ON-LINE, REAL TIME CIRCULATION;

A REPORT ON THE

NORTHWESTERN UNIVERSITY LIBRARY SYSTEM

INTRODUCTION

This issue of the LARC REPORTS is devoted to one of the major library automation projects accomplished last year — the operational on-line circulation system at Northwestern University Library. Joseph T. Paulukonis, Velma D. Veneziano, and Rolf H. Erickson, of the Northwestern University Library staff, have provided an unusually thorough review of the system's development and capabilities and its effect on the circulation staff, other library departments, and the users.

Mr. Paulukonis, who is Acting Librarian at Northwestern's Technological Institute Library and a member of the Board of Directors of the LARC Association, served as guest editor and was responsible for planning and coordinating this issue. He and Mrs. Veneziano have included some unusual features in their system report: the glossary, in Appendix P, which clearly explains all of the terms used; the decision tables, in Appendix P, which display the logical analysis of several circulation operations; and the frank discussion in the "UPDATE" reports of problems that arose, and were solved, during actual operation — rarely do we get this kind of insight into the differences between a projected system and an operational system. And finally, Mr. Erickson has provided an excellent review of the impact that an on-line capability has on the various facets and complexities of circulation control in a university environment.

One of the goals of the LARC Association is to provide, from time to time, detailed descriptions of particular systems and, in these descriptions to focus the reader's attention on the many intellectual problems to be faced in the automation of libraries. Mr. Paulukonis, Mrs. Veneziano, and Mr. Erickson have produced a report that meets these goals and makes a significant contribution to the literature on systems analysis of circulation processes.

Barbara Evans Markuson
General Editor
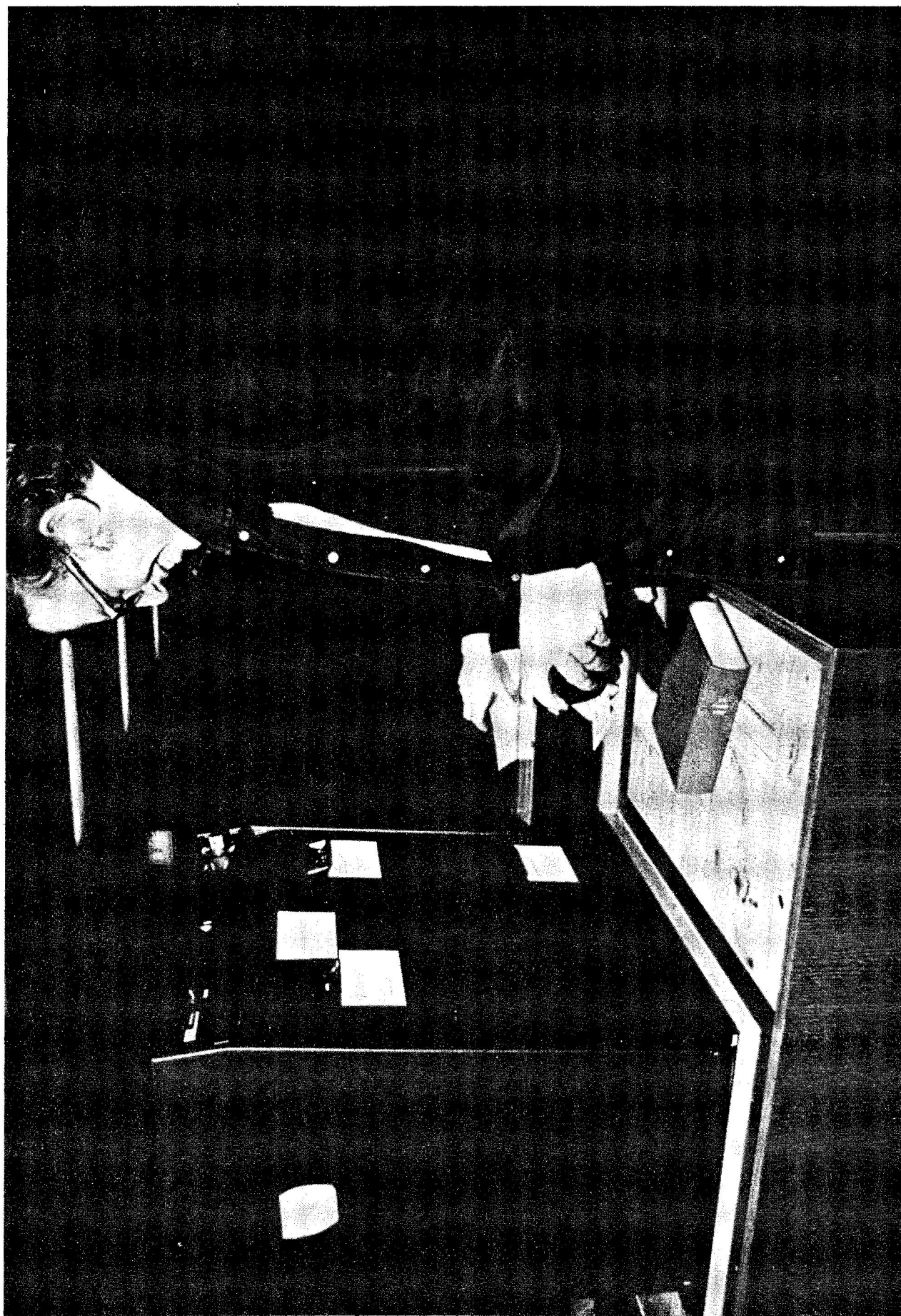The LARC REPORTS

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Figure 1. STUDENT USING SELF-SERVICE 1031/1033 UNIT IN STACK AREA

AN ON-LINE, REAL-TIME CIRCULATION SYSTEM — OVERVIEW

by
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The system to be described was developed during 1969 and put into operation on January 19, 1970 — the same day the new Northwestern University Library opened.

In this on-line system, all records are available for display and updating on a real-time basis during regular library hours (about 90 hours most weeks). Circulation records are maintained on an IBM 2311 data cell (although access time is slower than on a disk, the data cell is significantly less expensive) and are directly addressable by call number. IBM 1031 badge/card readers are used to transmit book and user data for charges and discharges. IBM 1033 printers, one for each 1031, produce date due slips, print out error messages requiring follow-up action, and print notices for books on which there are saves (reserves). IBM 2740 typewriter terminals are used for inquiry into circulation status, entering saves, entering special renewals, and a variety of record-keeping chores.

Overdue notices are produced weekly on a batch basis. Each morning, Monday through Friday, fine notices, call-in notices, and book-available notices are produced.

The system runs on a time-shared IBM 360-30 with 64 K (the teleprocessing program uses approximately 36 K). A total of seven terminals (five 1031-1033 units and two buffered 2740's) are used in the circulation system and are connected to the computer by two telephone lines. Two additional 2740's also share one of these lines. They are currently being used for record conversion for the serials module of the overall system. Later in 1971 they will also be used for on-line check-in of serials.

Among the special features of this system are 1) the fast response time (as soon as a record is created or changed by one terminal, another terminal has access to that data), 2) self-service operation (three 1031/1033 units are located in stack areas where users (see fig. 1) can do their own charging), 3) a file directly accessible by call number (extremely important in a research library), and 4) utilization of a relatively small and inexpensive computer on a time-shared basis.

Before going on to a more detailed look at the system, a little background information is in order. In the fall of 1966, John P. McGowan was appointed Associate University Librarian. One of his responsibilities was the application of technology in the Library. Mrs. Velma D. Veneziano joined the Library as Systems Analyst at the beginning of 1967. After a detailed study of all manual operations, it became evident that a completely integrated system, covering technical services (searching, ordering, check-in, book-budget accounting, cataloging and physical processing) and circulation was needed. Furthermore, it was determined that only a system designed to provide on-line access to computer-based files would have substantial impact on library operating efficiency. Such an ambitious approach, with limited resources and no outside funding, dictated that costs of design and operation of the system be pared to the bone in order to be acceptable to the University.

After a survey of computer resources on campus (a CDC 6400 and an IBM 360-30), it was decided that, although the 360-30, located in the Administrative Data Processing Department, was small and would need upgrading, it was best suited to library needs. The cost of a suitable computer dedicated to library use only was, and still is, prohibitive.

It was also decided that while the design of the system would be a staff function, the responsibility for implementing and operating the various system modules would be transferred at the earliest possible moment to the existing library departments and become a line function.

Rather than having the Library employ its own programmers, it was decided that programming would be performed by the Administrative Data Processing Department. It turned out that this Department had no programmers sufficiently experienced to do such sophisticated work. Fortunately, a member of the Electrical Engineering faculty, Dr. James S. Aagaard (now also a member of the Computer Sciences Department), with extensive knowledge of the software needed for information processing, became interested in the Library applications and agreed to develop an on-line, interactive, general purpose, file management system. This system would be designed to serve not only the Library, but other departments of the University needing on-line access to files.

The old Deering Library presented such constraints to testing that the Technological Institute Library was selected as the site of a pilot project. There programs and procedures could be tested prior to implementation in the main Library. Joseph T. Paulukonis had the responsibility of putting the system into operation in the pilot Library. He also worked closely with the Systems Analyst during the design phase, helping define library practices and needs.

The system was designed to handle both technical services and circulation. The original intention was to implement the technical services module first, then circulation. However, in December of 1968, Thomas R. Buckman, the new University Librarian, decided that it would be desirable to have the circulation system operational for the opening of the new Library. All efforts were then focused on the circulation module.

After less than two weeks of testing with simulated data in the Technological Institute Library, the system was put into operation the day the new Library opened. Unfortunately, only one 1031/1033 was installed, creating a major bottleneck. Within several weeks, however, things began to shape up and the system began to be more fully utilized.

It must be noted that this system was put into operation under very trying circumstances. Not only was it basically untested, but the staff was just being introduced to a new building. In addition, a new head of the Circulation Department, Rolf Erickson, had been appointed just three weeks earlier. For many weeks each member of the department did much above and beyond the ordinary call of duty.

A detailed description of the system is presented in the following report. The first part of each section contains the initial system description as of January, 1970. The second part, entitled UPDATE, brings the information up to January 1971. (Not all sections needed updating.) Section P of the report is an appendix which contains a glossary of terminology used in this system and exhibits of forms, specifications, etc.

There are also two additional articles: one dealing with the preparation of punched book cards and one giving the Circulation Librarian's view of the system.

AN ON-LINE, REAL TIME CIRCULATION SYSTEM — SYSTEM DESCRIPTION

by

Velma D. Veneziano and Joseph T. Paulukonis

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Section A—BOOK CARDS

One of the two principal machine-readable input documents is the book card. A sample appears in section P-2 of the appendix; section P-3 describes the contents of this card.

This machine-readable card replaces the previously used typed book card and is stored in a pocket inside the back cover of the book. The card usually fits in the pocket, provided the pocket is placed low. If a book is particularly small, the card is creased, about a third of the way from either end, to permit folding. While folding is not particularly desirable, it does not usually interfere with reading by the terminal, especially since the right-hand crease does not occur in the area which contains the call number.

The book card is used to charge out the book, after which it is reinserted in the book. Thus the card never leaves the book except at point of charge and discharge.

