENDIF.
UNTIL L1_FRONT_OFFICE_MENU_CHOICE EQ ( 'E', 'e' ).
RETURN.

ISSUE_KEY: @R111_ISSUE_KEY.DMC
RETURN_KEY: @R112_RETURN_KEY.DMC
INFORMATION_ACCESS: @R113_INFORMATION_ACCESS.DMC
GENERATE_CORRESPONDENCE: @R114_GEN_CORRESPONDENCE.DMC

@
Module Name: ISSUE KEY

Parameters:

In Only:

Out Only: ISSUE_KEY_NUMBER

UNAVAILABLE

FOUND

BLD_NUMBER

ROOM_NUMBER

DEPOSIT

In/Out: SS_NUMBER

Last_Name

First_Name

Coded By: Robin Fauntleroy

Date Last Modified: July 10, 1985

Reason Modified:

Module Description:

This module will collect the information necessary to issue a key and then update the files to reflect this information.

DEFINE TEXT ISSUE_AVAILABLE

TEXT ISSUE_ANSWER

TEXT ISSUE_FILLER

TEXT ISSUE_FOUND

TEXT ISSUE_DONE

TEXT ISSUE_KEY_NUMBER

TEXT ISSUE_BLD_NUMBER

TEXT ISSUE_ROOM_NUMBER

TEXT ISSUE_DEPOSIT.

DEFINE INTEGER ISSUE_AMOUNT

INTEGER ISSUE_DEPOSIT.

LET ISSUE_FILLER EQ ".

LET ISSUE_FOUND EQ "F".

LET ISSUE_DONE EQ "F".

LET ISSUE_AVAILABLE EQ "F".

REPEAT

PRINT ".

PRINT "Please enter 9-digit social security number,\n
PRINT "If not available, simply type a 0 (zero). \n
PRINT FMT $ "SSN: "END.

ACCEPT ISSUE_SS_NUMBER.

PRINT "\n
PRINT "SSN: " ISSUE_SS_NUMBER.

PRINT FMT $ "Is this correct? (Y/N) \n
ACCEPT ISSUE_ANSWER.

UNTIL ISSUE_ANSWER EQ ('Y','y').

IF ISSUE_SS_NUMBER EQ 0 THEN

LET ISSUE_FOUND EQ "F".

ELSE

PRINT "\n
CALL FIND_NAME.

ENDIF.

IF ISSUE_FOUND EQ "F" THEN

PRINT "\n
PRINT "There is no corresponding record for that SSN.". 

REPEAT

PRINT "\n
"
PRINT FMT $ "Please enter issuee's last name: " END.
ACCEPT G11_LAST_NAME.
PRINT '".
PRINT "NAME: " G11_LAST_NAME.
PRINT '".
PRINT FMT $ "Please enter issuee's first name and middle initial
: " END.
ACCEPT G11_FIRST_NAME.
PRINT '".
PRINT "NAME: " G11_FIRST_NAME.
PRINT '".
PRINT FMT $ "Is this correct? (Y/N) " END.
ACCEPT L111_ANSWER.
UNTIL L111_ANSWER EQ ('Y','y')
LET G11_NAME = STRIM(G11_FIRST_NAME) + L111_FILLER + STRIM(G11_LAST_NAME).
ENDIF.
IF G11_SS_NUMBER EQ 0 THEN CALL FIND_SSN.
IF G11_SS_NUMBER NEQ 0 THEN LET G111_FOUND EQ "T".
ENDIF.
ENDIF.
REPEAT
REPEAT
PRINT ".
PRINT "Please enter building abbreviation,".
PRINT "(maximum 3 characters).".
PRINT FMT $ "Bldg: " END.
ACCEPT G111_BLD_NUMBER.
PRINT ".
PRINT "Please enter room number,".
PRINT "(maximum 4 characters).".
PRINT FMT $ "Room No: " END.
ACCEPT G111_ROOM_NUMBER.
PRINT ".
PRINT "Bldg: " G111_BLD_NUMBER.
PRINT "Room No: " G111_ROOM_NUMBER.
PRINT ".
PRINT FMT $ "Is this correct? (Y/N) " END.
ACCEPT L111_ANSWER.
UNTIL L111_ANSWER EQ ( 'Y','y' )
CALL FIND_KEY_NUMBER.
IF G111_AVAILABLE EQ "T" THEN
PRINT ".
PRINT "Enter deposit amount".
PRINT "If amount is other than standard, type in ".
PRINT FMT $ "new amount, otherwise type a carriage return: " EN

ACCEPT L111_DEPOSIT.
LET L111_AMOUNT EQ SINT(L111_DEPOSIT).
IF L111_AMOUNT GT 0 THEN LET G111_DEPOSIT EQ L111_AMOUNT.
ENDIF.
PRINT ".
PRINT "The following record will be entered into the files: ".
PRINT "Name: " G111_NAME.
PRINT "Bldg & Room: " G111_BLD_NUMBER G111_ROOM_NUMBER.
PRINT "Key Number: " G111_KEY_NUMBER.
PRINT "Deposit Amt: " G111_DEPOSIT.
PRINT FMT $ "Is this correct? (Y/N) " END.
ACCEPT L111_ANSWER.
IF L111_ANSWER EQ ( 'Y','y' ) THEN
CALL UPDATE_NAME_FILES.
ENDIF.
ENDIF.
PRINT "."
PRINT FMT $ "Do you have another entry for this individual (Y/N) " END.
ACCEPT L111_DONE.
UNTIL L111_DONE EQ "N".
RETURN.

FIND KEY NUMBER: @R1111_FIND_KEY_NUMBER.DMC
UPDATE_NAME_FILES: @R1112_UPDATE_NAME_FILES
FIND_NAME: @ R117_FIND_NAME.DMC
Module Name: 1111 Find Key Number

Parameters:
In Only: Gl11_BLD_NUMBER
Gl11_ROOM_NUMBER
Out Only:
In/Out: Gl11_AVAILABILITY
Gl11_Key Number

Coded By: Robin FauntleRoy
Date Last Modified: 7/10/85
Reason Modified:

Module Description:
This module will check the locate file to determine if there is a key that fits the appropriate room and building number given by the user who wishes to be issued a key. If an appropriate key number is found, then CheckInventory is called to determine if there is a key available to be issued.

DEFINE TEXT 1 L1111_WAIT.

DBSET LOCATE.
FIND ALL.
SEARCH BLD CT $TRIM(Gl11_BLD_NUMBER).
SEARCH RN CT $TRIM(Gl11_ROOM_NUMBER).
IF SYSREC EQ 1 THEN CALL CHECK_INVENTORY.
ELSE
PRINT " ".
PRINT "You have an invalid building and room combination.".
PRINT "Please check your numbers."
PRINT FMT $ "(Type a carriage return <cr> to continue) " END.
ACCEPT L1111_WAIT.
ENDIF.
RETURN.

CHECK_INVENTORY: @R1111_CHECK_INVENTORY.DMC
Module Name: llll1 Check Inventory
Parameters:
   In Only:
   Out Only:
   In/Out: Gl11 Available
   In/Out: Gl11 Key Number
Coded By: Robin FauntLeRoy
Date Last Modified: 7/10/85
Reason Modified:
Module Description:
This module takes the key number found by Find Key Number and checks to see if there is a key available to be issued. If there is, it decreases the quantity_on_hand by one and sets the available flag to true.

DEFINE TEXT 1 Llllll_FOUND
   TEXT 1 Llllll_WAIT.
LET Gl11 AVAILABLE EQ "P".
MAP TO INVEN VIA KIN.
IF SYSNREC EQ 1 THEN
   IF QON GT 0 THEN
      LET Llll11 FOUND EQ "T".
      LET Gl11 KEY NUMBER EQ KIN.
      CHANGE QON QON-1.
      LET Gl11_AVAILABLE EQ "T".
   ELSE
      PRINT " ".
      PRINT "There is an insufficient supply of that key ".
      PRINT "to issue one. The key number will be sent to ".
      PRINT "the locksmith to order some additional made.".
   ENDIF.
ELSE
   PRINT " ".
   PRINT "That key has no record in the inventory file."
   PRINT FMT "$ (Type a carriage return <cr> to continue) "END.
   ACCEPT Llllll_WAIT.
ENDIF.
RETURN.
Module Name: 1112 Update Name Files
Parameters:
   In Only: Gill Key Number
   Out Only:
   In/Out: Gill Ind Name
   Gill SS Number
   Coded By: Robin FauntLeRoy
   Date Last Modified: 7/11/85
   Reason Modified:
   Module Description:
   This module will add information to the Ind_Record file and
   the Name file (if necessary) to reflect a recent key issue

IFI11_SS_NUMBER LT 0 THEN
   CALL FIND_SSN.
ENDIF.
IFI11 FOUND NEQ "T" THEN
   IF Gill SS NUMBER EQ 0 THEN
      DBSET DUMMY SS.
      FIND ALL.
      LET Gill SS NUMBER EQ SSN.
      CHANGE SSN SSN-1.
   ENDIF.
   DBSET NAME.
   ADD SSN Gill SS_NUMBER LNM Gill LAST_NAME FNM Gill FIRST_NAME.
ENDIF.
DBSET IND RECORD.
ADD SSN Gill SS_NUMBER KIN Gill KEY_NUMBER DEP Gill DEPOSIT.
CALL BOOKKEEPING.
RETURN.
BOOKKEEPING: @R115_BOOKKEEPING.DMC
FIND_SSN: @R116_FIND_SSN.DMC
Module Name: 112 Return Key
Parameters:
In Only:
In/Out: Gll_SS_Number
Gll_First_Name
Gll_Last_Name
Out Only: Gll2_Key_Number
Coded By: Robin FauntLeRoy
Date Last Modified: 7/11/85
Reason Modified:

Module Description:
This module checks the files for the ssn and key number for an individual who is returning a key.

DEFINE TEXT 10 Gll2_KEY_NUMBER
TEXT 1 Lll2_DONE
TEXT 1 Lll2_ANSWER.

LET SYSCASE EQ 1.
LET Glll_FOUND EQ "F".
LET Gll_SS_NUMBER EQ 0.
LET Lll2_DONE EQ "Y".
REPEAT
PRINT " 
PRINT FMT $ "Please enter SSN or a 0 <zero> if not available: 
" "END.
ACCEPT Gll_SS_NUMBER.
PRINT " 
PRINT "SSN: 
PRINT FMT $ "Is this correct? (Y/N) " "END.
ACCEPT Lll2_ANSWER.
UNTIL Lll2_ANSWER EQ ( 'Y', 'y' ).
IF Gll_SS_NUMBER NEQ 0 THEN
PRINT " 
CALL FIND_NAME.
ENDIF.
IF Glll_FOUND NEQ "T" THEN
LET Gll_SS_NUMBER EQ 0.
REPEAT
PRINT " 
PRINT "Please enter the individual's last name. 
PRINT FMT $ "Last Name: 
" "END.
ACCEPT Gll_LAST_NAME.
PRINT " 
PRINT "Please enter individual's first name 
PRINT FMT $ "First Name: " Gll_FIRST_NAME.
" and middle initial if known. 
ACCEPT Gll_FIRST_NAME.
PRINT " 
PRINT "Last Name: 
PRINT FMT $ "First Name: " Gll_FIRST_NAME.
PRINT FMT $ "Is this correct? (Y/N) " END.
ACCEPT Lll2_ANSWER.
UNTIL Lll2_ANSWER EQ ( 'Y', 'y' ).
CALL FIND_SSN.
ENDIF.
IF Gll_SS_NUMBER EQ 0 THEN
PRINT " 

PRINT "There is no record for that individual."
PRINT "This operation is aborted."
PRINT FMT "$ (Type carriage return <cr> to continue) " END.
ACCEPT L112_ANSWER.
ELSE
  REPEAT
    PRINT " ".
    PRINT "Enter the key number of the returned key. ".
    PRINT FMT "$ Key number: " END.
    ACCEPT G112_KEY_NUMBER.
    PRINT " ".
    PRINT "Key Number: " G112_KEY_NUMBER.
    PRINT FMT "$ Is this correct? (Y/N) " END.
    ACCEPT L112_ANSWER.
  UNTIL L112_ANSWER EQ ( 'Y', 'y' )
UNTIL L112_D0NE EQ "N".
ENDIF.
RETURN.

CHECK_ALL_NAMES: &R1121_CHECK_ALL_NAMES.DMC
Module Name: 1121 CHECK ALL NAMES
Parameters:
  In Only:
  Out Only: GL121_DELETE_FLAG
  GL121_DEPOSIT
  In/Out:
Coded By: ROBIN PAUNTLEROY
Date Last Modified: JULY 17, 1985
Reason Modified:
Module Description:
This module will check to see if that individual who is returning a key has only one key, if so it will set a flag to check to delete the corresponding record in the name file, if it exists there. Also, it will find the appropriate record to delete in the individual record file.

DEFINE TEXT 1 GL121_DELETE_FLAG
DEFINE INTEGER GL121_DEPOSIT.

LET L1121_FOUND EQ "F".
DBSET INDRECORD.
FIND ALL.
FIND SSN EQ GL11_SS_NUMBER.
IF SYSNREC EQ 1 THEN
  IF KIN EQ GL12_KEY_NUMBER THEN
    LET GL121_DELETE_FLAG EQ "T".
    LET L1121_FOUND EQ "T".
  ENDIF.
ELSE
  SEARCH KIN EQ GL12_KEY_NUMBER.
  IF SYSNREC NEQ 0 THEN
    LET L1121_FOUND EQ "T".
  ENDIF.
ENDIF.