If the card is lost or damaged, a new card is punched before the book is returned to the stacks. An 029 printing keypunch is available for making these replacement cards, as well as for making cards for books which do not have punched cards, including new acquisitions.

After the implementation of the Technical Services System in the new Library, book cards for all newly acquired books and bound serials will be produced by computer, together with printed spine and pocket labels. Computer-produced cards will be run through the 029 keypunch with the interpreting feature.

The present key-punched cards contain only the call number. In the future, computer-produced cards will contain abbreviated author-title data, only a portion of which (up through column 40) will be carried in the file, to save storage space.

UPDATE
In terms of card stock, book cards have been no problem. Even after having been folded along the crease, they have always been readable by the 1031. (The Standard Register Machine (used for back up when the 1031 is down) seems to be more delicate and frequently misreads other than perfect cards.) However, cards which are folded in half present difficulties — the lozenge in column 41 (12-4-8 punch) is often misread, putting a spurious character into the record.

Section B — USER BADGES

The circulation system requires that each user have a plastic badge, punched with his social security number (or other identification number) and a user code which identifies the type of user. Most students are already identified by social security numbers, although a few have an old-style number assigned by the University. The Office of Student Finance provides all Evanston campus students with these badges. All faculty and staff badges are issued by the Personnel Department.

Student cards are valid for one year, carry a picture of the student and also contain name, address and identification number. To minimize the use of temporary cards each fall, the Office of Student Finance prepares cards for returning students after spring pre-registration. Only cards for new students need be prepared in the fall.

The badges must conform to the specifications established by IBM. These specifications recommend a square guide hole at the end of the badge which is inserted in the 1031; however, a round hole is acceptable.

Faculty badges are distributed to all members of the faculty on both the Evanston and Chicago campuses. Unlike the student badges, they do not contain a picture. They are designed to deemphasize the numeric identification of the individual.

Special individual users are supplied with a paper badge. Their library-assigned number is taken from a list of sequential numbers; their names and addresses are entered on the list.

At present, graduate students are not distinguished from undergraduates. It is possible to incorporate a graduate-student code into the badges, to permit a differential loan period.

UPDATE

Badge quality, in terms of placement of the guide hole and punching of the user number, is very important. The badges in use for the academic year in which the system was installed were, unfortunately, of poor quality. A new vendor was utilized for the 70/71 year — with even worse results. The errors were primarily in not enough punches rather than wrong punches. These badges were thus not accepted by the 1031 and charges had to be made manually.

The Library has considered the possibility of acquiring equipment to punch badges but would prefer that the University develop in-house capability for both production and punching of badges.

Consideration is also being given to supplying special users with punched badges that include an expiration date. There would be up to four punches available for this, since special users have a six-digit user number. It might also be possible to give users who have assigned carrels or studies a badge in which the carrel or study number is the user, thus facilitating in-house charges which must now be done at the main circulation desk.

Section C — TERMINALS

The Main University Library has four 1031/1033 terminals, three of which are devoted exclusively to standard book charges (i.e., users with badges and a standard two-week loan period). The terminals devoted exclusively to these standard charges are located in the 3rd, 4th, and 5th levels of the stacks. The fourth terminal (see fig. 2) is located at the main circulation desk. It is used to process discharges and also to charge books to special users, to faculty members who do not have their badges, for renewals, and for charges to carrels. These terminals are on a single telephone line, which also handles the 1031/1033 at the Technological Institute Library.

Each 1031 badge/card reader has one slot into which the book card is inserted and another slot into which the user badge is placed. The badge can be locked into place until manually released, enabling a number of books to be processed for the same user without the necessity of reinserting the badge each time.

In addition to the book and badge slots, the 1031 badge/card reader at the circulation desk has a bank of 12 slides, each capable of holding a numeric digit from 0 to 9. The terminals in the stacks do not have these slides; the unit in the Technological Institute Library does. The first two slides are used for control codes — a transaction code which tells the documents to be read and the source of the data elements, and a code which tells the loan period or fine-payment status. These two slides can be locked to avoid resetting after every transaction. The remaining slides are used to enter the user code and user number for special users and users who have forgotten their badges. These slides can also be locked until all books for a user have been processed.

A 1033 printer (a typewriter with no keyboard) is associated with each 1031 terminal. The primary purpose of these printers is to print charge slips, print out computer-detected errors, and to flag discharged books which should be held aside for other users (saves). The 1033 printer can communicate in only one way — from the computer back to the terminal.

Central to the decision to design an on-line, real-time system was the need to be able to inquire easily into the status of a book without having to consult expensive, inconvenient, bulky and out-of-date listings. Theoretically the 2740 typewriter terminal, used for this inquiry purpose, could also be programmed to serve the charge slip, error detection, saved book identification, and inquiry functions; practically, the complexity and costs of programming the interchange between the two terminal types dictated that, initially, both types of terminal would be used.

A single 2740 typewriter terminal was installed at the front counter of the main circulation desk. This 2740 shares a phone line with another 2740 in the Technological Institute Library, and additional 2740's acquired for Technical Services will share this same line.

The present version of the 2701 control unit, which is the interface device between the terminals (2740's and 1030's) and the computer, can service up to four telephone lines. A separate line is required for each type of terminal. A single line handles all the 1031's and their associated printers.
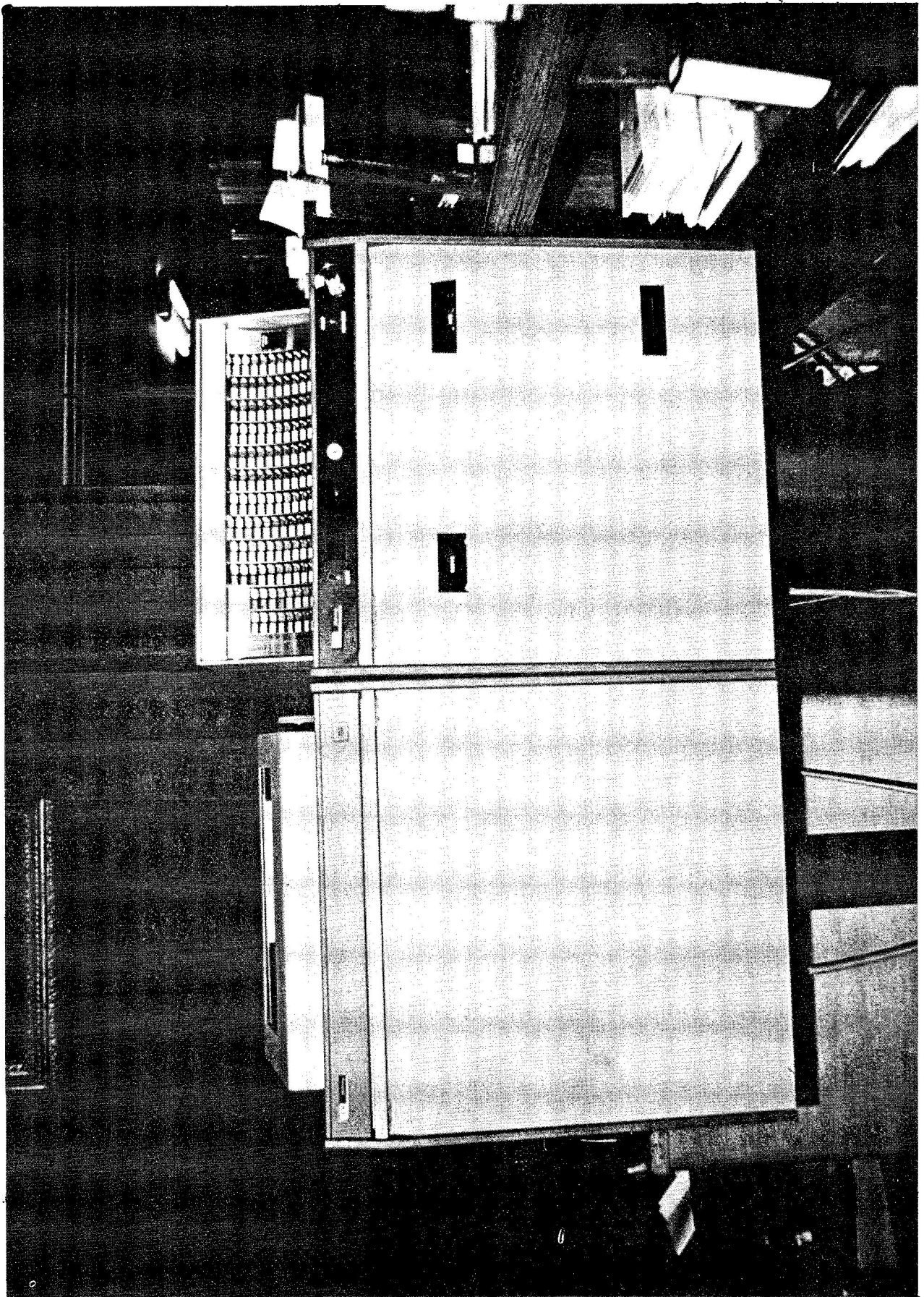
Figure 2. 1031 BADGE/CARD READER (RIGHT) AND 1033 PRINTER AT CIRCULATION DESK, TECHNOLOGICAL/INSTITUTE LIBRARY

UPDATE

During the early months of operation, the terminals were frequently down for a variety of reasons, including considerable telephone-line problems. Yeoman efforts by the IBM field engineers several times kept the system from falling apart. Once these problems were corrected, the 1031 functioned quite satisfactorily.

The greatest continuing problem concerns the 1033 printer and its paper. In the beginning, the heavier-weight paper used would not feed properly, but the IBM engineers rigged a device to overcome that. Then it became necessary to produce a printed charge slip no more than three inches high to fit in the book pockets. Since the original cutting edge produced a much larger slip, one of the shops in the Technological Institute was called upon to make a new cutting edge. The glass plate directly above the printing area was replaced by a plexiglass plate with a slit for the paper and a serrated edge. This solved the problem for the manned terminals — the operators easily detached the slips by tearing downward. The users at the self-service terminals, however, insisted on tearing upward, just as if moving a sheet of paper from a typewriter. This led to ridiculously wide charge slips, considerable skewing of the paper and eventual paper jams. Pin-feed platens were installed to halt the skewing. However, the upward pull by the users caused the holes to misalign with the pins, and jams occurred again. (These jams often developed at the rate of four to five per hour per unit.)

Presently, new cutting devices are being installed. These require the punching of a lever to activate cutting blades. This may solve the difficulty.*

Section D — CHARGE-OUT PROCEDURES

To charge out a book on a self-service stack terminal, the user's badge is inserted in the badge slot and the book card in the book-card slot. The in-process light goes on, and the card feeds down and comes out from the lower slot. If there is more than one book for the same customer, the book cards are inserted one after another without the necessity for inserting the badge each time. At the end, the reset button is pressed to release the badge.

As the book card is fed through the terminal, the charge slip (with the call number, the user's ID number and the date due) is printed on the printer and is torn off and inserted in the book. If either the badge or the book card is not inserted properly, the badge (or card) light will go on, and the book card will not feed. The user must then reinsert the documents correctly before processing will occur.

All books charged out in the stack terminals will automatically carry a two-week loan period. In the case of faculty, this loan period is non-significant, since there is no penalty for non-return by the due date. Since badges contain a code which identifies user type, the fine and overdue programs can suppress the preparation of such notices for exempt users.

The circulation desk 1031/33 terminal, which has a set of slides in addition to badge/card slots, is more versatile than the self-service stack terminals. (See fig. 3.) Circulation operations which cannot be handled at the stack terminals are performed at the circulation desk and include:
1) All discharges
2) Charges where the user has no punched badge
3) Charges where the book has no punched card
4) Charges where the book has other than standard (two-week) loan period
5) Renewals

If a book happens **not** to have a punched book card, the clerk at the circulation desk records the call number, user code and number on a two-part composite card. One part goes into the book; the other goes to be keypunched, in accordance with procedures detailed in Section N, BACKUP SYSTEM, for later processing.

Although a student cannot charge out books unless he has his punched badge or a temporary card, for public relations reasons it was thought desirable to permit faculty members who did not have their badges to charge out books. Such charges are handled by the terminal at the main circulation desk. The appropriate transaction loan period codes are entered in slides 1 and 2 of the 1031, followed, on slides 3-12, by the user code and number. To facilitate such transactions, a faculty directory, in name order, is produced by the computer center once a year. A similar procedure is used for all special users and for intra-and inter-library loans.

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* Editor's note: While this article was in press, the authors reported that the new cutting blades are now operational and are working very well.
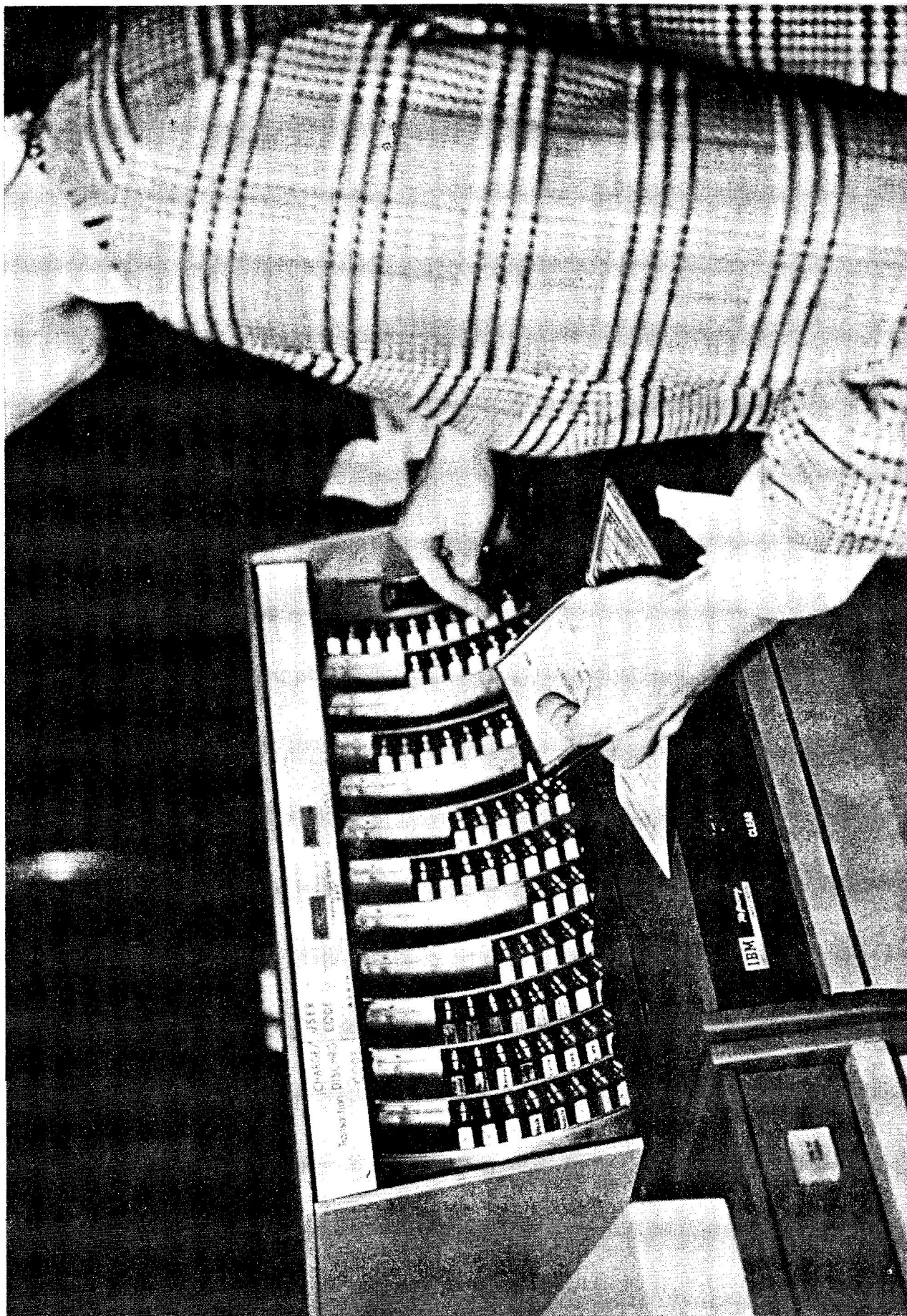
Figure 3. ENTERING TRANSACTION, CHARGE AND USER CODES, AND USER NUMBER ON SLIDES OF 1031 AT MAIN CIRCULATION DESK

UPDATE

There have been no significant changes in the basic procedures. The reset button on the stack terminals has been removed because of the many badges left behind by the users. Unless the badge pops back automatically, they seem to forget about it.

Except for the badge problem, the users have adjusted to the self-service aspect very well. Those who are reluctant to use the strange looking boxes (or who do not know what they are for) bring their books to the main circulation desk. If they have no valid reason for not using the self-service terminals, they are asked to use them in the future. Once they have tried the terminals, users are enthusiastic about them. In fact, they become disgruntled if these units are out of order, forcing them to go to the main circulation desk.

In the beginning written directions for use of the terminals were placed on each unit. These have now been replaced by word and picture directions (See figures 5 and 6.) In the event that a particular terminal becomes inoperable, users usually go to another terminal but they rarely notify the Circulation Department of the malfunction. This can inconvenience many users, but, fortunately, machine breakdowns are not as common now as they were during the first few months. The one major problem concerning paper charge slips remains to be solved (see discussion in Section C, TERMINALS).

Section E — DISCHARGE PROCEDURES

The discharge operation is performed at the 1031 at the main circulation desk. In this operation, the first slide is set to a transaction code of 4 (if to be discharged as of yesterday) 5 (if to be discharged as of a date earlier than yesterday) (set date in slides 3-8), or 6 (if to be discharged today) (card only); the second slide (discharge code) is set to 8 if no fine was paid; to 9 if the standard fine was paid. The use of the first slide provides flexibility in discharging. For example, if there are too many books to discharge in one day, they can be held over and discharged using the actual date of return (the previous day — code 4).

Procedurally, the books are batched separately into paid and unpaid (by date) groups, to avoid switching from one discharge code to another. The book card is removed from the book pocket and inserted in the card slot. After it feeds through the terminal, it is replaced in the book pocket. The charge slip is discarded.

Occasionally no book card will be found in the pocket. It may be waiting in the cards-pending file (the result of a manual charge), or it may have been lost. If it is not in the cards-pending file, it is assumed lost, and a new book card must be key punched before the book can be discharged.

If discharged book has had a save put on it, the 1033 immediately prints out a message to that effect. The book can then be put on a special shelf to await pickup by the saver, i.e., the patron requesting the hold. (The saver number appears on the message.)

UPDATE

It quickly became obvious that a screening process for all returned books had to be developed. The possible problems—books without cards, with wrong cards, without charge slips—had to be set aside for special handling.

In particular, books returned without charge slips presented problems. While there is a possibility that slips may be lost or that these books were only used in the library, there is also the possibility that these books are targeted to be stolen from the collection. For example, if such a book is returned to the shelves prior to its date due, the "missing" charge slip could be reinserted by the patron, making the book look like a validly charged item. To thwart such a possibility, a charged book returned prior to its due date without a charge slip is kept on a special shelf until the due day. In terms of quantity this is a minor operation, rarely more than a half-dozen books are involved at one time, but the quality of the items suggests that this is a very worth-while operation.