IF L1121_FOUND EQ "T" THEN
  LET GL11_DEPOSIT EQ -1*DEP.
  CALL BOOKKEEPING.
  CALL DELETE_FILES.
  CALL INCREASE_KEYAVAILABLE.
ELSE
  PRINT "The record corresponding to that individual and ".
  PRINT "key number could not be located.".
  PRINT FMT $ "(type carriage return <cr> to continue) "END.
  ACCEPT L1121_WAIT.
ENDIF.
RETURN.

DELETE_FILES: @R11211_DELETE_FILES.DMC
INCREASE_KEY_AVAILABLE: @R11212_INCREASE_KEY_AVAILABLE.DMC
Module Name: 11211 Delete Files
Parameters:
  In Only:  G112_key_number
  Out Only:
  In/Out:
Coded By: Robin FauntLeroy
Date Last Modified: 7/18/85
Reason Modified:
Module Description:
  This module will delete the appropriate files, after an
  individual has returned a key.

DEFINE TEXT 1 L11211_RESPONSE
TEXT 3 L11211_BLD_NUMBER
TEXT 4 L11211_RM_NUMBER.
DBSET LOCATE.
FIND ALL.
FIND KIN EQ G112_KEY_NUMBER.
LET L11211_BLD_NUMBER EQ BLD.
LET L11211_RM_NUMBER EQ RN.
DBSET IND_RECORD.
PRINT "The following record will be deleted from the files:"
PRINT "Name: "G111_NAME.
PRINT "Key Number: "G112_KEY_NUMBER.
PRINT "Bldg: "L11211_BLD_NUMBER.
PRINT "Room Num: "L11211_RM_NUMBER.
PRINT DEP FORMAT "Deposit Amount: "F$3.2 END.
PRINT FMT $ "Is this correct? (Y/N) " END.
ACCEPT L11211_RESPONSE.
IF L11211_RESPONSE EQ (Y,'y') THEN
  PRINT "The record has been deleted."
  DELETE.
  IF G1121_DELETE_FLAG EQ "T" THEN
    DBSET NAME.
    FIND ALL.
    FIND SSN EQ G11_SS_NUMBER.
    DELETE.
ENDIF.
ENDIF.
RETURN.

*
Module Name: 11212 Increase Key Available
Parameters:
  In Only: gl12_key_number
  Out Only:
  In/Out:
Coded By: Robin FauntLeRoy
Date Last Modified: 7/15/85
Reason Modified:

Module Description:
  This module update the inventory file to reflect the return
  of a key.

DBSET INVEN.
FIND ALL.
FIND KIN EQ gl12_KEY_NUMBER.
CHANGE QON QON+1.
RETURN.

Module Name: 113 Distribute Info

Parameters:
- In Only: none
- Out Only: none
- In/Out: none

Coded By: Robin FauntLeRoy
Date Last Modified: July 12, 1985
Reason Modified:

Module Description:
The module is the main controlling module for the distribute info section and displays a menu to allow the user to choose what information is wanted. It passes no parameters and calls modules depending upon the user choice.

DEFINE TEXT 1 L113_INFO_MENU_CHOICE.

REPEAT
  REPEAT
    PUSH USING BL
    POP END.
    PRINT "
    *****.
    PRINT "
    ****.
    PRINT "
    ****.
    PRINT "
    ****.
    PRINT "
    ****.
    PRINT "
    ****.
    PRINT "

*****.
PRINT "Enter information topic option:
PRINT "A Keyholder Information
PRINT "B Key Number Information
PRINT "C Building and Room Number Information
PRINT "D Information on Keys Held
PRINT "E Key Inventory Information
PRINT "F Daily Cash Balance
PRINT "G Exit
PRINT "

*****.
PRINT FMT $"Enter Choice: " END.
ACCEPT L113_INFO_MENU_CHOICE.

IF L113_INFO_MENU_CHOICE NEQ ('A', 'a', 'B', 'b', 'C', 'c', 'D', 'd', 'E', 'e', 'F', 'f', 'G', 'g') THEN
PRINT "invalid choice, please try again.".

ENDIF.
UNTIL L113_INFO_MENU_CHOICE EQ ('A','a','B','b','C','c','D','d','E','e','F','f','G','g').

IF L113_INFO_MENU_CHOICE EQ ('A','a') THEN
CALL DISPLAY_OWNER.
ELSEIF L113_INFO_MENU_CHOICE EQ ('B','b') THEN
CALL DISPLAY_KEY_NUMBER.
ELSEIF L113_INFO_MENU_CHOICE EQ ('C','c') THEN
CALL DISPLAY_LOCATION.
ELSEIF L113_INFO_MENU_CHOICE EQ ('D','d') THEN
CALL DISPLAY_HOLDER_KEYS.
ELSEIF L113_INFO_MENU_CHOICE EQ ('E','e') THEN
CALL DISPLAY_INVENTORY.
ELSEIF L113_INFO_MENU_CHOICE EQ ('F','f') THEN
CALL DISPLAY_DEPOSIT.
ELSE
PRINT "".
ENDIF.
UNTIL L113_INFO_MENU_CHOICE EQ ('G','g').
RETURN.

DISPLAY_OWNER: @R1131_DISPLAY_OWNER.DMC
DISPLAY_KEY_NUMBER: @R1132_DISPLAY_KEY_NUMBER.DMC
DISPLAY_LOCATION: @R1133_DISPLAY_LOCATION.DMC
DISPLAY_DEPOSIT: @R1134_DISPLAY_DEPOSIT.DMC
DISPLAY_INVENTORY: @R1135DISPLAY_INVENTORY.DMC
DISPLAY_HOLDER_KEYS: @R1136_DISPLAY_HOLDER.DMC
Module Name: 1131 Display Owner
Parameters:
  In Only: G11_NAME, G11_SS_NUMBER
  Out Only: none
  In/Out: none
Coded By: Robin FauntLeRoy
Date Last Modified: 7/12/85
Reason Modified:

Module Description:
This module will display all individual who have a certain key. The user is prompted for either the building and room number for which he wishes information, or the key number, and will then see displayed a list of all those individuals who have been issued that key.

DEFINE TEXT 1 L1131_MENU_CHOICE
TEXT 3 L1131_BLD_NUMBER
TEXT 4 L1131_ROOM_NUMBER
TEXT 1 L1131_RESPONSE
TEXT 10 L1131_KEY
TEXT 1 L1131_WAIT
TEXT 10 L1131_KEY_NUMBER.

DEFINE INTEGER L1131_COUNT
INTEGER L1131_SOC
INTEGER L1131_SS_TEMP
INTEGER L1131_TEMP_CTR
INTEGER L1131_TOTAL.

LET L1131_RESPONSE EQ "N".
REPEAT
  REPEAT
    PUSH USING BL
    POP END.
    PRINT " "
    PRINT " "
    PRINT " "
    PRINT " "
    PRINT " "
    PRINT " "
    PRINT " "
    PRINT " "
    PRINT " "
    PRINT " "
  
  "KEYHOLDER INFORMATION MENU"

  "Enter option for which you have information on:" 
  PRINT " "
  PRINT " "
  PRINT " "
  PRINT " A Building and room number"
  PRINT " B Key numbers"
  PRINT " C Exit"
  PRINT " "
  PRINT " "

PRINT "

*************
PRINT " 
PRINT FMT $ "$Please enter menu choice. "$END. 
ACCEPT L1131 MENU_CHOICE. 
IF L1131 MENU_CHOICE NEQ ('A','a','B','b','C','c') THEN 
PRINT "Invalid choice. Please try again.".
ENDIF. 
UNTIL L1131 MENU_CHOICE EQ ('A','a','B','b','C','c'). 
IF L1131 MENU_CHOICE EQ ('A','a') THEN 
REPEAT 
REPEAT 
PRINT " 
PRINT "Please enter the building abbreviation". 
PRINT "(maximum 3 characters):". 
ACCEPT L1131_BLD_NUMBER. 
PRINT " 
PRINT "Please enter the room number " . 
PRINT "(maximum 4 characters):". 
ACCEPT L1131_ROOM_NUMBER. 
PRINT " 
PRINT "Bldg: "L1131_BLD_NUMBER. 
PRINT "Room No: "L1131_ROOM_NUMBER. 
PRINT FMT S "Is this correct? IY/N) "END. 
ACCEPT L1131_WAIT. 
UNTIL L1131_WAIT EQ ('Y','y').
DBSET LOCATE. 
FIND ALL. 
SEARCH BLD EQ L1131_BLD_NUMBER. 
SEARCH RN EQ L1131_ROOM_NUMBER. 
IF SYSNREC EQ 0 THEN 
PRINT " 
PRINT "You have an invalid building and room number ". 
ELSEIF SYSNREC EQ 1 THEN 
MAP IND RECORD VIA KIN. 
IF SYSNREC EQ 0 THEN 
PRINT " 
PRINT "No one has been issued that key number.". 
ELSE 
REPEAT 
GETREC LEAVE. 
LET G11_SS_NUMBER EQ SSN. 
CALL FIND NAME. 
UNTIL SYSNREC EQ U. 
ENDIF. 
ELSE 
REPEAT 
GETREC LEAVE. 
MAP IND_RECORD VIA KIN. 
REPEAT 
GETREC LEAVE. 
LET G11_SS_NUMBER EQ SSN. 
CALL FIND_NAME. 
UNTIL SYSNREC EQ 0. 
UNTIL SYSNREC EQ 0. 
ENDIF. 
PRINT " 
PRINT FMT $ "$Do you have another request? (Y/N) "$END. 
ACCEPT L1131_RESPONSE. 
UNTIL L1131_RESPONSE EQ ('N','n'). 
ELSEIF L1131_MENU_CHOICE EQ ('B','b') THEN 
REPEAT 
LET L1131_COUNT EQ 0. 
REPEAT

---
PRINT "Please enter a key number or a 'q' to ".
PRINT "indicate no more keys. If no names appear ".
PRINT "then no one has been issued that group of keys."
PRINT FMT $ "Key Number: "END.
ACCEPT L1131_KEY_NUMBER.
IF L1131_KEY_NUMBER NEQ ('Q','q') THEN
    LET L1131_COUNT EQ L1131_COUNT + 1.
    DBSET IND_RECORD.
    FIND KIN EQ L1131_KEY_NUMBER.
    IF SYSNREC GT 0 THEN
        IF L1131_COUNT EQ 1 THEN
            LET L1131_TOTAL EQ SYSNREC.
        ENDIF.
        REPEAT
            GETREC LEAVE.
            LET L1131_SOC EQ SSN.
            LET L1131_KEY EQ KIN.
            DBSET HOLDER.
            FIND ALL.
            ADD SNS L1131_SOC KN L1131_KEY.
        UNTIL SYSNREC EQ 0.
    ENDIF.
ENDIF.
UNTIL L1131_KEY_NUMBER EQ ('Q','q').
DBSET HOLDER.
FIND ALL.
IF SYSNREC EQ 0 THEN
    PRINT " ".
    PRINT "There is no one who has all those keys issued to them".
ELSE
    LET L1131_TEMP_CTR EQ 0.
    REPEAT
        FIND ALL.
        LET L1131_TEMP_CTR EQ L1131_TEMP_CTR + 1.
        GETREC LEAVE L1131_TEMP_CTR.
        LET L1131_SS_TEMP EQ SNS.
        FIND ALL.
        SEARCH SNS EQ L1131_SS_TEMP.
        IF SYSNREC EQ L1131_COUNT THEN
            LET G11_SS_NUMBER EQ L1131_SS_TEMP.
            CALL FIND_NAME.
        ENDIF.
    UNTIL L1131_TEMP_CTR EQ L1131_TOTAL.
ENDIF.
DBSET HOLDER.
DELETE.
PRINT FMT $ "Do you have another request? (Y/N) "END.
ACCEPT L1131_RESPONSE.
UNTIL L1131_RESPONSE EQ ('N','n').
ELSE
    PRINT " ".
ENDIF.
UNTIL L1131_MENU_CHOICE EQ ('C','c').
RETURN.

@
Module Name: 1132 Display Key Number

Parameters:

In Only: none
Out Only: none
In/Out: none

Coded By: Robin FauntLeRoy
Date Last Modified: 7/12/85
Reason Modified:

Module Description:
This module will take a building number and room number
and displays the keys that will open that door.

DEFINE TEXT 3 L1132_BLD_NUMBER
TEXT 1 L1132_WAIT
TEXT 4 L1132_ROOM_NUMBER.

LET L1132_WAIT EQ "N".
REPEAT
PRINT " ".
PRINT "Please enter the building abbreviation".
PRINT FMT $ "Bldg: "END.
ACCEPT L1132_BLD_NUMBER.
PRINT " ".
PRINT "Please enter the room number".
PRINT FMT s "Room No: "END.
ACCEPT L1132_ROOM_NUMBER.
DBSET LOCATE.
FIND ALL.
SEARCH BLD EQ L1132_BLD_NUMBER.
SEARCH RN EQ L1132_ROOM_NUMBER.
IF SYSREC NEQ 0 THEN
PRINT " ".
PRINT BLD RN KIN.
ELSE
PRINT " ".
PRINT "That is an invalid building and room number.".
ENDIF.
PRINT " ".
PRINT FMT $ "Do you have another request? (Y/N) "END.
ACCEPT L1132_WAIT.
UNTIL L1132_WAIT EQ ( 'N', 'n' ) .
RETURN.
Module Name: 1133 Display Location

Parameters:

In Only: none
Out Only: none
In/Out: none

Coded By: Robin FauntLeRoy
Date Last Modified: 7/12/85
Reason Modified:

Module Description:

This module, given a key number will display the location of the building and room that that key opens

DEFINE TEXT 10 L1133_KEY_NUMBER
TEXT: L1133_WAIT.