Discharge is an operation in which the staff plays a most important role. Unless they pay strict attention to what they are doing, and why, chaos can ensue.
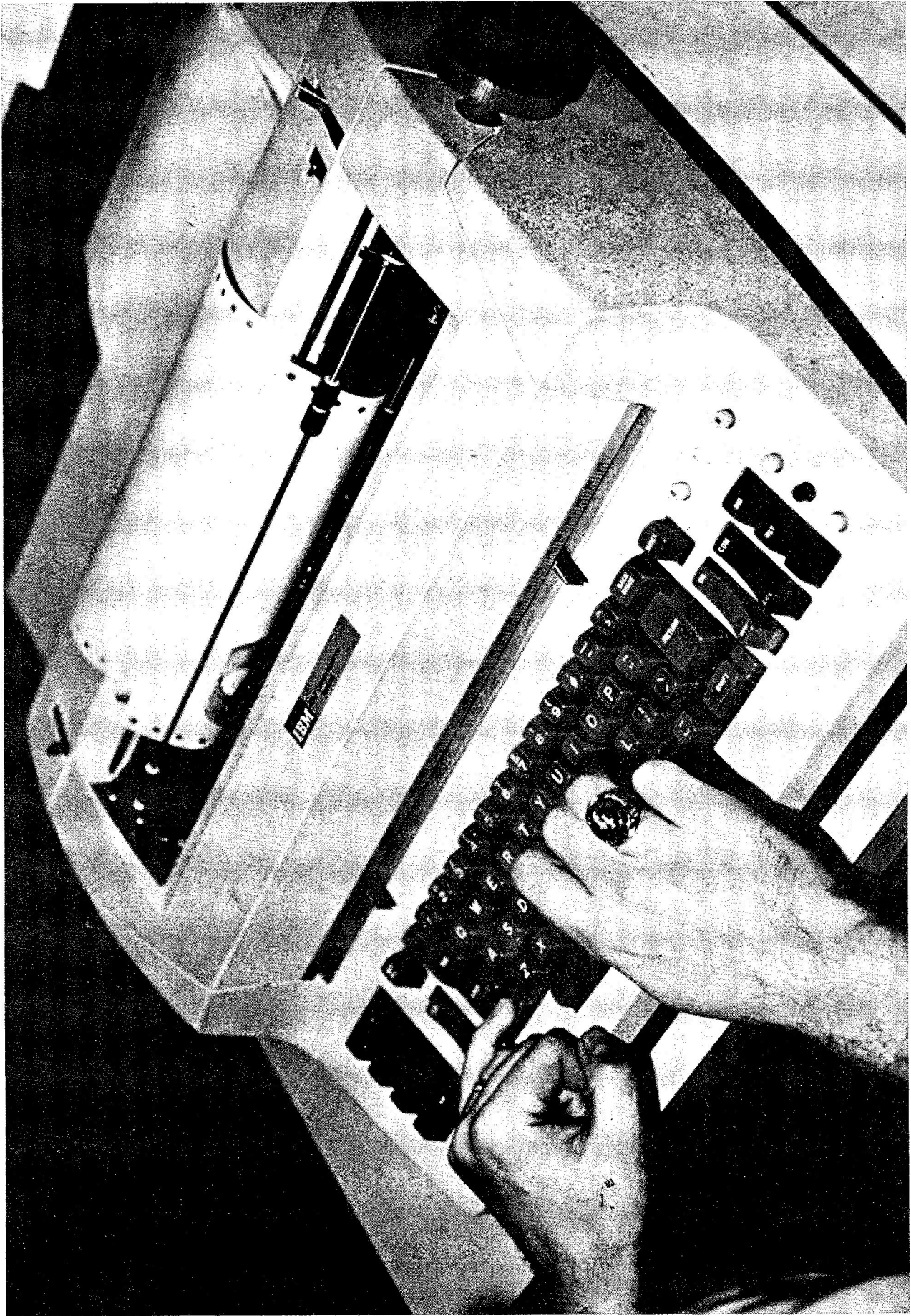
Figure 4. 2740 TYPEWRITER TERMINAL — ONLY MEANS OF INQUIRY TO CIRCULATION RECORDS
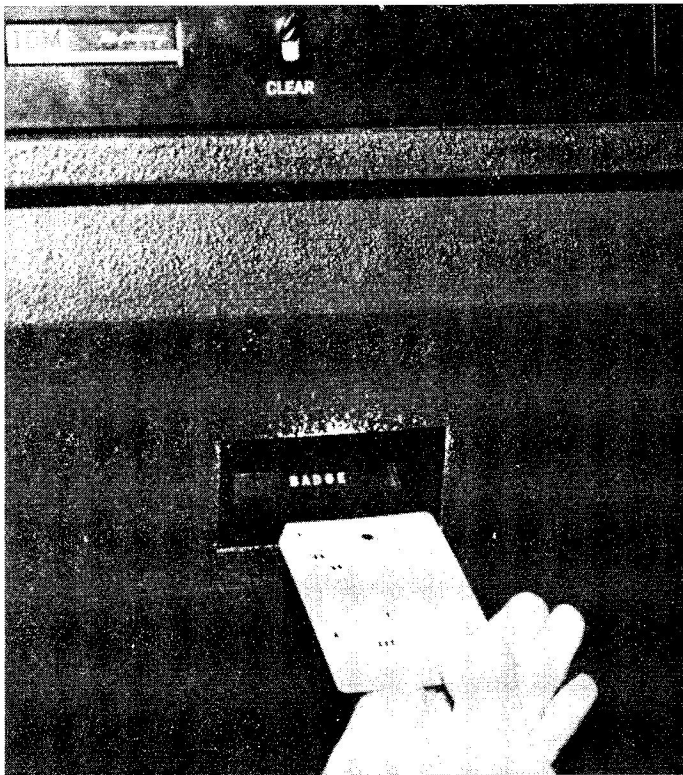
Push plastic identification badge into slot labeled "BADGE" at top left of machine, face up, hole end first, until badge clicks into place.
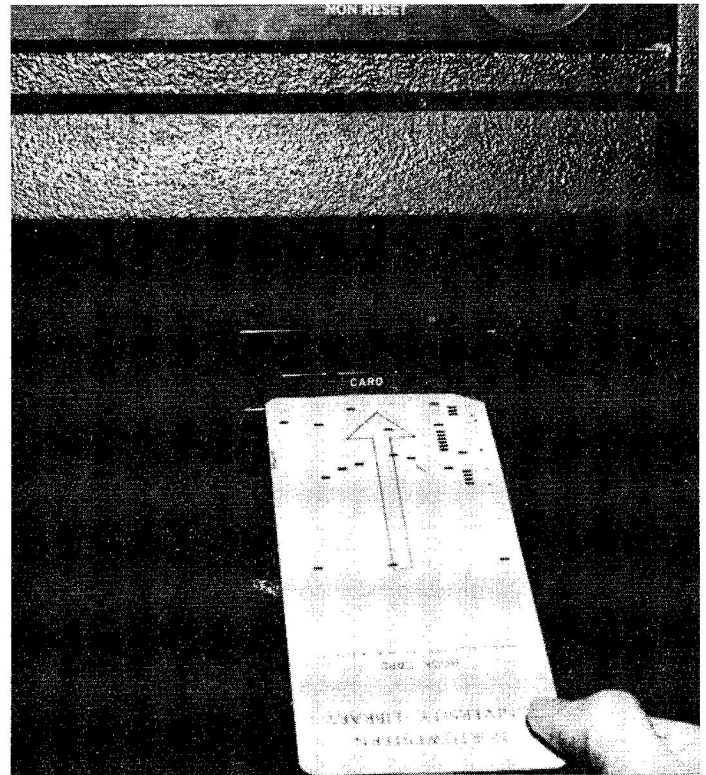
Insert punched IBM book card into slot labeled "CARD", face up, arrow on card pointing toward machine, until card is entirely inside machine.
IMPORTANT: If book card is folded, be sure to **unfold** it.

Self Service Terminal Hours — Fall Quarter

Monday-Thursday	9:00 a.m. - 12:00 Midnight
Friday	9:00 a.m. - 5:00 p.m.
Saturday	9:00 a.m. - 5:00 p.m.
Sunday	2:00 p.m. - 10:00 p.m.

Figure 5. FIRST PART OF DIRECTIONS ATTACHED TO SELF-SERVICE TERMINALS
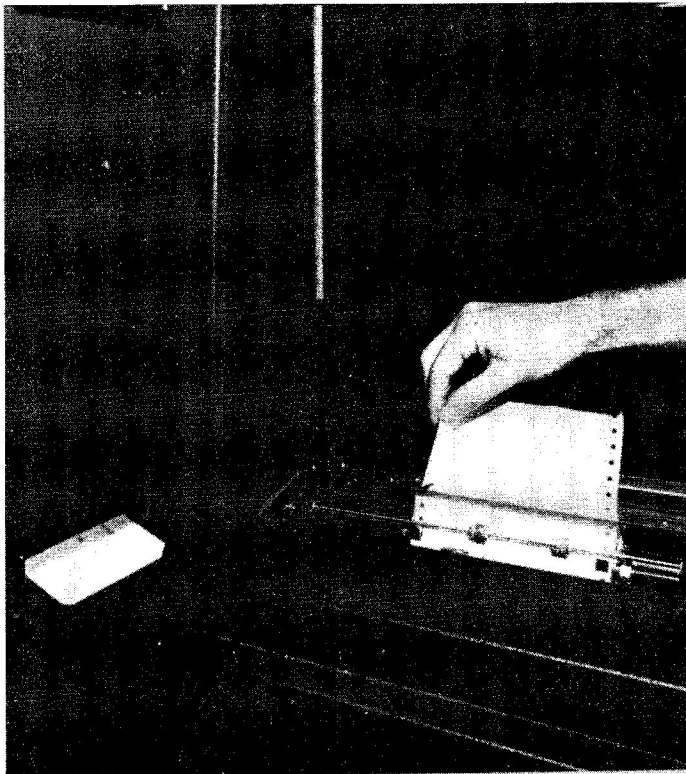
When punched book card feeds down and out slot at lower right of machine, remove card and insert in the book pocket.

Tear off printed slip from typewriter to right of machine.

If slip contains the words "DATE DUE" your book is properly charged out. Insert this "Date Due" slip in the book pocket.

If slip contains the word "UNPROCESSED" your book is NOT charged out. It must be taken to the Main Circulation Desk on Level 1 so the Circulation Desk attendant may properly charge it out.
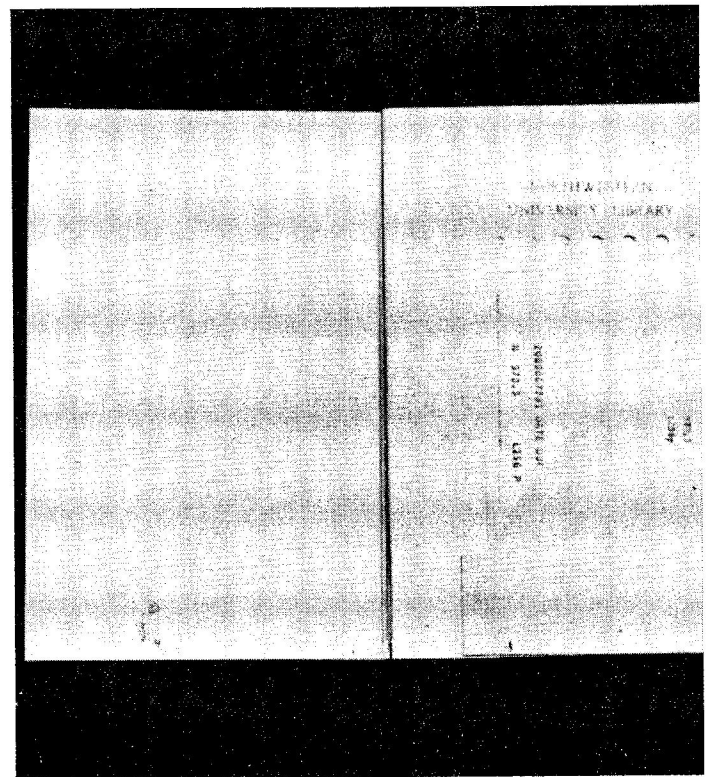
Your book is properly charged out when both the book card and the slip reading "Date Due" are in the book pocket.

If you have more books to charge out, repeat the process.

Be sure to remove your ID BADGE when you finish.

Figure 6. SECOND PART OF DIRECTIONS ATTACHED TO SELF-SERVICE TERMINALS

Section F — INQUIRY INTO CIRCULATION STATUS

A 2740 typewriter terminal is located at the front counter of the main circulation desk and is used both for inquiry into the circulation file and for charge record modification (entering saves and special renewals). (See fig. 4.)

When a user who cannot locate a book in the stacks wants to know the status of a book, the operator can request a display of the record by typing in the call number (key portion only) of the record. If the book is in circulation, the record will be displayed, including the user number and the date due. If the circulation file contains more than one record with the same key, all such records with that key will be displayed, permitting exact identification of volumes, copies, editions, etc., which are in circulation.

The name of the user will not be displayed — only his identification number. If it is desired to identify him by name, the operator must consult a printed directory, prepared by the computer center at the beginning of each quarter. The need for such consultation should be very infrequent.

UPDATE

Training the staff to use the 2740 was quite easy. Within fifteen minutes full-time staff and student assistants were able to search the file for a record and display it. The terminal command language was straightforward; reconstructing**call numbers was the hard part. But even that, after a few days, became second nature.

The saving grace is the ability to search the file by only the key part of the call number (class number, Cutter letter and number, and work letters). The operator is thus able to "browse" through parts of the file — the records of those books which have the same base number but differ only by copy number, edition, volume or part, can all be looked at without having to reconstruct each complete call number. (This is especially useful for putting saves on multicopy items.)

While all service personnel must be able to check into the status of a book through the 2740, particular operators are assigned the specialized tasks of entering saves or special renewals, deleting records, or otherwise updating records. These operators have also become proficient at identifying transpositions which can occur during the keypunching of composite cards for the back-up system.

Section G — ERROR DETECTION

In charging and discharging books via the 1031 terminal, the transaction code minimizes operator error by insuring insertion of the correct combination of documents before control is passed to the computer.

If the documents do not agree with the transaction code, or if they are inserted incorrectly, the non-process light will appear, and the operator must restart the transaction. If the card or badge is defective, this also will be detected by the terminal, and processing will not occur.

Other types of errors cannot be recognized until they have been received by the computer, in which case the 1033 will print out an error message, and the transaction which caused the error will not be processed. If this occurs in conjunction with a charge out, no valid charge slip will be produced, and the user cannot leave the library with the book. Errors detected by the computer and printed out on the printer include:
1) books charged out without having been discharged
2) books discharged without having been charged out
3) books renewed more than 3 times
4) books renewed when overdue
5) invalid user numbers
6) invalid charge-discharge codes
7) invalid book numbers
8) books renewed which have been saved
9) blocked user number

** Editor's Note: The term "reconstructing" is used at Northwestern to describe the process whereby the terminal operator inputs a call number keeping in mind the rules for formatting these numbers. Appendix P-3 describes the call number format.

One feature that the initial system does not have is the ability to determine on a real-time basis if a user is authorized to charge out books. To build this in at the beginning would have complicated programming, delayed the schedule of implementation, and required additional and expensive core storage.

It appears that with a badge which is reissued each year (with a change in user code), the number of unauthorized people attempting to borrow should be minimal. In any event, if the user is or has been a student and incurs a bill, his academic record can be "attached." If experience proves this user control feature to be needed, it can be added at a later date. In the meantime, to provide some control over the few users who abuse their privileges, or even to handle lost badges, it is possible to block a small number (about 50) of user numbers. These numbers are carried in the system program.

UPDATE

The addition of an on-line user file would be very welcome. The continued use of badges by students who have left school during the year has been a minor problem; lost badges have produced more difficulties. The small "blocked" file has not been able to handle all the cases. (An on-line file would be able to solve this problem very easily — provided the user notified the Library of the loss of his badge.)

Of more importance, proper use of such a file would likely be able to eliminate that bane of all librarians — FINES. As a user accumulated late days because of overdue books, a running total would be kept, and when the magic figure was reached, his number would automatically be blocked. Then, until his record was cleared, no additional borrowing could take place. There are, of course, many other refinements that could be implemented. For example, a user who did not return a saved book on time could also be blocked, or faculty who build personal libraries could be somewhat impeded.

Section H — SAVE PLACEMENT

It was determined that the ability to identify, at the time of discharge, books needed by another user, was desirable. Initially, it was thought necessary to be able to process multiple saves for the same book; an examination of the Library's circulation file revealed that such situations were too infrequent to justify the extra core storage and programming required.

When a reader requests that a book be saved for him, the 2740 operator calls in (displays) the record for the book. Then, if there is not already a save on it, she enters the user number of the requester. This causes a copy of that record to be written into the machine-readable transaction file and the subsequent production of a book-needed notice during the daily notice run. The user is given a minimum of 5 days to return a book needed by a library department. Otherwise, the user is either allowed 14 days from the date of charging, or renewing, the book; or 5 days from the time the save was requested, depending upon which gives him the most time.

If it happens that more than one person requests the same book, the second save is held (manually) until the first person requesting the book has charged it out.

Section I — SAVED BOOK IDENTIFICATION

In addition to alerting staff as to the occurrence of errors, the 1033 printer at the circulation desk identifies discharged books which have saves on them. It is thought important that saved books be flagged as soon as possible after discharge, to avoid delays in shelving and to avoid a saved book's being charged to someone other than the person who established a prior claim.

The discharge of a book causes its record to be removed from the main circulation file and written into the transaction file. The appearance of a save in the record triggers production of a book-available notice in the daily notice run. Such saved books will be put aside and held for 5 days. If not picked up in that period, they will be reshelved unless a second save has been requested, in which case the second person will be sent a manually prepared book-available notice.

Section J — FINE AND OVERDUE NOTICES

The transaction file is processed daily to prepare fine notices, book-needed notices, and book-available notices.

A fine notice is always prepared if the book has a save request and the discharge date is greater than the call-in date (the date by which the user was requested to return the book). A fine notice is also prepared if there is no save on the book but there is a standard fine of at least 40 cents due. (Fines of less than 40 cents are not collected.)

A book-needed notice is prepared whenever a save is entered in the record. A book-available notice is prepared whenever a book is returned on which there is a save.

Fine notices, book-needed notices, and book-available notices are all prepared on a four-part form. These are delivered each morning from Administrative Data Processing, and the first copy is stuffed in envelopes and mailed by library personnel. The three carbon copies of the fine notices are filed by user name in the fines-due file. The carbons of the other notices are discarded. (It is easier for Administrative Data Processing to print all these notices on the four-part form, rather than switch to one-part for a few notices.)

When the user comes in and pays the fine, the copy(ies) of the form are pulled from the fines-due file, the last copy is retained as a file copy, and any additional copies are discarded. If the fine is not paid within a prescribed period, the second carbon copy is sent as a follow-up. If this follow-up does not bring results, the third carbon can be used as a final notice, warning the student that failure to pay will result in his academic records being withheld. If this, too, is unsuccessful, a Student Finance Bill form will be typed manually, as at present.

Once a week overdue notices will be prepared, as well as follow-ups on saves whose call-in date is past. Overdue notices will be repeated at biweekly intervals until the book is more than 46 days overdue, at which time the notices will be produced weekly. An overdue notice is not sent until the book is at least 4 days overdue. If the call-in date of a save is past, another call-in notice is prepared in lieu of an overdue notice. Follow-up notices on expired call-ins are repeated at weekly intervals.

Although loans to faculty and indefinite loans (to carrel holders or library departments) are not subject to fine or to overdue notices, it is planned to prepare notices once a quarter to inform users of the books charged to them and to request that they be returned or renewed.

Although failure to renew will not result in any penalty, it is hoped that this reminder will provide better control over books loaned on a long term basis and will discourage keeping books longer than necessary. Computer-produced notices will contain the name and address of the user-saver, drawn from the payroll or student files maintained by Administrative Data Processing. If a user-saver is not a faculty member or an Evanston campus student, notices will contain just the user number. Library staff must then look up the name and address from the library-assigned number list.

Fine, book-available, and book-needed notices will be printed in alphabetical order by name; overdue and follow-up notices (which do not require hand filing) will be in user number order. If a user has multiple fines or multiple overdue books, the records will be combined on one form, except for delinquent overdues, which are printed one to a form.

UPDATE
Quarterly notices are now being generated. They are prepared for all fine-exempt borrowers and all departments or locations to which books may be charged.

Section K — FINE COLLECTION

The collection of fines is complicated by the policy of changing due dates for some called-in books and charging a differential fine rate for users who do not respond on time to a call-in. It is hoped that the following procedure will simplify the clerical operation of collecting fines at point of actual book return.

Under this procedure, when a user returns a book, the clerk collects only the standard fine, calculating the fine from the due date which appears on the charge slip. Since the decision has been made to adopt a two-week minimum loan period for students,* the fine collected on this basis will usually be equitable — in no case will the user be overcharged. If, when the discharge is processed, it is determined that a penalty fine is **also** due, a fine notice covering this penalty fine will be computer generated. A minor simplification in the penalty fine system involves charging a flat one dollar per day penalty fine for both library department and reader saves. If, as may rarely happen, a user demands to pay the penalty fine at the time he returns the book, the computer-generated fine notice should be pulled before mailing.

Once a fine notice is generated, there is no automatic follow-up. (This is thought to be both uneconomical and very difficult to control.) For a description of the manual follow-up, see Section J, FINE AND OVERDUE NOTICES.

Section L — SPECIAL RENEWALS

Renewals in cases where the user has both badge and book card will be handled by the 1031 terminal at the circulation desk, as described in Section D, CHARGE OUT PROCEDURES. Phone or mail renewals will be entered from the 2740 by first displaying the record (to see that a renewal is allowable) and then changing the renewal code and the date due.

UPDATE

The day the system was put into effect, phone renewals were eliminated. This practice was something that the department had wished to eliminate under the old system, and this proved an opportune moment to do so. Mail renewals offer no real handling problem, though the date-due slip which the user is asked to send often reaches the Library after the three-day grace period. However, much of the circulation system logic is by-passed by the 2740, and renewals can be made on overdue books. The one drawback to special renewals is that the date due in the record must be changed by the operator. The displayable date due, then, may not be correct, but since all notices use the base date for computation purposes, no errors are introduced into the system.

Section M — SECURITY

An important factor to be considered was security to prevent removal of uncharged books from the Library. Initially, because of the cost of the 1033 printers, it was thought to be uneconomical to utilize a computer-printed charge slip. At that time, also, it was planned to have all charging done at the main circulation desk by the staff. As the new Library neared completion, however, the idea of placing terminals in stack areas evolved. This would allow a self-service operation and a reduction in staff costs. The 1033 printers then became mandatory, but they were less costly than utilizing the staff. The computer-printed slip, which contains book and user identification, along with the date due, will be used by exit guards as authorization for an individual to remove the book from the library. (See figures 5 and 6.)

The date-due slips, as well as all 1033 messages, are printed on roll-type paper about 6 inches wide. Alterations were made to the 1033 so that the produced slip would be no more than 3 inches high. This allows the slip to be placed in the book pocket without folding.

UPDATE

Because of the significant number of lost badges, it has been necessary to instruct the exit guards to not only check books for valid date-due slips, but to check the badges to see that individuals use their own badges to charge books. This checking not only keeps lost badges from being used but also keeps them from being lost — a person who leaves his badge in the self-service terminal is quickly reminded to go back there and retrieve it.

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* Editor's Note: Within the last few weeks, the standard loan period has been changed to four weeks.

As additional precaution, the user code in student badges was changed in September — the previous year's code will not be accepted. This code change will continue to be done.

The importance of the exit check cannot be overemphasized. However, the task need not be as burdensome as it would seem. A simple verification of two or three random characters in the call number and user number is sufficient.

Section N — BACK-UP SYSTEM

One major problem was how to perform the circulation function when the computer or terminals were down. Although the 1030/1033's are claimed to be highly reliable, there will be times when breakdowns occur. It is also recognized that the computer itself is subject to some down time, although it is hoped that good scheduling of preventive maintenance will keep this to a minimum.

A simple solution would have been to copy call numbers and users' numbers on a slip, which is then keypunched to a composite card. This is, however, time-consuming and error-prone.

The adopted solution is to rent "Source Record Punches" from Standard Register Corporation, capable of punching a composite card, using as input the book card and the user badge. While this machine is slow, noisy, and expensive in relation to its capability, it appears to afford the best protection against hardware and software malfunction. The Source Record Punch transfers linearly up to 40 columns of data from the book card, the user number from the badge, and the date due from a set of slides into the composite card. It is a two-part form at this point: one copy goes into the book as the date-due slip; the other is held and processed through the 1031 when the computer system is back in operation.

This back-up system is meant to be used during periods of hardware or software breakdown; it is not a substitute for an on-line system, since it does not solve one of the main requirements of the circulation system — inquiry into the circulation status of a book. The only complete back-up for this aspect of the system would be a nightly listing of all books in circulation. Since this could mean printing fifty thousand or more records, it is not economically feasible and was, in fact, one of the determining factors in the decision to develop an on-line system. Moreover, our university environment demands more up-to-date information than a day or two old listing.