LET L1133_WAIT EQ "N".

REPEAT

PRINT " ".
PRINT "Please enter the key number.".
PRINT FMT $ "Key Number: "END.
ACCEPT L1133_KEY_NUMBER.
DBSET LOCATE.
FIND ALL.
FIND KIN EQ L1133_KEY_NUMBER.
IF SYSNREC NEQ 0 THEN
    PRINT " ".
    PRINT KIN BLD RN.
ELSE
    PRINT " ".
    PRINT "That is an invalid key number.".
ENDIF.
PRINT " ".
PRINT FMT $ "Do you have another request? (Y/N) "END.
ACCEPT L1133_WAIT.
UNTIL L1133_WAIT EQ ('N', 'n').
RETURN.
Module Name: 1134 Display Deposit
Parameters:
   In Only: none
   Out Only: none
   In/Out: none
Coded By: Robin FauntLeRoy
Date Last Modified: 7/12/85
Reason Modified:

Module Description:
   This module will print out the total of the amount in the checkbook file. This file maintains a running total of the deposit amount. It also provides the user with a method of zero'ing out the total to start another days total.

DEFINE TEXT l L1134_CLEAR
TEXT  l L1134_WAIT.
DBSET CHECKBOOK.
FIND ALL.
PRINT " ".
PRINT "Deposit Total".
PRINT BAL*100 FORMAT 3X IS5..2 END.
PRINT " ".
PRINT FMT $ "Do you wish to have the total cleared? (Y/N) " END.
ACCEPT L1134_CLEAR.
IF L1134.Clear EQ ('Y','y') THEN
   CHANGE BAL 0.
   PRINT "Deposit total is now $0.00."
ENDIF.
PRINT " ".
PRINT FMT $ "Type a carriage return <cr> to continue " END.
ACCEPT L1134_WAIT.
RETURN.
Module Description:
This module will prompt the user for the key number for which the inventory information is requested. It will then
Print the information to the screen.

DEFINE TEXT 10 L1135_KEY_NUMBER
TEXT 1 L1135_WAIT.

DEFINE INTEGER L1135_TOTAL_OUT.

LET L1135_WAIT EQ "N".
REPEAT
PRINT "Please enter the Key Number.".
PRINT FMT $ "Key Number: " END.
ACCEPT L1135_KEY_NUMBER.
DBSET INVEN.
FIND ALL.
FIND KIN EQ L1135_KEY_NUMBER.
IF SYSNREC EQ 1 THEN
  LET L1135_TOTAL_OUT EQ TN-QON.
  PRINT "  
  PRINT KIN QON L1135_TOTAL_OUT TN FORMAT 110 1  OX 13 16X 13 12X 13
END.
ELSE
  PRINT "  
PRINT "Invalid key number given.".
ENDIF.
PRINT "  
PRINT FMT $ "Do you have another request? (Y/N) " END.
ACCEPT L1135_WAIT.
UNTIL L1135_WAIT EQ ('n', 'N').
RETURN.
Module Name: 1136 Display Holder

Parameters:

In Only:
Out Only:

In/Out: G11_SS_Number
        G11_Last_Name
        G11_First_Name

Coded By: Robin FauntLeRoy

Date Last Modified: 7/16/85

Module Description:

This module will determine which individual the user is requesting the information for, and then display all keys that that user has issued to him.

DEFINE TEXT 9 L1136_RESPONSE
TEXT 1 L1136_AGAIN
TEXT 1 L1136_ANSWER.

LET L1136_AGAIN EQ "N".

REPEAT
LET G11_SS_NUMBER EQ 0.
PRINT "Please enter the individual's SSN. (9 digits) ".
PRINT FMT S " (or a carriage return <cr> if none) " END.
ACCEPT L1136_RESPONSE.
IF $INT(L1136_RESPONSE) NEQ 0 THEN
  LET G11_SS_NUMBER EQ $INT(L1136_RESPONSE).
  CALL FIND_NAME.
ELSE
  REPEAT
    PRINT "Please enter the individual's last name. ".
    PRINT FMT $ "Last Name: " END.
    ACCEPT G11_LAST_NAME.
    PRINT "Please enter the individual's first name. ".
    PRINT FMT $ "First Name: " END.
    ACCEPT G11_FIRST_NAME.
    PRINT "LAST NAME: ".
    PRINT FMT $ "FIRST NAME: ".
    PRINT FMT $ "Is this correct? (Y/N) " END.
    ACCEPT L1136_ANSWER.
    UNTIL L1136_ANSWER EQ ('Y', 'y').
  CALL FIND_SSN.
ENDIF.

IF G11_SS_NUMBER NEQ 0 THEN
  DBSET IND_RECORD.
  FIND ALL.
  FIND SSN EQ G11_SS_NUMBER.
  IF SYSREC NEQ 0 THEN
    PRINT "Key Number	Date Out	Deposit Amount"
    PRINT "Date Out	Deposit Amount"
    PRINT "Key Number	Date Out	Deposit Amount"
    PRINT KIN DO DEP FORMAT A 6X D3 5X F$3.2 END.
ELSE
  PRINT ".",
  PRINT "That individual does not have any keys issued to him."
ENDIF.
ELSE
  PRINT ".",
  PRINT "That individual does not have any keys issued to him."
ENDIF.
PRINT "."
PRINT FMT & "Do you have another request? (Y/N) "END.
ACCEPT L1136_AGAIN.
UNTIL L1136_AGAIN EQ ( 'n', 'N' ).
RETURN.
}
DEFINE TEXT L114_CHOICE.

REPEAT
  PUSH USING BL
  POP END.
  PRINT " ".
  PRINT " The following types of correspondence are available:".
  PRINT " ".
  PRINT " L: Letter".
  PRINT " R: Report".
  PRINT " Q: Quit".
  PRINT " ".
  PRINT "Please enter choice: " END.
  ACCEPT L114_CHOICE.
  IF L114_CHOICE EQ ( 'L', 'l' ) THEN
    CALL GENERATE_LETTERS.
  ELSEIF L114_CHOICE EQ ( 'R', 'r' ) THEN
    CALL GENERATE_REPORTS.
  ELSEIF L114_CHOICE EQ ( 'Q', 'q' ) THEN
    PRINT " ".
    PRINT "Invalid choice, please try again.".
  ELSE
    PRINT " ".
  ENDIF.
UNTIL L114_CHOICE EQ ( 'Q', 'q' ).
RETURN.

GENERATE_LETTERS: @R1141 GEN LETTERS.DMC
GENERATE_REPORTS: @R1142 GEN REPORTS.DMC
Module Name: 1141 Gen Letters
Parameters:
  In Only: none
  Out Only: G11_SS_Number
  G11_Name
  G11_First_Name
  G11_Last_Name
Coded By: Robin FauntLeRoy
Date Last Modified: 7/12/85
Reason Modified:

Module Description:
This module determines whether the user wants to generate student letters or personnel letters and then calls the appropriate modules.

DEFINE TEXT 1 L1141_MENU_CHOICE.

REPEAT
  PRINT ".
  PRINT "The following types of letters are available:"
  PRINT " S: Student"
  PRINT " P: Personnel"
  PRINT " Q: Quit"
  PRINT ".
  PRINT FMT $ "Please enter choice: "END.
  ACCEPT L1141_MENU_CHOICE.
  IF L1141_MENU_CHOICE EQ ( 'S', 's' ) THEN
    CALL GEN_STUDENT_LETTERS.
    CALL PRINT_LETTERS.
  ELSEIF L1141_MENU_CHOICE EQ ( 'P', 'p' ) THEN
    CALL GEN_PERSONNEL_LETTERS.
    CALL PRINT_LETTERS.
  ELSEIF L1141_MENU_CHOICE EQ ( 'Q', 'q' ) THEN
    PRINT "Leaving letter generation"
  ELSE
    PRINT "Invalid choice, please try again."
  ENDIF.
  UNTIL L1141_MENU_CHOICE EQ ( 'Q', 'q' ).
RETURN.

GEN_STUDENT_LETTERS: @R11411_GEN_STU_LETTERS.DMC
GEN_PERSONNEL_LETTERS: @R11412_GEN_PER_LETTERS.DMC
PRINT_LETTERS: @R11413_PRINT_LETTERS.DMC

#
Module Name: 11411_Gen_Per_letters
Parameters:
  In Only:
  Out Only:
  In/Out:
Coded By: Robin FauntLeRoy
Date Last Modified: 8/04/85
Reason Modified:

Module Description:
This module will determine which students are intending to
graduate during the quarter indicated and have keys issued to them.
It will generate a letter to each one requesting the return of the
keys which have been issued to each.

DEFINITION

TEXT 20 L 11411 ADO
TEXT 1 L 11411 RESPONSE
TEXT 1 L 11411 FOUND
TEXT 18 L 11411 CITY
TEXT 3 L 11411 SEARCH
TEXT 10 L 11411 WAIT
TEXT 30 L 11411 NAME
TEXT 2 L 11411 STATE
TEXT 6 L 11411 ZIP.

DEFINE INTEGER L 11411 QUARTER
INTEGER L 11411 SSN.

PRINT ":
PRINT "This process may take some time.".
PRINT FMT $"Do you wish to continue? (Y/N) "END.
ACCEPT L 11411 RESPONSE.
IF L 11411 RESPONSE EQ ('Y','y') THEN
REPEAT
PUSH USING BL
POP END.
PRINT "
PRINT "Please choose the quarter you would like your ".
PRINT "letters of graduation based upon".
PRINT FMT $"Quarterm: "END.
ACCEPT L 11412 QUARTER.
UNTIL L 11412 QUARTER LE 4 AND L 11412 QUARTER GT 0.
LET L 11411 FOUND EQ "F".
DBSET GRAD.
FIND ALL.
LET L 11411 SEARCH EQ ($RIGHT($TEXT($YEAR(SYSDATE)),2) + $RIGHT($TEXT(L 11412 QUARTER),1)).
FIND EGD_DATE EQ L 11411_SEARCH.
IF SYSNREC EQ 0 THEN
PRINT "
PRINT "Please choose the quarter you would like your ".
PRINT "letters of graduation based upon".
PRINT FMT $"Quarterm: "END.
ACCEPT L 11412 QUARTER.
UNTIL L 11412 QUARTER LE 4 AND L 11412 QUARTER GT 0.
LET L 11411 FOUND EQ "F".
DBSET GRAD.
FIND ALL.
LET L 11411 SEARCH EQ ($RIGHT($TEXT($YEAR(SYSDATE)),2) + $RIGHT($TEXT(L 11412 QUARTER),1)).
FIND EGD_DATE EQ L 11411_SEARCH.
IF SYSNREC EQ 0 THEN
PRINT "
PRINT "Please choose the quarter you would like your ".
PRINT "letters of graduation based upon".
PRINT FMT $"Quarterm: "END.
ACCEPT L 11412 QUARTER.
UNTIL L 11412 QUARTER LE 4 AND L 11412 QUARTER GT 0.
LET L 11411 FOUND EQ "F".
DBSET GRAD.
FIND ALL.
ELSE  PRINT "No one is graduating that quarter."

INIT 7 STLST.
REPEAT.
GETREC LEAVE.
LET L11411_NAME EQ NAME.
LET L11411_ADD EQ L_STR.
LET L11411_CITY EQ L_CITY.
LET L11411_STATE EQ L_STATE.
LET L11411_ZIP EQ L_ZIP.
LET L11411_SSN EQ $INT(SSNO).
DBSET IND записи.
FIND ALL.
FIND SSN EQ L11411_SSN.
PRINT "IN IND записи".
PRINT ALL.
IF SYSREC GT 0 THEN
  LET L11411_FOUND EQ "T".
  PRINT ON 7 FMT /// END.
  PRINT ON 7 L11411_NAME.
  PRINT ON 7 L11411_ADD.
  PRINT ON 7 L11411_CITY L11411_STATE L11411_ZIP.
  PRINT ON 7 SYSDATE FMT /// "Dear Student/University Employee," / E
  PRINT ON 7 FMT $ "It has come to our attention " E
  PRINT ON 7 "that you will soon be leaving ".
  PRINT ON 7 FMT $ "the University system, and that " E
  PRINT ON 7 "you still possess one or " .
  PRINT ON 7 FMT $ "more keys from the Physical Plant." E
  PRINT ON 7 "Please return these to ".
  PRINT ON 7 FMT $ "the Physical Plant prior to " END.
  PRINT ON 7 FMT $ "be refunded. The keys we " END.
  PRINT ON 7 FMT "show that you have are:" / / END.
  PRINT ON 7 KIN FMT 10X A10 END.
  PRINT ON 7 FMT // "University of Montana Physical Plant" END.
ENDIF.
UNTIL SYSREC EQ 0.
IF L11411_FOUND EQ "F" THEN
PRINT "None of the individuals who were terminating had keys".
ELSE
PRINT "The letters have been generated and can be picked up ".
PRINT "at the Computer Center tomorrow."
ENDIF.
ENDIF.
PRINT "Type a carriage return <cr> to continue: " END.
ACCEPT L11411_WAIT.
ENDIF.
RETURN.
This module will determine those individuals employed for the university who are terminated and have keys issued to them. This information will be placed in a list to be printed.

DEFINE TEXT 20 L11412_IADD TEXT 1 L11412_FOUND
TEXT 20 L11412_JADD
TEXT 1 L11412_WAIT
TEXT 20 L11412_JADD
TEXT 10 L11412_NAME
TEXT 2 L11412_STATE
TEXT 6 L11412_ZIP.