However, because trouble can be expected in the early days of operation, it may be desirable to prepare some printed output from which one could construct, however laboriously, the status of a book — perhaps a twice-a-month listing, supplemented by nightly listings of the transaction file. A further justification for this would be protection in case of file loss.

As additional insurance, it appears advisable to maintain both the manual and the computer system in parallel until the computer system is thoroughly tested in an operational environment. It is hoped that this will not exceed three months.

The system also had to be designed so that a book which lacked a punched card or had a damaged card could still be charged out. The procedure in this case is to use the two-part composite card and fill in the book and user information manually. One part is put in the book as a date-due slip; the other is sent to be keypunched for later entry through the 1031. At the time of keypunching, a regular book card is punched and put into the cards-pending file near the discharge terminal. When the book is returned, the newly prepared card is pulled, used to discharge the book and then inserted into the book pocket.

UPDATE
A file listing was never prepared because it was never needed. The few errors in the program were of such a minor nature as to cause no serious difficulties. Not only has there not been a need to reconstruct the file, but it has been decided that such an effort would not be worth while in terms of the books which might not be returned to the Library. The parallel operation was dropped after two weeks — the staff could not cope with the work load, and the system was functioning properly. It was a dangerous step, but as became more obvious day by day, the program was almost faultless. A rare occurence indeed, but we had a rare programmer!

While opinions of the Standard Register Punch have not changed, the machine has been useful in emergencies. The two-part form, however, is in need of some revision. Student assistants at the main circulation desk often forget to include the location symbol and some of the key extension data when preparing the card. During the coming year the form will be revised, taking these factors into consideration.

Section O — MANAGEMENT REPORTS

Because of the priority assigned to the operational aspects of the circulation system, the exact nature of the reports most useful to management has not been determined. At a minimum, management should be provided monthly and yearly summaries of circulation by major Dewey classification and by user type.

In any event, it is felt that the transaction files contain valuable data which must be preserved, in raw or reduced form. Until such time as tape drives (the present computer configuration utilizes only disk drives and a data cell) are available for historical records, it is recommended that the transaction records be stored on a data cell, in raw form. When time permits, a program will be written to summarize that data.

UPDATE

During the year, preparation of weekly summaries of circulation statistics was begun. The Dewey class numbers were broken down into meaningful units (516, 517, 518-19, etc.) and circulated items were tallied against these by user type. The number of renewals is also recorded. Subtotals of class numbers by tens (510-19, 520-29, etc.) are listed, along with grand totals.

These figures are prepared for each collection and are gathered from the main circulation file during the weekly notice run. While items which are charged and discharged between runs are not recorded, current indications are that this is not a significant omission.

In order to initiate the system, punched book cards had to be prepared for the collection. Prior to insertion of these punched book cards in their respective books, the cards were read into a computer and the data were transferred to magnetic tape and a printed listing was produced. This inventory file will be periodically brought up to date, for a duplicate (add) card is made for every new acquisition, corrected or reclassified book, and the original (delete) card is kept for errors, withdrawals or reclassifications already on the tape. Totals by class number and collection will be obtained.

Although there is potentially much additional information to be gleaned from the circulation records, at present the completion of the Technical Services module has greater priority.

P-1 — GLOSSARY OF CIRCULATION TERMS

BASE DATE
The date of renewal. if any; otherwise, the charge date (used in figuring the date due).

BOOK-AVAILABLE NOTICE
This is one type of output from the daily notice run. It is addressed to the person who saved the book (the saver). It is written for discharged records which have saves on them. The heading is BOOK AVAILABLE NOTICE. The main line contains only the location and call number. The main line is followed by the message:
> BOOK AVAILABLE AT CIRCULATION DESK:
> WILL BE HELD UNTIL xx-xx-xx (this is hold-till date).

BOOK-NEEDED NOTICE
This is one type of output from the daily notice run. It is written for non-discharged books which have a non-zero saver number. It is addressed to the person charged with the book. The heading is BOOK NEEDED NOTICE. The main line contains the charge code, the location and call number and, if it is non-indefinite or greater than the call-in date, the date due. If the saver is a library department, the first line of the message is NEEDED BY LIBRARY; otherwise it is NEEDED BY ANOTHER READER. In either case the second line of the message reads: PLEASE RETURN BOOK BY xx-xx-xx (the call-in date). Unless the user is fine exempt or the date due is indefinite, a third-line message is printed: TO AVOID $1.00 PER DAY PENALTY FINE.

CALL-IN DATE
The date by which a book saved (needed) by another user must be returned to avoid a penalty fine. If the saver is a library department, the call-in date is the save date plus 5. Otherwise, it is the base date plus 14, or save date plus 5, whichever is greater. Since notices are prepared only Monday through Friday mornings, saves entered on Friday or Saturday are treated as if entered on Sunday.

CARDS PENDING
A book card is prepared as a by-product of a back-up system charge (when there is no book card). It is placed in a file near the discharge terminal and is used to discharge the book when it is returned.

CARREL CHARGE
A charge to an individual who is assigned a carrel. The book cannot leave the library and is not subject to fines. It is charged out with a charge code of 5 and an indefinite loan period. It is subject to call-in after 2 weeks from the date of charge.

CHARGE CODE
A field in the record, set by the 1031 at the time a record is created (charge out). It indicates the loan period as follows:
> Code 1 = 2 weeks
> Code 2 = 4 weeks
> Code 3 = 6 weeks
> Code 4 = 8 weeks
> Code 5 = carrel indefinite
> Code 6 = standard indefinite (restricted to intra-library loans, Reserve Room, lost/missing, or
>   library departments).

CHARGE DATE
The date the book is charged out and the date the record is created. Set automatically by the program.

COMPOSITE CARD
The two-part form used in the back-up system. It contains both book and user information, which at the time of charging is either punched (by the Standard Register Punch) or written (by a circulation clerk). The top part is used as the date-due slip; the other is sent to keypunch for complete punching.

DAILY NOTICES

Produced each morning, Monday through Friday, using the records in the transaction file which were created the previous day(s). They consist of three types — fine notices, book-needed notices, and book-available notices. A discharged record, with a save, gets a book-available notice; a discharged record with a total fine exceeding the minimum fine gets a fine notice; a non-discharged record, with a save, gets a book-needed notice.

DUE DATE

Although this appears in the record as a tagged, displayable field, set **either** by the program or by the 2740 operator, it is subject to operator error and should not be used in determining the date due, which can always be computed as follows:

If the charge code is 5 or 6, the date due is always zeroes (indefinite). Otherwise it is equal to the base date plus the number of days specified by the charge code.

DAYS LATE

If a book is a late return, days late equals discharge date minus date due.

DAYS OVERDUE

If a book is not discharged and is overdue, days overdue equals the processing date minus the due date.

DELINQUENT BILL

An overdue notice for a book more than 46 days overdue. The notice is repeated at weekly intervals until the book is returned or the record is manually removed from the file.

DISCHARGE CODE

This is the code, entered from the second slide of the 1031 terminal, which tells the fine-payment status of the book at time of discharge: code 8 — no fine paid at time of book return; code 9 — standard fine paid at time of book return. Code 9 applies only to standard fines. Penalty fines are never collected by the circulation attendant at the time the book is returned.

DISCHARGE DATE

The date on which the book is returned (or assumed lost). Automatically set, it is associated with the discharge code. It is the date the record is deleted from the main circulation file, and is used in computing days overdue, penalty days, or late days.

EXPIRED CALL-IN

A saved book where the processing date is greater than the call-in date. An expired call-in gets repeated call-in notices at weekly intervals.

FINAL OVERDUE NOTICE

An overdue notice sent for books more than 32 but less than 40 days overdue. A message is printed following the main line: FINAL NOTICE.

FINE EXEMPT

A user is fine exempt if he is faculty member (user code 1), a library department (user code 8), or missing book (user code 9).

FINAL NOTICE

This is a type of output from the daily notice run. Written for discharged records, where the user is not fine exempt, and which have a standard fine or penalty fine or both, and where the total fine exceeds the minimum fine. The heading for the form is FINE NOTICE. A message follows the main line only if there is a penalty fine. The notice can contain fines for more than one book, up to the maximum capacity of the form (8 lines).

FINES DUE
The second, third and fourth copies of the four-part fine notice are kept on file until the fine is paid. Since there is no automatic follow-up, this must be handled manually.

FIRST OVERDUE NOTICE
Sent out to users who are not fine exempt and whose book is more than 4 and less than 12 days overdue. No special message.

HOLD-TILL DATE
Date, printed in the message which follows the main line on a book-available notice, which tells the date through which a book will be held at the circulation desk for pick up by the person who initiated the save. It is always equal to the processing date plus 5.

LATE RETURN
A discharged book with a discharge date greater than the due date, and a due date which is not indefinite.

LIBRARY-ASSIGNED NUMBER
A six-digit number, sequentially assigned by the library to users in user-code categories 4 through 9. It is manually issued and controlled by the circulation department.

LIBRARY CALL-IN
This is a save with a saver code of 8. It results in a call-in date which is always the save date plus 5 (with weekends taken into account). It triggers the preparation of a book-needed notice, with a message, the first line of which is: BOOK NEEDED BY LIBRARY DEPARTMENT.

LOAN PERIOD
The number of days for which a book is charged or renewed; indicated by the charge code.

LOCATION
The book card contains in col.2 the primary location of the book — the collection in which it is located. A collection has been defined as a group of books with a separate shelf list. If necessary, a second location can be entered in col. 3, indicating where the book is shelved within the collection. Col.4 contains an L if oversize. In printing notices, the location should be decoded from the first digit of the location field (the primary location) as follows: N,S,F, or C is decoded to MAIN; T becomes TECH. Everything else is printed without decoding.

LOST BOOK
A book which had been charged to a user and subsequently reported lost. The charge record is removed from the main circulation file either by deletion through the 2740 or, after preparation of a new book card, by discharging through the 1031. If through the 1031, discharge code 9 (fine paid) is used. All billing is followed up manually.

With the new book card, the item is then charged to user code 9 (lost/missing) with a library-assigned number indicating lost. Quarterly listings of lost books are prepared.

MAIN CIRCULATION FILE
The file of all books charged out to individuals or other entities. Displayable on the 2740; created, modified and deleted by the 1031 and the 2740 terminals. All the records in this file are input to the weekly overdue notice run.

MAIN LINE

This is the line on the printed notices (fine, book-needed, book-available or book-overdue) which contains the location and call number of the book. If other than a book-available notice, it also contains the charge code. If it is a fine notice it contains the date due and date returned and the standard fine. If it is a book-needed notice it contains the date due unless the date due is indefinite or greater than the call-in date.

MINIMUM FINE

No fine notice is prepared for a book unless the fine (standard plus penalty) exceeds 30c. This is equivalent to giving a user three days' grace on a book, provided there is no expired call-in.

MISSING BOOK

A book which, unlike a lost book, is not charged out to anyone. It cannot be found in the stacks and hence must be charged out for an indefinite period to a library-assigned number.

NOTICE DATE

This is a computer-printed date on the daily and weekly notices (same line as heading) which is always set equal to the processing date.