LET L11412_FOUND EQ "F".

SET PSMA5T.

IF SYSNREC EQ 0 THEN
  PRINT "There is no one terminated lately.".
ELSE
  LETR.LIST.
  REPEAT.
    GETREC LEAVE.
    LET L11412_NAME EQ STRIM(FMNAM) + " + STRIM(LNAM).
    LET L11412_JADD EQ ADDR1.
    LET L11412_JADD EQ ADDR3.
    LET L11412_STATE EQ ST.
    LET L11412_ZIP EQ ZIP.
    MAP TO IND_RECORO VIA SSN.
    IF SYSNREC GT 0 THEN
      LET L11412_FOUND EQ "T".
      PRINT "Dear Student/University Employee,"
      PRINT "$success has come to our attention."
      PRINT "$success you will soon be leaving the university system, and that you still possess one or more keys from the Physical Plant. "$success please return these to the Physical Plant. "$success the Physical Plant prior to "END.
      PRINT "$success leaving with your deposit will be refunded. The keys we "END.
      PRINT "$success thank you for your cooperation. "END.
      PRINT "$success University of Montana Physical Plant"
    ELSE
      PRINT "$success None of the individuals who were terminating had keys".
    ENDIF.
  UNTIL SYSNREC EQ 0.
ENDIF.

ENDIF.

PRINT "$Type a carriage return <cr> to continue: "END.
ACCEPT L11412_WAIT.
RETURN.
!!! Module Name: 1142 Gen Reports

Parameters:

In Only: none

Out Only:

In/Out: Gl_Report

Coded By: Robin FauntLeRoy

Date Last Modified: 7/26/85

Reason Modified:

Module Description:

This module sets the gll32_report flag, which determines whether or not the name found in Find_Name is printed out, and then determines which report the user wants.

!!!!!!!

DEFINE TEXT 1 L1142_RESPONSE.

REPEAT

LET G1_REPORT EQ "T".

PUSH USING BL

POP END.

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!PUSH USING PRINT INVEN.TXT.
!POP END.
ELSEIF LI142 RESPONSE EQ ('b', 'b') THEN
CALL INVENTORY REPORT.
ELSEIF LI142 RESPONSE EQ ('c', 'c') THEN
CALL LOCATION REPORT.
ELSEIF LI142 RESPONSE EQ ('d', 'd') THEN
CALL RETIREMENT REPORT.
ELSE
PRINT " ".
ENDIF.
UNTIL LI142 RESPONSE EQ ('e', 'e').
RETURN.

KEYHOLDER_REPORT: @R11421_KEY_REPT.DMC
INVENTORY_REPORT: @R11422_INVEN_REPT.DMC
LOCATION_REPORT: @R11423_LOCAT_REPT.DMC
RETIREMENT_REPORT: @R11424_RETIRE_REPT.DMC
@
Module Name: 11421 Key Rept
Parameters:
  In Only: none
  Out Only: none
  In/Out: Gl_Report
Coded By: Robin Fauntleroy
Date Last Modified: 7/26/85
Reason Modified:
Module Description:
This module determines the extent of the keyholder report
requested by the user, and sets up the information for the report.
It also sets the report flag, so that names are not printed out
when Find_Name is called.

DEFINE TEXT 1 L11421_RESPONSE
TEXT 10 L11421_NUM
TEXT 1 L11421_WAIT
TEXT 4 L11421_KEY.
REPEAT
  PRINT " ".
  PRINT "Please choose one of the following: ".
  PRINT " T: Report on Total Keyholders".
  PRINT " I: Individual Report ".
  PRINT " Q: Quit ".
  PRINT " ".
  PRINT FMT $ "Please enter your choice: "END.
  ACCEPT L11421 RESPONSE.
  UNTIL L11421_RESPONSE EQ ('T', 't', 'I', 'i', 'Q', 'q').
  IF L11421_RESPONSE NEQ ('Q', 'q') THEN
    LET Gl_REPORT EQ "T".
    DBSET IND_RECORD.
    IF L11421_RESPONSE EQ ('T', 't') THEN
      FIND ALL.
      SORT BY SSN.
    ELSE
      REPEAT
        PRINT " ".
        PRINT "Please enter keyway number for report.".
        PRINT FMT $ "Keyway Number: "END.
        ACCEPT L11421_KEY.
        FIND ALL.
        FIND KIN CT STRIM(L11421_KEY).
        IF SYSNREC EQ 0 THEN
          PRINT "Invalid Keyway Number.".
        ENDIF.
      UNTIL SYSNREC GT 0.
      SORT SSN.
    ENDIF.
  ENDIF.
  IF SYSNREC GT 0 THEN
    REPORT START.
    SECTION INITIAL.
    INIT 5 KEYHOLDER.TXT.
    HEADING ON 5 PRINT SYSDATE FMT ///// 30T "KEYHOLDER REPORT" 60T
    FOOTING ON 5 2 PRINT SYSPAGE FORMAT 40T 12..0 END.
    PAGE 60.
BODY BU.
SECTION GETREC.
   LET G11 SS NUMBER EQ SSN.
   IF G11 SS NUMBER LT 0 THEN
      LET L11421_NUM EQ "DUMMY SSN: ".
   ELSE
      LET L11421_NUM EQ $TEXTL(G11 SS NUMBER).
   ENDIF.
   LET G1 REPORT EQ "T".
   CALL FIND NAME.
   DBSET IND RECORD.
ENDIF.
SECTION TOTALS.
SECTION FINAL.
REPORT END.
RETURN.

ENDIF.
RELEASE 5.

ENDF.
RETURN.

0 END.

SECTION PRINT.
PRINT ON 5 KIN DO DEP FORMAT 10 T A10 25 T D3 40 T F$3.2.
SECTION REPORT.
PRINT ".
PRINT "Your report has been sent to the line printer".
PRINT "and can be picked up at the computer center".
PRINT FMT $ "Type a carriage return <cr> to continue: " END.
ACCEPT L11421_WAIT.
RELEASE 5.
Module Name: 11422 Inven Rept
Parameters:
  In Only: none
  Out Only: none
  In/Out: none
Coded By: Robin Fauntleroy
Date Last Modified: 7/26/85
Reason Modified:
Module Description:
This module determines the extent of the inventory report requested by the user, and sets up the information for the report.

DEFINE TEXT 1 L11422_RESPONSE
TEXT 1 L11422_WAIT
TEXT 4 L11422_KEY.
REPEAT
PRINT " ".
PRINT "Please choose one of the following: ".
PRINT " T: Report on Total Inventory".
PRINT " I: Individual Report ".
PRINT " (report by individual keyways)".
PRINT " Q: Quit ".
PRINT FMT $ "Please enter your choice: ").END.
ACCEPT L11422_RESPONSE.
UNTIL L11422_RESPONSE EQ ( 'T', 't', 'I', 'i', 'Q', 'q')
IF L11422_RESPONSE NEQ ('Q', 'q') THEN
  DBSET INVEN.
  IF L11422_RESPONSE EQ ( 'T', 't') THEN
    FIND ALL.
    SORT BY KIN.
  ELSE
    REPEAT
      PRINT " ".
      PRINT "Please enter keyway number for report.").
      PRINT FMT $ "Keyway Number: ").END.
      ACCEPT L11422_KEY.
      FIND ALL.
      FIND KIN CT STRIM(L11422_KEY).
      IF SYSNREC EQ 0 THEN
        PRINT "Invalid Keyway Number.").
      ELSE
        REPORT START.
        INIT 2 INVEN.TXT.
        HEADING ON 2 PRINT SYSDATE FMT ///// 30T "INVENTORY REPORT" 60T
        FOOTING ON 2 PRINT SYSPAGE FORMAT 40T 12..9 END.
        PAGE 60.
        ON START PRINT ON 2 FMT 5T "KEY NUMBER: " 20T "QUANTITY ON HAND:" 40T "QUANTITY OUT:" 55T "TOTAL NUMBER:" /END.
        ON START PRINT ON 2 FMT 5T " " 55T " " /END.
  ENDIF.
ENDIF.
IF SYSNREC GT 0 THEN
  REPORT START.
  INIT 2 INVEN.TXT.
  HEADING ON 2 PRINT SYSDATE FMT ///// 30T "INVENTORY REPORT" 60T
  FOOTING ON 2 PRINT SYSPAGE FORMAT 40T 12..9 END.
  PAGE 60.
  ON START PRINT ON 2 FMT 5T "KEY NUMBER: " 20T "QUANTITY ON HAND:" 40T "QUANTITY OUT:" 55T "TOTAL NUMBER:" /END.
  ON START PRINT ON 2 FMT 5T " " 55T " " /END.
PRINT ON 2 KIN QON TN-QON TN FMT 7T A10 27T IJ 49T 1J BUT IJ END

REPORT END.
PRINT " '
PRINT "Your report has been sent to the line printer".
PRINT "and can be picked up at the computer center".
PRINT FMT $ "Type a carriage return <cr> to continue: "END.
ACCEPT L11422_WAIT.
RELEASE 2.

ENDIF.
RETURN.

"
Module Description:
This module determines the extent of the location report requested by the user, and sets up the information for the report.

DEFINE TEXT 1 L11423_RESPONSE
TEXT 1 L11423_WAIT
TEXT 1 L11423_SORT
TEXT 3 L11423_BLDG
TEXT 4 L11423_KEY.

REPEAT
PRINT " ".
PRINT "Please choose one of the following: ".
PRINT " T: Total Location Report ".
PRINT " I: Individual Report ".
PRINT " (report by individual keyways or building numbers) ".
PRINT " Q: Quit ".
PRINT " ".
PRINT FMT $ "Please enter your choice: "END.
ACCEPT L11423_RESPONSE.
UNTIL L11423_RESPONSE EQ ( 'T', 't', 'I', 'i', 'Q', 'q' ) .
IF L11423_RESPONSE EQ ( 'T', 't' ) THEN
REPEAT
PRINT " ".
PRINT "Would you like the report sorted by Keyway Number".
PRINT FMT $ "or Building Number? (K/B): "END.
ACCEPT L11423_SORT.
UNTIL L11423_SORT EQ ( 'K', 'k', 'B', 'b' ) .
IF L11423_SORT EQ ( 'K', 'k' ) THEN
FIND ALL.
SORT BY KIN.
ELSE
FIND ALL.
SORT BY BLD RN.
ENDIF.
ELSEIF L11423_RESPONSE EQ ( 'I', 'i' ) THEN
REPEAT
PRINT " ".
PRINT "Would you like a report based upon a Keyway Number".
PRINT FMT $ "or Building Number? (K/B): "END.
ACCEPT L11423_SORT.
UNTIL L11423_SORT EQ ( 'K', 'k', 'B', 'b' ) .
IF L11423_SORT EQ ( 'K', 'k' ) THEN
REPEAT
PRINT " ".
PRINT "Please enter keyway number for report.".
PRINT FMT $ "Keyway Number: "END.
ACCEPT L11423_KEY.
FIND ALL.
FIND KIN CT STRIM(L11423_KEY).
IF SYSNREC EQ 0 THEN
  PRINT "Invalid Keyway Number.".
ENDIF.
UNTIL SYSNREC GT 0.
SORT KIN.
ELSE
  REPEAT
    PRINT "  ".
    PRINT "Please enter building abbreviation for report.".
    ACCEPT L11423_BLDG.
    FIND ALL.
    SEARCH BLD EQ L11423_BLDG.
    IF SYSNREC EQ 0 THEN
      PRINT "Invalid building abbreviation.".
      PRINT "  ".
    ENDIF.
    UNTIL SYSNREC GT 0.
  ENDIF.
ELSE
  PRINT "  ".
ENDIF.
IF SYSNREC EQ 0 THEN
  REPORT START.
  INIT 3 LOCAT.TXT.
  HEADING ON 3 PRINT SYSDATE FMT ///// 33T "LOCATION REPORT" 60T D
3 //END.
  FOOTING ON 3 2 PRINT SYSPAGE FORMAT 40T 12..0 END.
  PAGE 60.
  BODY 60.
  ON START PRINT ON 3 FMT 5T "KEY NUMBER:" 20T "BUILDING NUMBER:" 40T
    "ROOM NUMBER:" END.
  ON START PRINT ON 3 PFM 5T "________________" 20T "________________" 40T "/END.
  PRINT ON 3 KIN BLD RN FMT 7T A10 26T A3 45T A4 END.
  REPORT END.
  PRINT "  ".
  PRINT "Your report has been sent to the line printer".
  PRINT "and can be picked up at the computer center".
  PRINT FMT 5T "Type a carriage return <cr> to continue: "END.
  ACCEPT L11423_WAIT.
  RELEASE 3.
ENDIF.
RETURN.
Module Name: 11424 Retire Rept

Parameters:

In Only: none

Out Only: none

In/Out: none

Coded By: Robin Fauntleroy

Date Last Modified: 7/26/85

Reason Modified:

Module Description:

This module prints a report consisting of a list of all keys that have been retired.

DEFINE TEXT 1 L11424_WAIT.

DBSET INVEN.

FIND ALL.

SEARCH ST EQ "R".

IF SYSNREC EQ 0 THEN

PRINT " ".

PRINT "There are no retired keys at this time.".

ELSE

SORT KIN.

REPORT START.

INIT 4 RETIRE.TXT.

HEADING ON 4 PRINT SYSDATE FMT ///// 30T "RETIRED KEY REPORT" 60T D3 ///

FOOTING ON 4 PRINT SYSPAGE FORMAT 40T 12..0 END.

PAGE 60.

ON START PRINT ON 4 FMT IT "KEY NUMBER:" 15T "QUANTITY ON HAND:" 34T "QUANTITY OUT:" 49T "TOTAL NUMBER:" 65T "DATE RETIRED:" /END.

ON START PRINT ON 4 FMT IT " ____________" 15T "___________________" 34T " ______________" 49T "______________" 65T "____________" /END.

PRINT ON 4 KIN QON TN-QON TN DR FMT 4T A10 24T 13 38T 13 53T 13 66T D2 END.

REPORT END.

PRINT "Your report has been sent to the line printer.

"and can be picked up at the computer center".

PRINT FMT 5 "Type a carriage return <cr> to continue: "END.

ACCEPT L11424_WAIT.

RELEASE 4.
Module Name: 115 Bookkeeping
Parameters:
  In Only: Glll_Deposit
  Out Only:
  In/Out:
Coded By: Robin FauntLeRoy
Date Last Modified: 7/11/85
Reason Modified:

Module Description:
This module will maintain the amount in the checkbook. It will open the checkbook file and update the balance there.

DBSET CHECKBOOK.
FIND ALL.
CHANGE BAL BAL+Glll_Deposit.

RETURN.

Module Name: 116 Find SSN
Parameters:
In Only: G11_First_Name
G11_Last_Name
Out Only: G11_SS_Number
G11_Name
Coded By: Robin FauntLeRoy
Date Last Modified: 7/11/85
Reason Modified:
Module Description:
This module will search the Personnel and Registrar files when given a name, for a matching name and social security number. If found, it sets the name variables to the value of that name.

DEFINE TEXT 1 L116_ANSWER.
LET G11_NAME EQ G11_FIRST_NAME + G11_LAST_NAME.
DBSET PSMAST.
FIND ALL.
SEARCH LNAM CT STRIM(G11_LAST_NAME).
SEARCH FMNAM CT STRIM(G11_FIRST_NAME).
IF SYSNREC EQ 1 THEN
  LET G11_SS_NUMBER EQ SSN.
ELSEIF SYSNREC GT 1 THEN
  PRINT "With the information given the correct individual cannot be determined. All the above records apply. Do you have additional information to distinguish between entries (Y/N)? END.
  ACCEPT L116_ANSWER.
  IF L116_ANSWER EQ ('Y', 'y') THEN
    REPEAT
      PRINT "Enter the corresponding SSN. END.
      ACCEPT G11_SS_NUMBER.
    END.
  ELSE
    PRINT "Is this correct? (Y/N): END.
    ACCEPT L116_ANSWER.
    UNTIL L116_ANSWER EQ { 'Y', 'y' }.
  ENDIF.
ENDIF.
IF G11_SS_NUMBER EQ 0 THEN
  DBSET SSMST.
  FIND ALL.
  SEARCH NAME CT STRIM(G11_FIRST_NAME).
  IF SYSNREC EQ 1 THEN
    LET G11_SS_NUMBER EQ ID.
  ELSEIF SYSNREC GT 1 THEN
    PRINT " ".
  ENDIF.
ELSE
  PRINT " ".
ENDIF.
ENDF.
END.
PRINT NAME ID.
PRINT " ".
PRINT "With the information given the correct ".
PRINT "individual cannot be determined. All the ".
PRINT "above records apply. Do you have additional".
PRINT FMT $ "information to distinguish between entries (Y/N) "
END.

ACCEPT L116_ANSWER.
IF L116_ANSWER EQ ( 'Y', 'Y' ) THEN
REPEAT
  PRINT " ".
  PRINT FMT $ "Enter the corresponding SSN. " END.
  ACCEPT G11_SS_NUMBER.
  PRINT " ".
  PRINT "SSN: " G11_SS_NUMBER.
  PRINT " ".
  PRINT FMT $ "Is this correct? (Y/N): " END.
  ACCEPT L116_ANSWER.
  UNTIL L116_ANSWER EQ ( 'Y', 'Y' ).
  FIND ALL.
  FIND ID EQ G11_SS_NUMBER.
  LET G11_SS_NUMBER EQ ID.
  LET G11_NAME EQ NAME.
ENDIF.
ELSE
  PRINT " ".
ENDIF.
ENDIF.
END.
IF G11_SS_NUMBER EQ 0 THEN
  DBSET NAME.
  FIND ALL.
  SEARCH LNM CT $TRIM(G11_LAST_NAME).
  SEARCH FNM CT $TRIM(G11_FIRST_NAME).
  IF SYSREC EQ 0 THEN
    PRINT "The matching SSN could not be found".
  ELSEIF SYSREC EQ 1 THEN
    LET G11_SS_NUMBER EQ SSN.
  ELSE
    PRINT " ".
    PRINT LNM FNM SSN.
    PRINT " ".
    PRINT "With the information given the correct ".
    PRINT "individual cannot be determined. All the ".
    PRINT "above records apply. Do you have additional".
    PRINT FMT $ "information to distinguish between entries (Y/N) "
  END.
  ACCEPT L116_ANSWER.
  IF L116_ANSWER EQ ( 'Y', 'Y' ) THEN
    REPEAT
      PRINT " ".
      PRINT FMT $ "Enter the corresponding SSN. " END.
      ACCEPT G11_SS_NUMBER.
      PRINT " ".
      PRINT "SSN: " G11_SS_NUMBER.
      PRINT " ".
      PRINT FMT $ "Is this correct? (Y/N): " END.
      ACCEPT L116_ANSWER.
      UNTIL L116_ANSWER EQ ( 'Y', 'Y' ).
      FIND ALL.
      FIND SSN EQ G11_SS_NUMBER.
    ENDIF.
  END.
RETURN.
Module Name: 117 FIND Name
Parameters:
In Only: G1l_SS_Number
Out Only: G1l_Found
In/Out: G1l_Last_Name
G1l_First_Name
Coded By: Robin FauntLeRoy
Date Last Modified: 7/11/85
Reason Modified:
Module Description:
This module will search all available files for an occurrence of the social security number passed to it. If it finds one, then it sets the social security variable to that number.

DEFINE TEXT 1 L117_FILLER.
LET L117_FILLER EQ " ".
IF G1l_SS_NUMBER LT 0 THEN
DBSET NAME.
FIND ALL.
FIND SSN EQ G1l_SS_NUMBER.
IF SYSNREC NEQ 1 THEN
PRINT " ".
ELSE
LET G1l_LAST_NAME EQ LNM.
LET G1l_FIRST_NAME EQ FNM.
LET G1l_NAME EQ STRIM(G1l_FIRST_NAME) + L117_FILLER + STRIM(G1l_LAST_NAME).
LET G1l_FOUND EQ "T".
IF G1_REP0RT EQ "F" THEN
PRINT "NAME: "G1l_NAME.
ENDIF.
ELSE
DBSET PSMAST.
FIND ALL.
FIND SSN EQ G1l_SS_NUMBER.
IF SYSNREC NEQ 1 THEN
DBSET SRMAST.
FIND ALL.
FIND ID EQ G1l_SS_NUMBER.
IF SYSNREC NEQ 1 THEN
PRINT " ".
ELSE
LET G1l_NAME EQ NAME.
LET G1l_FOUND EQ "T".
IF G1_REP0RT EQ "F" THEN
PRINT "NAME: "G1l_NAME.
ENDIF.
ELSE
LET G1l_FIRST_NAME EQ FMNAM.
LET G1l_LAST_NAME EQ LNAM.
LET G1l_NAME EQ STRIM(G1l_FIRST_NAME) + L117_FILLER + STRIM(G1l_LAST_NAME).
IF G1_REP0RT EQ "F" THEN
PRINT "NAME: "G1l_NAME.
ENDIF.
PRINT "NAME: "G11_NAME.
ENDIF.
ENDIF.
ENDIF.
LET G1_REPORT EQ "F".
RETURN.
@

Module Name: 1.2 Locksmith Main
Parameters:
- In Only: none
- Out Only: none
- In/Out: none
Coded By: Michele Miley
Date Last Modified: July 5, 1985
Reason Modified: Initial module creation.

Module Description:
The Locksmith Main module is a controlling module which displays a user menu, and asks the user to choose which locksmith subprogram he wishes to use. It has no parameters and accesses no files.

DEFINE TEXT 1 L12_MENU_CHOICE.

REPEAT
PUSH USING BL
POP END.
PRINT " ★ LOCKSMITH MENU
PRINT " ★ Choose Option:
PRINT " A Complete Key Orders
PRINT " B Replace Key
PRINT " C Rekey Lock
PRINT " D Inventory Control
PRINT " E Exit
PRINT " ★
PRINT " Enter choice: "
ACCEPT L12_MENU_CHOICE.
IF L12_MENU_CHOICE EQ 'A' OR L12_MENU_CHOICE EQ 'a' THEN
  CALL M121_COMPLETE_KEY_ORDERS:
ELSEIF L12_MENU_CHOICE EQ ('B', 'b') THEN
  CALL M122_REPLACE_KEY:
ELSEIF L12_MENU_CHOICE EQ ('C', 'c') THEN
  CALL M123_REKEY_LOCK:
ELSEIF L12_MENU_CHOICE EQ ('D', 'd') THEN
  CALL M124_INVENTORY_CONTROL:
ELSEIF L12_MENU_CHOICE NEQ ('E', 'e') THEN
  PRINT "You have entered an invalid choice."
ENDIF.
UNTIL L12_MENU_CHOICE EQ ('E', 'e').
RETURN.

M121_COMPLETE_KEY_ORDERS: @M121_COMPLETE_KEY_ORDERS.DMC
M122_REPLACE_KEY: @M122_REPLACE_KEY.DMC
M123_REKEY_LOCK: @M123_REKEY_LOCK.DMC
M124_INVENTORY_CONTROL: @M124_INVENTORY_CONTROL.DMC
DEFINE TEXT 1 L121_MENU_CHOICE.

REPEAT
  PUSH USING BL
  POP END.
  PRINT "               COMPLETE KEY ORDERS MENU"
  PRINT "Choose Option:"
  PRINT "  A List Orders"
  PRINT "  B Change Orders"
  PRINT "  C Record Completion"
  PRINT "  D Print Orders"
  PRINT "  E Exit"
  PRINT " "

  PRINT FMT $ "Enter choice: " END.
  ACCEPT L121_MENU_CHOICE.
  IF L121_MENU_CHOICE EQ ('A', 'a') THEN
    CALL LIST_ORDERS.
  ELSIF L121_MENU_CHOICE EQ ('B', 'b') THEN
    CALL CHANGE_ORDERS.
  ELSIF L121_MENU_CHOICE EQ ('C', 'c') THEN
    CALL RECORD_COMPLETION.
  ELSIF L121_MENU_CHOICE EQ ('D', 'd') THEN
    CALL PRINT_ORDERS.
  ELSIF L121_MENU_CHOICE NEQ ('E', 'e') THEN
    PRINT "You have entered an invalid choice."
  ENDIF.
UNTIL L121_MENU_CHOICE EQ ('E', 'e').
RETURN.
LIST_ORDERS: @M1211_LIST_ORDERS.DMC
CHANGE_ORDERS: @M1212_CHANGE_ORDERS.DMC
RECORD_COMPLETION: @M1213_RECORD_COMPLETION.DMC
PRINT_ORDERS: @M1214_PRINT_ORDERS.DMC
Module Name: M1211_LIST_ORDERS.DMC
Parameters:
  In Only: none
  Out Only: none
  In/Out: none
Coded By: Michele Miley
Date Last Modified: July 7, 1985
Reason Modified: Initial module creation.

Module Description:
This module sorts the Order File by date and priority and displays the contents of the file on the screen.

DEFINE TEXT 1 L1211_CONTINUE.

DBSET ORDER.
FIND ALL.
SORT BY PRIORITY ENTRY_DATE.
PUSH USING BL
POP END.
PRINT " ".
PRINT " Priority Key Number Amount Needed Date Ordered".
PRINT " ".
PRINT " PR KID AMT " " ED FMT A16 A9 A10 I8 A10 D3 END.
PRINT " ".
PRINT FMT $ "Type a carriage return <cr> to continue. " END.
ACCEPT L1211_CONTINUE.
RETURN.
@
Module Name: M1212CHANGE_ORDERS.DMC

Parameters:
  In Only: none
  Out Only: none
  In/Out: none

Coded By: Michele Miley
Date Last Modified: July 7, 1985
Reason Modified: Initial module creation.
Date Last Modified: July 21, 1985
Reason Modified: Format user interface.

Module Description:
This module allows the user to change fields in the Order File manually rather than use the system assigned values automatically.

DEFINE TEXT 1 L1212_DONE
  L1212_NEW_PR.
  L1212_CORRECT.

DEFINE INTEGER L1212_AMT
  L1212_ORDER_NUMBER.

CALL NUMBER ORDER_FILE.
LET L1212_DONE EQ 'F'.
WHILE L1212_DONE NEQ 'T' DO
  DBSET ORDER.
  SORT BY PRIORITY ED.
  FIND ALL.
  PRINT "Please type the number of the record you wish to change."
  PRINT "(Enter a zero if you wish to exit this portion of the program.)"
  PRINT FMT $ "Order Number: " END.
  ACCEPT L1212_ORDER_NUMBER.
  PRINT "What is the new priority you would like to assign?"
  PRINT FMT $ "Priority: " END.
  ACCEPT L1212_NEW_PR.
  PRINT "What is the new amount to be assigned?"
  PRINT FMT $ "Amount: " END.
  ACCEPT L1212_AMT.
  PRINT "New Priority: " L1212_NEW_PR.
  PRINT "New Amount: " L1212_AMT.
  PRINT FMT $ "Are these the correct values? (Y/N) " END.
  ACCEPT L1212_CORRECT.
  UNTIL L1212_CORRECT EQ ('Y','y').
  GETREC LEAVE L1212_ORDER_NUMBER.
  CHANGE PR L1212_NEW_PR.
  CHANGE AMT L1212_AMT.
  PRINT "The order has been changed to the values you entered."
ELSE
  PRINT "There are no records corresponding to that order number."
ENDIF.
ENDWHILE.
RETURN.