OVERDUE

A book is overdue if it has not been discharged and the processing date is greater than the due date. Depending on the days overdue, an overdue book is called a first overdue, second overdue, final overdue or delinquent overdue.

OVERDUE NOTICES

This is output from the weekly notice run. They are prepared for books which are overdue provided they qualify as first overdues (more than 4 but less than 12 days overdue); second overdues (more than 18 and less than 26 days overdue); final overdues (more than 32 and less than 40 days overdue) or delinquent overdues (more than 46 days overdue). In all except first overdues, an overdue message follows the main line, telling the type of overdue.

An overdue notice is also prepared for an expired call-in, regardless of whether the book is actually overdue, and, if overdue, regardless of the number of days overdue. The main line is followed by the message NEEDED BY (ANOTHER READER) (LIBRARY); if not fine exempt, the message $1.00 PER DAY PENALTY FINE DUE AFTER xx-xx-xx. If the book is also delinquent (and not fine exempt) the message DELINQUENT BILL also appears.

PENALTY DAYS

If a book has penalty status, the number of penalty days is computed by subtracting the call-in date from the discharge date. This is used in computing penalty fine.

PENALTY FINE

If a discharged book has penalty status, penalty fine is computed by multiplying $1.00 by penalty days.

The penalty fine is printed on the same line as the penalty message. $1.00-DAY PENALTY FINE DUE AFTER xx-xx-xx.

PENALTY STATUS

A discharged book has penalty status if the discharge date is greater than the call-in date, and the user is not fine exempt.

PROCESSING DATE

The date the application program (daily notices or weekly overdue notices) is run.

RENEWAL

A renewal, instead of creating a new record, updates an existing one. The renewal code is increased by 1, up to a maximum of 3, and the displayable date due is recomputed, using the base date.

Renewals are of two types, regular (from the 1031) and special (the 2740 operator changes the renewal code and date due manually). Renewals are not accepted for saved books or for books more than three days overdue (to correspond with the three-day grace period on fines).

RENEWAL CODE

A field in the record, set by the program at the time a record is created. It indicates the number of renewals as follows:

        Code 0 = no renewal (charge)
        Code 1 = first renewal
        Code 2 = second renewal
        Code 3 = third renewal

RENEWAL DATE

This is the date on which the last renewal was entered in the record. It is set automatically, in conjunction with change to the renewal code.

SAVE DATE

This is the date on which a saver number is entered (from the 2740). It is automatically set by the program and triggers a book-needed notice.

Since a user is always allowed a minimum of 5 days to return a book before he becomes subject to a penalty fine, saves entered on Friday or Saturday are treated as if entered on Sunday.

SAVER

This is the person (or other entity) who needs a book and requests to be notified when it is available.

SAVER NUMBER

Identical in format to the user number, but it appears in a particular field in the record and can be entered into an existing record only by the 2740 operator.

SECOND OVERDUE NOTICE

An overdue notice sent to a user whose book is more than 18 and less than 26 days overdue. The main line is followed by the message: SECOND NOTICE.

STANDARD FINE

This is computed by multiplying the days late by 10¢.

TOTAL FINE

The sum of the standard and penalty fines for an individual book.

TRANSACTION CODE

This indicates to the program the type of activity (charge or discharge) and the source of the data. It is automatically set for the stack terminals at 1; it is set by the first column of the slides of the 1031 at the main circulation desk. (The number of columns to be used includes the first column.)

Code 1 = charge with book card and badge and 2 columns from slides
Code 2 = charge with book card and 12 columns from slides
Code 3 = charge with book card and 9 columns from slides
Code 4 = discharge as of yesterday with book card and 2 columns from slides
Code 5 = discharge as of earlier date with book card and 8 columns from slides
Code 6 = discharge as of today's date with book card and 2 columns from slides
The only exception is for composite cards where a code of 7 is punched in column 1 of the card, indicating that all data are in the card and that no slides are needed.

TRANSACTION DATE

This is the date on which a record is either created or renewed in the main circulation file, or written into the transaction file because of a modification or deletion. If a charge, it is the charge date; if a renewal, the renewal date; if a save, the save date; if a discharge, the discharge date.

TRANSACTION FILE

As records in the main circulation file are modified or deleted in such fashion as to necessitate preparation of a notice, a copy of the record is written into the transaction file. This file is used to produce the daily notices.

USER

The person (or other entity) to whom a book is charged. The user is identified by his user number.

USER CODE

The first digit of the user number, which identifies the user type as follows:

Code 1 = faculty/staff
Code 2 = student, Evanston campus
Code 3 = not used initially
Code 4 = other N.U. students (evening division, law and med schools, etc.)
Code 5 = other individual users
Code 6 = other libraries (interlibrary loans)
Code 7 = special internal usage
Code 8 = library departments
Code 9 = lost/missing

USER NUMBER

A field in the record consisting of a one-digit user code plus the user's social security number (9 digits) or library-assigned number (5 digits).

WEEKLY NOTICES

Notices, produced once a week, using the main circulation file as input and producing two types of notices: overdue notices and expired call-ins.

Code 1 = 2 weeks
Code 2 = 4 weeks
Code 3 = 6 weeks
Code 4 = 8 weeks
Code 5 = carrel indefinite
Code 6 = standard indefinite (restricted to intra-library loans, Reserve Room, lost/missing, or library departments).

CATALOGED

0F-L9624100000W4720C---&6,4,2≠2

NORTHWESTERN
UNIVERSITY LIBRARY

BOOK CARD
PLEASE KEEP THIS CARD IN BOOK POCKET.

IBMJ37244

NON-CATALOGED

0T--0000079766-0000----

NORTHWESTERN
UNIVERSITY LIBRARY

BOOK CARD
PLEASE KEEP THIS CARD IN BOOK POCKET.

IBMJ37244

1 A CONSTANT ZERO—used by the 1031 to transfer control to slide 1 to pick up the transaction and loan code.

2 PRIMARY LOCATION—an alphabetic character identifying the collection. (A collection has a shelf list.)

3 SHELVING LOCATION—a sub-location within a collection. If not applicable, the column is set to a hyphen.

4 OVERSIZE INDICATOR—L if oversize; hyphen if standard size.

5-14 DEWEY NUMBER—a maximum of 10 numeric digits. Decimal not punched, assumed to be between third and fourth digits. Right justified with any unneeded columns set to zero (right zero fill). (See Notes at end of list.)

15 CUTTER LETTER—first upper case alphabetic character in second line. If first character in second line is **not** an upper case alpha character, column is set to a hyphen. (NOTE: In the case of some classics the first line of the call number contains the Cutter information.)

16-19 CUTTER NUMBER—considered to be the first four (or less) numeric digits in the second line, provided they are not preceded by more than one alphabetic character. If none, or if preceded by more than one alphabetic character, set all columns to zeroes. If fewer than four, right fill with zeroes. If more than four, the balance can spill over into the next field.

20-23 WORK LETTERS—the first four characters, alphabetic or numeric, which follow the Cutter number as above defined but which **precede** a decimal, if any. Alphabetic characters in this field are assumed to be lower case. Upper case alphabetic characters in this field must be set off from adjacent lower case alphabetic characters to their right or left by hyphens. Examples: bXa becomes B-X-A; bX3 becomes B-X3; Xa2 becomes -X-A2.

Note: Columns 5-23 constitute the **KEY** which is used to compute the address on the data cell where the record is stored. The key is not necessarily unique to a book, requiring in some cases location, copy number, volume and part number and edition to make it unique.

24-40 KEY EXTENSION — This field carries edition, volume and copy information needed to distinctively identify a book in a particular collection. If col. 20-23 were not sufficient to hold the work letters, any excess characters are punched in this field. Edition data, either after the decimal in the second line, or in a third or fourth line of the call number proper (the portion of the call number which appears in the upper left of the catalog card) are punched in the field preceded by an ampersand (there may be more than one ampersand if more than one edition element). To avoid shifting between upper and lower case alpha characters, all alphabetic characters relating to edition should be considered to be lower case unless essential to cataloging logic. Periods should not be used—they will cause a machine error. Spaces cannot be read by the terminal and must either be avoided (preferable) or substituted with slashes.

This field is also used for volume and part numbering. The words vol., pt., ed., no., etc. are **not** punched; only the actual **number** is punched. Each number is preceded by a comma. Subdivisions which appear on separate lines are also preceded by a comma. As in the case of edition data, alphabetic characters should be assumed lower case if possible; periods and spaces should not be used; hyphens should be used to connect **inclusive** volume numbers; slashes should be used to connect volume numbers which are **not** inclusive.

The final element to be punched in this field, if applicable, is copy number. This must be numeric and must be preceded by a pound sign. The key extension must **not** extend beyond col. 40. Only the data up through col. 40 will be carried in the circulation record.

41 LOZENGE—indicates end of data to be read by the 1031.

Notes: Even though some categories of books (the Bible and classics, for example) do not correspond to the general pattern of Dewey number first line, Cutter number second line, and edition (or section) in third or fourth lines, it is thought advisable to treat variations as though they **did** conform. Letters in lines are examined in turn and are entered in the first field which is suitable, with any columns skipped during the search for suitable columns filled with the required fill characters.

Non-cataloged books may be circulated by punching a record number (roughly equivalent to an accession number) in the Dewey number field, right justified and left zero filled. In this case the Cutter letter will be set to a hyphen, the Cutter number to zeroes, and the work letters to hyphens. The key extension field (col. 24-40) may be used as needed to identify edition, volume, copy, etc.

According to present cataloging policy, books are classified with no more than 7 digits to the right of the decimal. If books are found which exceed this, they must be recataloged or else circulated manually.

Code

Africana . . . . F

Annex . . . . Q

Archives . . . . H

Astronomy . . . . A

Biology . . . . B

Business . . . . S

Core . . . . E

Curriculum C

Dissertations I

Documents . . . . D

Films L

Geology . . . . G

Maps . . . . Y

Microforms . . . . W

Math . . . . M

Music . . . . U

Newspapers . . . . K

Main Library . . . . N

Oriental . . . . O

Pamphlets V

Periodicals . . . . J

Poetry . . . . P

Rare Books . . . . Z

Reference . . . . R

Reserve X

Tech Inst . . . . T

LAYOUT (Columns 2-57 from Source Record Punch)

Co.1   Transaction code (key punched)

Col.2-40   Location-key-key extension (from book card)

Col.41-50   User number (from badge)

Col.51   Charge code (from slides)

Col.52-57   Date due (from slides)

Col.58-64   Blank

Col.65   Lozenge (12-4-8) (key punched)

SOURCE RECORD PUNCH CHARGE

MANUAL CHARGE

Transaction Code	Badge Required	Manual Entry	Borrower Code	Loan Code	Transaction Type
0	Yes	No	0-3	auto 1	charge
1	Yes	1-2	0-3	1-5 7	charge renewal
2	No	1-2 3-12 (user)	0-3	1-5 7	charge renewal
3	No	1-2 3-8 (user)	4-6	1-5 7	charge renewal
			7-9	1-5 6 7	charge indef charge renewal
5	No	1-2 3-8 (date)	----	8-9	discharge
6	No	1-2	—	8-9	discharge
7	No	3-8 (date)	0-3	1-5	SR charge

P-7—CIRCULATION FILE RECORD—FIELD DESCRIPTIONS

Name of Field	Field Tag	Rep.[1]	No. of Char.	Dated[2]	Req.[3]	Perm-ited	No. of Fields	Display to	Create by	Change by	Display Sequence
Key	KY	N A N AN	10 1 4 4	N	Y	Y	1	Any	1030	None	
Key Extension	VN	AN	17	N	N	Y	1	Any	1030	None	
Location	LO	A	3	N	Y	Y	1	Any	1030	None	
Charge Code	CC	N	1	Y	Y	Y	1	Any	1030	None	1
Discharge Code	DC	N	1	Y	N	Y	1	Any	1030	None	
Date Due	DD	N	6	N	N	Y	1	Any	1030	1030 or 2740	3
User No.	UN	N	10	N	Y	Y	1	Any	1030	None	4
Renewal Code	RC	N	1	Y	N	Y	1	Any	1030 or 2740	1030 or 2740	2
Saver No.	SN	N	10	Y	N	Y	1	Any	2740	None	5

[1] Rep.—Representation of data. N=Numeric data, AN=Alphanumeric, A=Alphabetic.
[2] Dated—A date is associated with the data field.
[3] Req.—Date field required in record, Y=Yes, N=No.