NUMBER_ORDER_FILE: @M12121_NUMBER_ORDER_FILE.DMC
Module Name: M12121_NUMBER_ORDER_FILE.DMC
Parameters:
  In Only: none
  Out Only: none
  In/Out: none
  Coded By: Michele Miley
  Date Last Modified: July 7, 1985
  Reason Modified: Initial module creation.
Module Description:
  This module accesses the order file and sorts it according to priority and date, then lists it along with a counter so that the user may select a record according to the counter value.

DEFINE INTEGER L12121_COUNT.

LET L12121_COUNT EQ 1.
DBSET ORDER.
FIND ALL.
SORT BY PRIORITY ED.
PUSH USING BL
POP END.
PRINT " Order Number Priority Key Number Amount Date Ordered"
PRINT "----------------- ----------- ----------- ----------- -----------
WHILE SYSNREC GT 0 DO
  GETREC LEAVE.
  PRINT " L12121_COUNT " " PR KID " " AMT " " ED FMT A15 I2 A11 I10 A10 A2 I5 A4 D3 END.
  LET L12121_COUNT EQ L12121_COUNT+1.
ENDWHILE.
PRINT " ".
RETURN.
Module Name: M1213_RECORD_COMPLETION.DMC
Parameters:
  In Only: none
  Out Only: none
  In/Out: none
Coded By: Michele Miley
Date Last Modified: July 7, 1985
Reason Modified: Initial module creation.

Module Description:
This module increases the amount of inventory listed in the
inventory file after keys have been ordered and cut.

DEFINE TEXT 10 L1213_KEY.
DEFINE TEXT 1 L1213_DONE L1213_CORRECT.
DEFINE INTEGER L1213_ORDER_NUMBER L1213_AMT.

CALL M1213_NUMBER ORDER_FILE.
LET L1213_DONE EQ 'F' .
WHILE L1213_DONE NEQ 'T' DO
  DBSET ORDER.
  FIND ALL.
  SORT BY PRIORITY ED.
  REPEAT
  PRINT "Please type the number of the record which has been completed."
  PRINT "(Enter a zero if you wish to exit this portion of the program.)"
  PRINT FMT $ "Order Number: " END.
  ACCEPT L1213_ORDER_NUMBER.
  PRINT "Order Number: " L1213_ORDER_NUMBER.
  PRINT FMT $ "Is this the correct order number? (Y/N) " END.
  ACCEPT L1213_CORRECT.
  UNTIL L1213_CORRECT EQ ('Y','y').
  IF L1213_ORDER_NUMBER EQ 0 THEN
    LET L1213_DONE EQ 'T'.
  ELSEIF L1213_ORDER_NUMBER LEQ SYSNREC THEN
    GETREC LEAVE L1213_ORDER_NUMBER.
    LET L1213_AMT EQ AMT.
    LET L1213_KEY EQ KID.
    DELETE.
    DBSET INVEN.
    FIND ALL.
    FIND KIN EQ L1213_KEY.
    .CHANGE TM TN+L1213_AMT.
    CHANGE Q0N Q0N+L1213_AMT.
    DBSET KEYWAY.
    FIND KYN CT $LEFT($SCAPS($STRIM(L1213_KEY)), $LEN($STRIM(L1213_KEY)) - 6)
    .CHANGE Q0N Q0N - L1213_AMT.
    PRINT "The completion of that order has been recorded."
  ELSE
    PRINT "There are no records corresponding to that order number."
  ENDIF.
ENDWHILE.
RETURN.
DEFINE TEXT 1 L1214_CONT.

DBSET ORDER.
FIND ALL.
PUSH USING BL
POP END.
PRINT " ".
SORT BY PRIORITY ENTRY_DATE.
PRINT " Priority Key Number Amount Needed Date Ordered".
PRINT " \\
PRINT " PR KID AMT " ED FMT A16 A9 A10 18 A10 D3 END.
PRINT " \\
PRINT FMT $ "Type carriage return <cr> to continue: " END.
ACCEPT L1214_CONT.
RETURN.
Module Name: M122_REPLACE_KEY.DMC

Parameters:
  In Only: none
  Out Only: none
  In/Out: none

Coded By: Michele Miley
Date Last Modified: July 7, 1985
Reason Modified: Initial module creation

Module Description:
If a defective key is returned for replacement, this amount
must be subtracted from the inventory file. This module accesses
that file and automatically decrements the quantity on hand and
the total amount.

DEFINE TEXT 10 L122_KEY_NUMBER.
DEFINE TEXT 1 L122_CORRECT
L122_CONT.

PRINT " ".
PRINT "Please enter the key number for the key to be replaced.".
PRINT "(If you wish to exit without entering the key number, type "E for Exit.)."
PRINT FMT $ "Key Number: " END.
ACCEPT L122_KEY_NUMBER.
PRINT " ".
IF L122_KEY_NUMBER NEQ ('E', 'e') THEN
  PRINT FMT $ "Key Number: " END.
  PRINT L122_KEY_NUMBER.
  PRINT FMT $ "Is this the correct key number? (Y/N) " END.
  ACCEPT L122_CORRECT.
  IF L122_CORRECT EQ ('N', 'n') THEN
    REPEAT
      PRINT " ".
      PRINT FMT $ "Please re-enter the key number: " END.
      PRINT " ".
      PRINT FMT $ "Key Number: " END.
      PRINT L122_KEY_NUMBER.
      PRINT FMT $ "Is this the correct entry? (Y/N) " END.
      UNTIL L122_CORRECT EQ ('Y', 'y').
  ENDIF.
ENDIF.

DBSET INVEN.
FIND KIN EQ L122_KEY_NUMBER.
IF (QON LEQ 0) OR (TN LEQ 0) OR (!SYSNREC EQ 0) THEN
  PRINT " ".
  PRINT "The inventory file shows there are no keys listed".
  PRINT "by that number.".
  PRINT FMT $ "Type carriage return <cr> to continue: " END.
  ACCEPT L122_CONT.
ELSE
  PRINT " ".
  PRINT "The replacement of that key has been recorded.".
  PRINT FMT $ "Type carriage return <cr> to continue: " END.
  ACCEPT L122_CONT.
  CHANGE QON QON-1, TN TN-1.
ENDIF.
RETURN.
Module Name: M123_REKEY_LOCK.DMC

Parameters:
- In Only: none
- Out Only: none
- In/Out: none

Coded By: Michele Miley
Date Last Modified: July 25, 1985
Reason Modified: Initial module creation.

Module Description:
This module prompts the user for the room being rekeyed and calls the appropriate modules to generate the new key number and update the files.

```
DEFINE TEXT 10 G123_KEY_NUM
G123_NEW_KEY.
DEFINE TEXT 4  G123_ROOM.
DEFINE TEXT 1  G123_BLDG.
DEFINE TEXT 1  G123_FOUND
G123_ACCEPT.
DEFINE INTEGER G123_AMT
G123_ORDER_AMT.
DEFINE TEXT 1  L123_CORRECT.

LET G123_FOUND EQ 'F'.
REPEAT
  PRINT " ".
  PRINT "Please enter the building and room number that are being rekeyed, ".
  PRINT "following their respective prompts.".
  PRINT FMT $ "Building: "  END.
  ACCEPT G123_BLDG.
  PRINT FMT $ "Room number: "  END.
  ACCEPT G123_ROOM.
  PRINT " ".
  PRINT "Building:" G123_BLDG.
  PRINT "Room number:" G123_ROOM.
  PRINT FMT $ "Are these values correct? (Y/N) "  END.
  ACCEPT L123_CORRECT.
UNTIL L123_CORRECT EQ ( 'Y', 'y' ).

CALL L123_GET_NUM.
IF G123_ACCEPT EQ ( 'Y', 'y' ) THEN
  CALL L123_UPDATE.
  PRINT " ".
  PRINT "The files have been changed to reflect the new key number.".
  PRINT FMT $ "Type carriage return <cr> to continue: "  END.
  ACCEPT L123_CORRECT.
ENDIF.
RETURN.

L123_GET_NUM: @M1231_GET_NEW_NUMBER.DMC
L123_UPDATE: @M1232_UPDATE_FILES.DMC
```
Module Name: M1231_GET_NEW_NUMBER
Parameters:
  In Only: G123_BLDG, G123_ROOM
  Out Only: G123_ACCEPT, G123_KEY_NUM, G123_AMT, G123_ORDER_AMT,
            G123_NEW_KEY
  In/Out: none
Coded By: Michele Miley
Date Last Modified: July 25, 1985
Reason Modified: Initial module creation.
Module Description:
This module determines the new key number and accepts an existing number as the new number or calls the appropriate modules for determining a new number.

DEFINE TEXT 1 L1231_CORRECT
  L1231_TYPE.
DBSET LOCATE.
FIND ALL.
SEARCH BLD CT $CAPS(STRIM(G123_BLDG)) AND RN CT $CAPS(STRIM(G123_ROOM)).
IF SYSREC EQ 1 THEN
  LET G123_KEY_NUM EQ KIN.
ELSEIF SYSREC GT 1 THEN
  PRINT "More than one key will fit that lock.".
  REPEAT
    PRINT "Please enter the key number you are changing."
    PRINT FMT $"Key Number: " END.
    ACCEPT G123_KEY_NUM.
    PRINT "Is this the correct key number? (Y/N)"
    ACCEPT L1231_CORRECT.
  UNTIL L1231_CORRECT EQ ('Y', 'y').
ELSE
  PRINT "There is no record of a key fitting that lock.".
  REPEAT
    PRINT "Please enter the key number opening that lock."
    PRINT FMT $"Key Number: " END.
    ACCEPT G123_KEY_NUM.
    PRINT "Is this the correct key number? (Y/N)"
    ACCEPT L1231_CORRECT.
  UNTIL L1231_CORRECT EQ ('Y', 'y').
ENDIF.
REPEAT
  PRINT "Do you wish to use a new key or an existing one?"
  PRINT FMT $"Type 'N' for new or 'E' for existing: " END.
  ACCEPT L1231_TYPE.
  IF L1231_TYPE EQ ('N', 'n') THEN
    PRINT "Do you have a number you would like to use? (Y/N)"
    ACCEPT L1231_TYPE.
    IF L1231_TYPE EQ ('Y', 'y') THEN
PRINT " ".
PRINT "Please enter the key number you would like to use.".
PRINT FMT $ "Key Number: " END.
ACCEPT G123.NEW_KEY.
PRINT ".
PRINT "Key Number: " G123.NEW_KEY.
PRINT FMT $ "Is this the correct key number? (Y/N) " END.
ACCEPT L1231.CORRECT.
UNTIL L1231.CORRECT EQ ('Y', 'y').
ELSE
CALL L1231_GEN_NEW.
ENDIF.
ELSE
REPEAT
PRINT ".
PRINT "What is the existing number you would like to use? ".
PRINT FMT $ "Key Number: " END.
ACCEPT G123.NEW_KEY.
PRINT ".
PRINT "Key Number: " G123.NEW_KEY.
PRINT FMT $ "Is this the correct key number? (Y/N) " END.
ACCEPT L1231.CORRECT.
UNTIL L1231.CORRECT EQ ( 'Y', 'y' ).
PRINT FMT $ "Do you wish to use this number? (Y/N) " END.
ACCEPT G123.ACCEPT.
IF G123.ACCEPT EQ ( 'Y', 'y' ) AND L1231.TYPE EQ ( 'E', 'e' ) THEN
PRINT ".
PRINT "How many keys do you have on hand?".
PRINT FMT $ "Amount on Hand: " END.
ACCEPT G123.AMT.
ENDIF.
IF G123.ACCEPT EQ ( 'Y', 'y' ) THEN
PRINT ".
PRINT "How many keys do you need to make?".
PRINT FMT $ "Amount to Order: " END.
ACCEPT G123.ORDER.AMT.
ELSE
PRINT ".
PRINT "The files have not been changed.".
PRINT FMT $ "Type carriage return <cr> to continue: " END.
ACCEPT L1231.CORRECT.
ENDIF.
RETURN.

L1231_GEN_NEW: @M12311_GENERATE_NEW_NUMBER.DMC
L1231_CHECK: @M12312_CHECK_APPLICABILITY.DMC
Module Name: M12311GENERATE_NEW_NUMBER.DMC

Parameters:
- In Only: G123_KEY_NUM
- Out Only: G123_NEW_KEY
- In/Out: none

Coded By: Michele Miley
Date Last Modified: July 25, 1985
Reason Modified: Initial module creation.