Condition / Action	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Valid Call No.	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Trans code equal		Chg	Chg	Chg	Chg	Ren	Ren	Ren	Ren	Ren	Ren	Dis	Dis	Dis	Dis
User code valid		N	Y	N	Y	N	Y	Y	Y	Y	Y	—	—	—	—
Record in file			N	N	Y		N	N	Y	Y	Y	N	Y	Y	Y
Chg/Dischg code valid (LT6 if chg/ren; GT6 if dischg)				N	Y			N	Y	Y	Y		N	Y	Y
Saver No. equal zero								N	Y					N	Y
Renewal code LT 4							N	Y	Y						
Book overdue							N	N	Y	N	Y			N	Y
User code lost/msg.															
Create new master		x													
Set (or reset) due date		x						x							
Set charge code		x													
Add 1 to renewal code								x							
Set discharge code													x		x
Write out trans record		x						x					x		x
Write out circulation record		x						x							x
Delete circulation record													x		x

FORMAT

FIRST LINE: USER NUMBER   DATE DUE xx/xx/xx
                            SAVER NUMBER   RENEWED TO xx/xx/xx
                                                           ERR XX
                                                           SAVE REQ
                                                           LOST/MSG BOOK

SECOND LINE: LOCATION   KEY   KEY EXTENSION

EXAMPLES:

CHARGE

```
1121212121 DATE DUE 01/26/71

T  530.12     B699 G-X &3,2#2
```


CHARGE
(same book)

```
1121212121 UNPROCESSED ERR01

T  530.12      B699 G-X &3,2#2
```


RENEWAL

```
1121212121 RENEW TO 02/08/71

T  530.12      B699 G-X &3,2#2
```

RENEWAL
(different user)

```
1232323232 UNPROCESSED ERR 14

T  530.12        B699 G-X &3,2#2
```

DISCHARGE
(save requested)

```
1343434343 SAVE REQ

T  530.12        B699 G-X &3,2#2
```

DISCHARGE
(book already discharged)

```
               UNPROCESSED ERR08

T 530.12         B699 G-X &3,2#2
```

CE01   RECORD ALREADY IN FILE

CE02   INVALID RECORD LENGTH (too short or too long)

CE03   INVALID CHARGE CODE

CE04   INVALID USER NUMBER

CE05   CANNOT RENEW—OVERDUE

CE06   CANNOT RENEW—ALREADY 3 RENEWALS

CE07   CANNOT RENEW—SAVE ON FILE

CE08   RECORD NOT IN FILE

CE09   RECORD BEING PROCESSED BY ANOTHER TERMINAL

CE10   USER NUMBER IN HOLD LIST

CE13   INVALID TRANSACTION CODE

CE14   RENEWAL—USER DIFFERENT THAN IN RECORD

CE15   INVALID TRANSACTION DATE IN SLIDES

CE90   SYSTEM ERROR IN RECORD I/O (read)

CE91   SYSTEM ERROR IN RECORD I/O (new record)

CE92   SYSTEM ERROR IN RECORD I/O (attempting to write or delete record)

The transaction file is processed daily to prepare daily notices of fines, book-needed notices, and book-available notices.

A four-part form is used, 7½ x 3½ inches, to fit in a 3⅞ x 8 window envelope.

When the forms are received by the library, thd first part is stuffed in the envelopes and sent out; the remaining three parts of the fine notices are filed in alphabetical order in the fines-due file.

Copies of book-needed and book-available notices may be discarded after review.

When a fine is paid, the fine-notice copies are pulled, and all but the No. 4 copy are destroyed; the No. 4 copy is filed in the fines-paid file.

Periodically the fines-due file is reviewed and the No. 2 and No. 3 copies are used to follow up on delinquent fines.

Notices should be printed in the following order:
    primary location (first digit of location code) / notice type (fines, needed notices, available notices) —user or saver name (or number if no name).

The name and address of the user/saver should be printed in the lower left corner, positioned to show in the envelope window. Fine notices and needed notices go to the user; book-available notices go to the saver.

The names of users and savers should be picked up from the faculty, staff, or student files, provided the user/saver code is faculty, classified staff, or Evanston campus student. If possible, forms for students no longer in school should be identified by an asterisk to the left of the name (line 14, position 4). All other user codes and also those not found in the student/faculty files should be printed with the name and address area blank—the user/saver code and number should be printed on line 18.

If a user has more than one fine due, more than one main line, up to a maximum of eight, may be printed on a single form. If more than eight, a separate form, complete, should be prepared.

Fine notices (with no penalty fine) do not require any explanatory message. However, if there is a peanlty fine, this appears on a second line, following the main line. Needed notices and available notices, which are always printed one main line to a form (one book to a form), will have an explanatory message printed on the line(s) following the main line.

Each form will be computer printed, with the appropriate heading on line 2, positions 2-23. Each form will contain the processing date on line 2, positions 62-69.

The printing of the main line is as follows:

The column labeled Chg should contain the charge code—just as it appears in the record, 1, 2, 3, or 4, 5, 6. Since this is primarily for the use of circulation staff, it does not need decoding.

The location column is derived from the first digit of the location code and should be decoded:
    If T in record, form should be printed: TECH
    If N, S, F, C, form should be printed: MAIN
    If any other codes, they should be printed without editing.
NOTE: This decoding will need to be expanded as we add libraries and collections to the system.

The call-number column should be edited as follows:

If the oversize indicator is L, an L should appear in print position 9; otherwise left blank.

The first three characters of the Dewey number are printed in positions 10-12. A period should be inserted in Col. 13. The balance of the Dewey number should be printed in positions 14-20, with any trailing zeroes replaced by blanks.

The Cutter letter and Cutter number should be printed in positions 22-26, with trailing zeroes suppressed (replaced with blanks).

The work letters should be printed in positions 27-30, with any hyphens replaced with blanks. At least initially, no attempt will be made to print lower-case characters.

The key extension is printed in positions 32-48, exactly as it appears with the following exceptions: If the first character in the field is a comma, it should be suppressed. An ampersand appearing as the first character or any successive character should be suppressed and replaced by a blank.

P-12 — DAILY NOTICES — GENERAL LOGIC

Discharged book	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Saved book	N	Y	Y	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y
Fine exempt	N	N	Y	N	N	Y	Y	Y	N	N	N	N	N	N	Y
Penalty fine due				−		−	−	−		−	Y	Y	N	N	Y
Std. fine due		N	Y	Y	Y	N		Y	Y		N	Y	Y	Y	Y
Std. fine exceeds 30 cents				N	Y	Y		N	Y			N	Y	Y	Y
Std. fine paid		Y	N		Y	N		Y	N			N			Y
No action	x					x			x						x
Book-available notice								x		x		x	x/o	x/o	x/o
Fine notice						x					x		o/x	o/x	o/x
Book-needed notice		x	x												
Charge code printed		x	x			x		x		o		o	o/x	o/x	o/x
Date due printed		x	o			x		x		o		o	o/x	o/x	o/x
Date ret'd. printed		o	o			x		x		o		o	o/x	o/x	o/x
Amt. due printed		o	o			x		x		o		o	o/x	o/x	o/x
$1/day pen. fine from x, amt. x													o/o	o/o	o/o
Book needed by x		x	x												
To avoid $1/day penalty fine		x													
Book will be held till x												x	x/o	x/o	x/o

x — printed
o — not printed
If 2 notices — book available to left of slash; fine notice to right of slash.

FINE NOTICE   DATE: 03/24/70

	LIBRARY	CALL NUMBER	DUE DATE	DATE RETURNED	AMOUNT DUE
1	MAIN	L381.005 037 M 84-88	03/16/70	03/20/70	$ .40
		$1.00 PER DAY PENALTY FINE DUE FROM 03/16/70			$ 4.00
				AMT. DUE	$ 4.40

2192389806

MACBETH MARION H
1820 CHICAGO AVE
EV   ILL
    60201

If any inquiry, please bring this notice to the circulation desk of library from which book was borrowed.

LOANS: 2 weeks. Maximum of 3 renewals. All books subject to call-in if needed by another reader.

FINES: .10¢ for each day overdue. Additional penalty fine of $1.00 per day for late return of book needed by another reader.

LOST BOOKS: Report to circulation desk immediately. FOR COMPLETE REGULATIONS SEE LIBRARY HANDBOOK

NORTHWESTERN UNIVERSITY LIBRARY, Circulation Department, Evanston, Ill., 60201

BOOK NEEDED NOTICE   DATE: 12/25/69

	LIBRARY	CALL NUMBER	DUE DATE	DATE RETURNED	AMOUNT DUE
1	TECH	541.396 G779 E	01/13/70		
		NEEDED BY ANOTHER READER PLEASE RETURN BY 01/13/70 TO AVOID $1.00 PER DAY PENALTY FINE			

2309463537

If any inquiry, please bring this notice to the circulation desk of library from which book was borrowed.

LOANS: 2 weeks. Maximum of 3 renewals. All books subject to call-in if needed by another reader.

FINES: .10¢ for each day overdue. Additional penalty fine of $1.00 per day for late return of book needed by another reader.

LOST BOOKS: Report to circulation desk immediately. FOR COMPLETE REGULATIONS SEE LIBRARY HANDBOOK

NORTHWESTERN UNIVERSITY LIBRARY, Circulation Department, Evanston, Ill., 60201

BOOK AVAILABLE NOTICE   DATE: 12/25/69

	LIBRARY	CALL NUMBER	DUE DATE	DATE RETURNED	AMOUNT DUE
1	TECH	L508 F219 5			
		BOOK AVAILABLE AT CIRCULATION DESK, WILL BE HELD UNTIL 12/30/69			
1	TECH	510.78 B725 AU			
		BOOK AVAILABLE AT CIRCULATION DESK, WILL BE HELD UNTIL 12/30/69			
1	TECH	510.78 B725 AU 2			
		BOOK AVAILABLE AT CIRCULATION DESK, WILL BE HELD UNTIL 12/30/69			

2000671458

SPORES CHRISTINE M
3815 ISABEL