Module Description:
This module generates a new key number when a lock is being rekeyed and the user does not wish to use an old number.

```
DEFINE TEXT 4 L12311_KWY.
DEFINE TEXT 6 L12311_KEYNO.
DEFINE INTEGER L12311_KID.

LET L12311_KWY EQ $LEFT($TRIM(G123_KEY_NUM),$LEN($TRIM(G123_KEY_NUM)) - 6).
DBSET INVEN.
FIND ALL.
FIND KIN CT SCAPS($TRIM(L12311_KWY)).
GETREC LEAVE.
WHILE G123_FOUND NEQ 'T' DO
    GETREC LEAVE.
    WHILE L12311_KEYNO EQ SRIGHT($TRIM(KIN),6).
    LET L12311_KID EQ $INT($L12311_KEYNO).
    LET L12311_KID EQ L12311_KID + 2.
    LET L12311_KEYNO EQ $TEXTR(L12311_KID).
    FIND KIN CT SCAPS($TRIM(L12311_KWY)) AND KIN CT SCAPS($TRIM(L12311_KEYNO)).
    IF SYNNREC EQ 0 THEN
        LET G123_FOUND EQ 'T'.
        LET G123_NEW_KEY EQ SCAPS($TRIM(L12311_KWY) + $TRIM(L12311_KEYNO)).
    ENDIF.
ENDWHILE.
RETURN.
```
Module Name: M12341_CHECK_APPLICABILITY
Parameters:
    In Only: G123_NEW_KEY, G123_AMT
    Out Only: G123_FOUND, G123_NO_MORE
    In/Out: none
    Coded By: Michele Miley
    Date Last Modified: July 25, 1985
    Reason Modified: Initial module creation.

Module Description:
    This module checks for the availability for use of a previously retired key.

DBSET INVEN.
FIND ALL.
FIND KIN EQ SCAPS($TRIM(G123_NEW_KEY)).
IF SYSNREC EQ 0 THEN
    LET G123_FOUND EQ 'T'.
ELSEIF STATUS EQ 'K' AND DR LT SYSDATE - 365 THEN
    LET G123_FOUND EQ 'T'.
ELSE
    PRINT " ".
    PRINT "That number is not available for use.".
    LET G123_FOUND EQ 'F'.
ENDIF.
RETURN.
Module Name: M1232_UPDATE_FILES

Parameters:
  In Only: G123_NEW_KEY, G123_AMT, G123_ORDER_AMT, G123_KEY_NUM
  Out Only: none,
  In/Out: none

Coded By: Michele Miley
Date Last Modified: July 25, 1985
Reason Modified: Initial module creation.

Module Description:
  If a key number is accepted, this module updates all the files
  associated with the rekeyed lock.

DBSET INVEN.
FIND ALL.
FIND KIN EQ SCAPS(G123_KEY_NUM).
CHANGE ST "R" DR SYSDATE.
FIND ALL.
FIND KIN EQ SCAPS(G123_NEW_KEY).
  IF SYSNREC GT 0 THEN
    CHANGE ST " " DR " ".
    CHANGE QON G123_AMT TN G123_AMT.
  ELSE
    ADD KIN SCAPS(G123_NEW_KEY) KY "C" QON G123_AMT TN G123_AMT ST " " DR " ".
  ENDIF.
DBSET LOCATE.
FIND ALL.
FIND KIN EQ SCAPS(G123_KEY_NUM).
SEARCH BLD CT SCAPS(STRIM(G123_BLDG)) AND RN CT SCAPS(STRIM(G123_ROOM)).
  IF SYSNREC GT 0 THEN
    CHANGE KIN SCAPS(G123_NEW_KEY).
  ELSE
    ADD KIN SCAPS(G123_NEW_KEY) BLD SCAPS(G123_BLDG) RN SCAPS(G123_ROOM).
  ENDIF.
DBSET ORDER.
ADD PR 1 KID SCAPS(G123_NEW_KEY) AMT G123_ORDER_AMT.

RETURN.
Module Name: M124_INVENTORY_CONTROL
Parameters:
  In Only: none
  Out Only: none
  In/Out: none
Coded By: Michele Miley
Date Last Modified: July 6, 1985
Reason Modified: Initial module creation.

Module Description:
This module is a controlling module for the inventory control subsystem of the locksmith portion of the Key Inventory Control system. It displays a menu allowing the user to choose the options available to him.

----------
DEFINE TEXT L124_MENU_CHOICE.
REPEAT
  PUSH USING BL
  POP END.
  PRINT " ******************************************************************".
  PRINT " INVENTORY CONTROL MENU  \\
  ".
  PRINT " ******************************************************************".
  PRINT " Choose Option:  \\
  ".
  PRINT " A Change Inventory  \\
  ".
  PRINT " B Order Parts  \\
  ".
  PRINT " C Add Item  \\
  ".
  PRINT " D Delete Item  \\
  ".
  PRINT " E Print Inventory  \\
  ".
  PRINT " F Exit  \\
  ".
  PRINT " ******************************************************************".
  PRINT FMT $ "Enter choice: " END.
  ACCEPT L124_MENU_CHOICE.
  IF L124_MENU_CHOICE EQ ('A', 'a') THEN
    CALL CHANGE_INVENTORY.
  ELSEIF L124_MENU_CHOICE EQ ('B', 'b') THEN
    CALL ORDER_PARTS.
  ELSEIF L124_MENU_CHOICE EQ ('C', 'c') THEN
    CALL ADD_ITEM.
  ELSEIF L124_MENU_CHOICE EQ ('D', 'd') THEN
    CALL DELETE_ITEM.
  ELSEIF L124_MENU_CHOICE EQ ('E', 'e') THEN
    CALL PRINT_INVENTORY.
  ELSEIF L124_MENU_CHOICE NEQ ('F', 'f') THEN
    PRINT "You have entered an invalid choice."
  ENDIF.
  UNTIL L124_MENU_CHOICE EQ ('F', 'f').
RETURN.

CHANGE_INVENTORY: @M1241_CHANGE_INVENTORY.DMC
ORDER_PARTS: @M1244_ORDER_PARTS.DMC
ADD_ITEM: @M1242_ADD_ITEM.DMC
DELETE_ITEM: @M1245_DELETE_ITEM.DMC
PRINT_INVENTORY: @M1243_PRINT_INVENTORY.DMC
Module Name: M1241_CHANGE_INVENTORY.DMC

Parameters:
In Only: none
Out Only: none
In/Out: none

Coded By: Michele Miley
Date Last Modified: July 8, 1985
Reason Modified: Initial module creation.
Date Last Modified: July 21, 1985
Reason Modified: To allow for lower case text entries.

Module Description:
This module allows the user to change an inventory record in the keyway file. Only the amount field may be changed.

DEFINE TEXT 4 L1241_KWY.
DEFINE TEXT 1 L1241_CORRECT.
DEFINE TEXT 1 L1241_CONTINUE.
DEFINE INTEGER L1241_AMT.

PRINT " ".
PRINT FMT "$Do you wish to continue with the inventory change process? (Y/N) " END.
ACCEPT L1241_CONTINUE.
IF L1241_CONTINUE EQ ('Y','y') THEN
REPEAT
PRINT " ".
PRINT "Please enter the keyway number for which you wish to make a change."
PRINT FMT "$Keyway Number: " END.
ACCEPT L1241_KWY.
PRINT " ".
PRINT FMT "$Keyway Number: " END.
PRINT L1241_KWY.
PRINT FMT "$Is this the correct entry? (Y/N) " END.
ACCEPT L1241_CORRECT.
UNTIL L1241_CORRECT EQ ('Y','y').

DBSET KEYWAY.
FIND KYN CT SCAPS(STRIM(L1241_KWY)).
PRINT "$.
PRINT "$The current inventory record is: ".
PRINT "$Keyway Number: " L1241_KWY.
PRINT "$Quantity on Hand: " QON.
IF SYSNREC GT 0 THEN
LET L1241_CORRECT EQ 'F'.
REPEAT
PRINT "$.
PRINT "$What is the new amount you would like to enter?"
PRINT FMT "$Amount: " END.
ACCEPT L1241_AMT.
PRINT "$.
PRINT FMT "$Amount: " END.
PRINT L1241_AMT.
PRINT FMT "$Is this the correct amount? (Y/N) " END.
ACCEPT L1241_CORRECT.
UNTIL L1241_CORRECT EQ ('Y', 'y').
CHANGE QON L1241_AMT.
PRINT "$.
PRINT "$The inventory record has been changed to: ".
PRINT "keyway number:" KIN "quantity on hand:" QUN.
PRINT ".
PRINT FMT $ "Type carriage return <cr> to continue: " END.
ACCEPT L1241_CONTINUE.
ELSE
PRINT "There are no entries in the file corresponding to that".
PRINT "keyway number.".
PRINT FMT $ "Type carriage return <cr> to continue: " END.
ACCEPT L1241_CONTINUE.
ENDIF.
ENDIF.
RETURN.
Module Name: M12421_UPDATE_FILE.DMC

Parameters:

In Only: G1242_AMT, G1242_KWY
Out Only: none
In/Out: none

Coded By: Michele Miley
Date Last Modified: July 8, 1985
Reason Modified: Initial module creation.

Date Last Modified: July 21, 1985
Reason Modified: To allow for lower case text entries.

Module Description:
This module accepts the keyway number and amount to be added to the keyway quantity on hand from M1242_ADD_ITEM, and proceeds to add the amount to the keyway file quantity on hand.

DEFINE TEXT 1 L12421_CORRECT.
DEFINE TEXT 1 L12421_CONT.

DBSET KEYWAY.
FIND KYN CT SCAPS(STRIM(G1242_KWY)).
IF SYNREC GT 0 THEN
  CHANGE QON QON+G1242_AMT.
  PRINT " ".
  PRINT "The updated inventory record is: ".
  PRINT "Keyway Number: " KYN.
  PRINT "Quantity on Hand: " QON.
  PRINT " ".
  PRINT FMT $ "Type carriage return <cr> to continue: " END.
  ACCEPT L12421_CONT.
ELSE
  PRINT " ".
  PRINT "The keyway file shows no entry for that keyway number.".
  PRINT " ".
  PRINT FMT $ "Keyway Number: " END.
  PRINT G1242_KWY.
  PRINT FMT $ "Is this the correct entry? (Y/N) " END.
  ACCEPT L12421_CORRECT.
  IF L12421_CORRECT EQ ('Y','y') THEN
    ADD KYN G1242_KWY QON G1242_AMT.
  ENDIF.
ENDIF.
RETURN.
@ @
Module Name: M1243_PRINT_INVENTORY.DMC

Parameters:
- In Only: none
- Out Only: none
- In/Out: none

Coded By: Michele Miley
Date Last Modified: July 10, 1985
Reason Modified: Initial module creation.
Date Last Modified: July 21, 1985
Reason Modified: To change user interface.

Module Description:
This module prints a listing of the inventory file on the line printer.

DEFINE TEXT 1 L1243_CONT.

DBSET KEYWAY.
FIND ALL.
PUSH USING BL
POP END.
PRINT "
PRINT "Keyway Number " Quantity on Hand".
PRINT " -------------- ------------------".
PRINT " " KEY QON FMT A21 A20 13 END.
PRINT " ".
PRINT FMT $ "Type carriage return <cr> to continue; " END.
ACCEPT L1243_CONT.
RETURN.
\"
Module Name: M1244_ORDER_PARTS.DMC
Parameters:
  In Only: none
  Out Only: none
  In/Out: none
Coded By: Michele Miley
Date Last Modified: July 10, 1985
Reason Modified: Initial module creation.
Date Last Modified: July 21, 1985
Reason Modified: To change user interface.
Module Description:
This module sends a copy of the contents of the Key Order File to the line printer.

DEFINE TEXT 1 L1244_CONT.

CALL CHECK_FILE.
PUSH USING BL
POP END.
DBSET KEY_ORDER_FILE.
FIND ALL.
PRINT " 
PRINT " Keyway Number Amount".
PRINT " 
PRINT " KYN QON FMT A19 A13 I3 END.
PRINT " 
PRINT FMT $ "Type carriage return <cr> to continue: " END.
ACCEPT L1244_CONT.
RETURN.

CHECK_FILE: #M12441_CHECK_FILE.DMC
Module Name: M12141_CHECK_FILE.DMC
Parameters:
  In Only: none
  Out Only: none
  In/Out: none
Coded By: Michele Miley
Date Last Modified: July 10, 1985
Reason Modified: Initial module creation.
Date Last Modified: July 21, 1985
Reason Modified: To change file access method.

Module Description:
This module checks the keyway file for amounts less than the
threshold number and places these in the key order file.

DBSET KEY_ORDER_FILE.
CLOSE.
FILE DELETE KEY_ORDER_FILE.DMS.
DBSET KEYWAY.
FIND ALL.
SELECT QON LT 100.
DUMP SET KEY_ORDER_FILE.
OPEN NOCLOSE KEY_ORDER_FILE.
KEY NOMSG ALL.
FIND ALL.
CHANGE QON 100 - QON.
RETURN.
Module Name: M1245_DELETE_ITEM.DMC
Parameters:
  In Only: none
  Out Only: none
  In/Out: none
Coded By: Michele Miley
Date Last Modified: July 8, 1985
Reason Modified: Initial module creation.
Date Last Modified: July 21, 1985
Reason Modified: To allow for lower case text entries.

Module Description:
This module will delete an entry from the keyway file when
the user indicates this keyway number is no longer in use.

DEFINE TEXT 4 L1245_KWY.
DEFINE TEXT 1 L1245_CORRECT
    L1245_CONTINUE.

REPEAT
  PRINT " ".
  PRINT "Please enter the keyway number for the record to be deleted."
  PRINT FMT S "Keyway Number: " END.
  ACCEPT L1245_KWY.
  DBSET KEYWAY.
  FIND KYN CT $CAPS($STRIM(L1245_KWY)).
  IF SYSNREC GT 0 THEN
    PRINT " ".
    PRINT FMT S "Is this the correct entry? (Y/N) " END.
    ACCEPT L1245_CORRECT.
    IF L1245_CORRECT EQ ('Y', 'y') THEN
      PRINT " ".
      PRINT FMT S "Continuation of this procedure will result in the deletion
      .
      PRINT FMT S "of that record. Do you wish to continue? (Y/N) " END
      ACCEPT L1245_CONT.
      IF L1245_CONT EQ ('Y', 'y') THEN
        DELETE.
        PRINT "The record for that keyway number has been deleted."
      ENDIF.
    ENDIF.
  ELSE
    PRINT " ".
    PRINT FMT S "Do you wish to delete another entry? (Y/N) " END.
    ACCEPT L1245_CONTINUE.
  UNTIL L1245_CONTINUE EQ ('N', 'n').
RETURN.
Module Name: Maint Main

Parameters:
  In Only: none
  Out Only: none
  In/Out: none

Coded By: Robin FauntLeRoy

Date Last Modified: 7/12/85

Reason Modified:

Module Description:
This module is the controller for all that occurs in the upkeep of this system. It includes such things as backing up the information on tape, and ordering keys made.

CALL BACKUP_INFO.
CALL ORDER_KEY.
CALL UPDATE_KEY_STATUS.

RETURN.

BACKUP_INFO: @R131_BACKUP_INFO.DMC
ORDER_KEY: @R132_ORDER_KEY.DMC
UPDATE_KEY: @R133_UPDATE_KEY.DMC
Module Name: 131 BACKUP INFO

Parameters:
- In Only: G1_REQUESTED
- Out Only: G131_FILE_CHOICE
- In/Out: none

Coded By: Robin FauntLeRoy
Date Last Modified: 7/15/85

Reason Modified:

Module Description:
This module is passed requested, which will determine whether
the user wished to enter this section of the program. If so, the
menu will be displayed, otherwise, if it has been 7 days since the
last save, then an automatic save of all files for backup will be
requested.

DEFINE TEXT 1 G131_FILE_CHOICE.

IF G1_REQUESTED EQ "F" THEN
   DBSET LAST_SAVE.
   FIND ALL.
   IF $DATEJUL(DLS) LT $DATEJUL(SYSDATE)-7 THEN
      CALL SAVE.
   ENDIF.
ELSE
   REPEAT
      PUSH USING BL
      POP
   END.
   REPEAT
      PRINT " ★ FILE RESTORATION MENU ★
      ★ Enter file to be restored:
      * A Individual Record File
      * B Name File
      * C Inventory File
      * D Location File
      * E Keyway File
      * F Order File
      * G All Files
      * H Exit
   END.
PRINT "
**
PRINT " Please enter the file to be restored: "END.
ACCEPT G131_FILE_CHOICE.
IF G131_FILE_CHOICE NEQ
('A', 'a', 'b', 'B', 'C', 'c', 'D', 'd', 'E', 'e', 'F', 'f', 'G', 'g', 'H', 'h')
) THEN
PRINT "Invalid choice, please try again."
ENDIF.
UNTIL G131_FILE_CHOICE EQ ('A', 'a', 'B', 'b', 'C', 'c', 'D', 'd', 'E', 'e', 'F', 'f', 'G', 'g', 'H', 'h')
IF G131_FILE_CHOICE NEQ ('H', 'h') THEN
CALL RESTORE.
ENDIF.
UNTIL G131_FILE_CHOICE EQ ('H', 'h')
ENDIF.

RETURN.

RESTORE: @R1312_RESTORE.DMC
SAVE: @R1311_SAVE.DMC
@
Module Name: SAVE

Parameters:
  In Only: none
  Out Only: none
  In/Out: none

Coded By: Robin FauntLeRoy
Date Last Modified: 7/15/85

Reason Modified:

Module Description:
This module calls a batch job which will mount the tape used for saving files and save all pertinent files for the key inventory control system.

PUSH USING SAVE.CTL
POP END.

RETURN.
IF G131_FILE_CHOICE EQ ('A', 'a') THEN
   PUSH USING INDIVIDUAL.CTL/OUTPUT:ERRORS
   POP END.
ELSEIF G131_FILE_CHOICE EQ ('B', 'b') THEN
   PUSH USING NAME.CTL/OUTPUT:ERRORS
   POP END.
ELSEIF G131_FILE_CHOICE EQ ('C', 'c') THEN
   PUSH USING INVENTORY.CTL/OUTPUT:ERRORS
   POP END.
ELSEIF G131_FILE_CHOICE EQ ('D', 'd') THEN
   PUSH USING LOCATION.CTL/OUTPUT:ERRORS
   POP END.
ELSEIF G131_FILE_CHOICE EQ ('E', 'e') THEN
   PUSH USING KEYWAY.CTL/OUTPUT:ERRORS
   POP END.
ELSEIF G131_FILE_CHOICE EQ ('F', 'f') THEN
   PUSH USING ORDER.CTL/OUTPUT:ERRORS
   POP END.
ELSE
   PUSH USING RESTORE.CTL/OUTPUT:ERRORS
   POP END.
ENDIF.
RETURN.
Module Name: 132 Order Key
Parameters:
In Only:
Out Only:
In/Out:
Coded By: Robin FauntLeroy
Date Last Modified: 7/17/85
Reason Modified:
Module Description:
This module will access the inventory file and check to be sure that the quantity on hand is adequate. If not, it will map the Order file to find out whether it has been ordered or not, and if not, insert the order for more keys into the order file.

DEFINE TEXT 1 L132_PRIOR.
DEFINE INTEGER L132_QON.
DEFINE TEXT 10 L132_KEY_NUMBER.

DBSET ORDER_DATE.
FIND ALL.
IF OD NEQ SYSDATE THEN
  CHANGE OD SYSDATE.
  DBSET INVEN.
  FIND ALL.
  SEARCH QON LT 3 ST NEQ "R".
  IF SYSNREC GT 0 THEN
    REPEAT.
    GETREC LEAVE.
    LET L132_QON EQ QON.
    LET L132_KEY_NUMBER EQ KIN.
    MAP TO ORDER VIA KIN TO KID.
    IF SYSNREC EQ 1 THEN
      IF (3-L132_QON) GT AMT THEN
        CHANGE AMT (3-L132_QON).
      ENDIF.
      ELSE
        IF L132_QON EQ 1 THEN
          LET L132_PRIOR EQ "1".
        ELSE
          LET L132_PRIOR EQ "2".
        ENDIF.
        ADD PR L132_PRIOR KID L132_KEY_NUMBER AMT (3-L132_QON).
      ENDIF.
    UNTIL SYSNREC EQ 0.
  ENDIF.
ENDIF.
RETURN.
Module Name: R133_UPDATE_KEY.DMC
Parameters: 
In Only: none
Out Only: none
In/Out: none
Coded By: Michele Miley
Date Last Modified: July 21, 1985
Reason Modified: Initial module creation.
Module Description:
This module updates the inventory file so that keys retired
for more than one year are listed as available.

RETURN.
CLEAR.
DEFINE TEXT 17 G11_LAST_NAME.

SET FMSG OFF.
OPEN IND_RECORD DUMMY_SS PSMAST SRMAST NAME.

PL1022 START.
REPEAT
   CALL ACCEPT_NAME.
   CALL ENTER_INFO.
UNTIL G11_LAST_NAME EQ Q.

ACCEPT_NAME: @R21_ACCEPT_NAME.DMC
ENTER_INFO: @R22_ENTER_INFO.DMC

PL1022 STOP.

CLOSE.
CLOSE.
CLOSE.
SET FMSG ON.
PL1022 END.
Module Name: 21 Accept Name

Parameters:

In Only: g11_last_name
Out Only: g11_first_name
In/Out:
g11_ss_number

Coded By: Robin Faustleroy
Date Last Modified: 7/29/85

Reason Modified:

Module Description:
This module will determine if a name exists on campus for the individual who has a key issued to him.

DEFINE TEXT 1 L21_ANSWER
TEXT 10 G11_NAME
TEXT 13 G11_FIRST_NAME.
DEFINE INTEGER G11_SS_NUMBER.

LET G11_SS_NUMBER EQ 0.

REPEAT
PRINT " ".
PRINT "Please enter issuee's last name.".
ACCEPT G11_LAST_NAME.
PRINT ".
PRINT "Name: "G11_LAST_NAME.
PRINT FMT $ "Is this correct? (y or n): "END.
ACCEPT L21_ANSWER.
UNTIL L21_ANSWER EQ ('Y','y').
IF G11_LAST_NAME NEQ "Q" THEN
REPEAT
PRINT " ".
PRINT FMT $ "Please enter issuee's first name. "END.
ACCEPT G11_FIRST_NAME.
PRINT ".
PRINT "Name: "G11_FIRST_NAME.
PRINT FMT $ "Is this correct? (y or n): "END.
ACCEPT L21_ANSWER.
UNTIL L21_ANSWER EQ ('Y','y').
LET G11_NAME EQ G11_LAST_NAME + G11_FIRST_NAME.
CALL FIND_SSN.
IF G11_SS_NUMBER EQ 0 THEN
DBSET DUMMY_SS.
FIND ALL.
LET G11_SS_NUMBER EQ SSN.
CHANGE SSN SSN=1.
ENDIF.
ENDIF.

FIND_SSN: @R16_FIND_SSN.DMC
0
Module Name: 22 Enter Info

Parameters:
In Only: g11_ss_number

Out Only:

In/Out:

Coded By: Robin Fauntleroy
Date Last Modified: 7/12/85

Reason Modified:

Module Description:
This module enters into the appropriate files the incoming information about a key which is issued.

DEFINE TEXT 10 L22_KEY_NUMBER
TEXT 5 L22_ANSWER
TEXT 1 L22_WAIT.

DEFINE INTEGER L22_AMOUNT
INTEGER L22_DEPOSIT.

IF g11_LAST_NAME NEQ "Q" THEN
  IF g11_SS_NUMBER LT 0 THEN
    DBSET NAME.
    ADD NM g11_NAME SSN g11_SS_NUMBER.
  ENDIF.
  DBSET IND_RECORD.
  REPEAT
    PRINT " ■  "
    PRINT FMT ? "Please enter key-number: "END.
    ACCEPT L22_KEY_NUMBER.
    PRINT "  ".
    PRINT "Key_Number:  " L22_KEY_NUMBER.
    PRINT FMT S "Is this correct? (y or n): "END.
    ACCEPT L22_WAIT.
    UNTIL L22_WAIT EQ ( 'Y', 'y' ).
  PRINT "  ".
  PRINT "Enter deposit amount".
  PRINT "If amount is other than normal, type in ".
  PRINT FMT $ "new amount. Otherwise type a carriage return. "END.
  ACCEPT L22_ANSWER.
  LET L22_AMOUNT EQ $INT(L22_ANSWER).
  IF L22_AMOUNT GT 0 THEN
    LET L22_DEPOSIT EQ L22_AMOUNT.
  ELSE
    LET L22_DEPOSIT EQ 200.
  ENDIF.
  ADD SSN g11_SS_NUMBER KIN L22_KEY_NUMBER DEP L22_DEPOSIT NUL.
ENDIF.
RETURN.
INDIVIDUAL.CTL.1
@MOUNT TAPE KIC:/WRI
@DUMPER
*TAPE KIC:
*FILES
*REWIND
*RESTORE IND_RECORD.DMS
*REWIND
*EXIT
@DISMOUNT KIC:

INVENTORY.CTL.1
@MOUNT TAPE KIC:/WRI
@DUMPER
*TAPE KIC:
*FILES
*REWIND
*RESTORE INVENTORY.DMS
*REWIND
*EXIT
@DISMOUNT KIC:

KEYWAY.CTL.1
@MOUNT TAPE KIC:/WRI
@DUMPER
*TAPE KIC:
*FILES
*REWIND
*RESTORE KEYWAY.DMS
*REWIND
*EXIT
@DISMOUNT KIC:

LOCATION.CTL.1
@MOUNT TAPE KIC:/WRI
@DUMPER
*TAPE KIC:
*FILES
*REWIND
*RESTORE LOCATION.DMS
*REWIND
*EXIT
@DISMOUNT KIC:

MAIL.CTL.2
@MAIL
*CS.GRAD.FAUNTLEROY
*
*UNAUTHORIZED ACCESS
*An attempt was made to enter the Key Inventory
*Control system by someone who did not know the
*proper password for entry.
*Z

NAME.CTL.1
@MOUNT TAPE KIC:/WRI
@DUMPER
*TAPE KIC:
REWIND
*RESTORE NAME.DMS
*REWIND
*EXIT
@DISMOUNT KIC:

ORDER.CTL.1
@MOUNT TAPE KIC://WRI
@DUMPER
*TAPE KIC:
*FILES
*REWIND
*RESTORE ORDER.DMS
*REWIND
*EXIT
@DISMOUNT KIC:

RESTORE.CTL.1
@MOUNT TAPE KIC://WRI
@DUMPER
*TAPE KIC:
*FILES
*REWIND
*RESTORE
*REWIND
*EXIT
@DISMOUNT KIC:

SAVE.CTL.1
@MOUNT TAPE KIC://WRI
@DUMPER
*TAPE KIC:
*FILES
*REWIND
*NAME KEY INVENTORY CONTROL DATA FILES
*SNAME IND RECORD.DMS TMPIND RECORD.DMS NAME.DMS TMPNAME.DMS, LOCATION.DMS
*TMPLOCATION.DMS, INVENTORY.DMS TMPINVENTORY.DMS, KEYWAY.DMS TMPKEYWAY.DMS
*ORDER.DMS TMPORDER.DMS
*EXIT
@DISMOUNT KIC:
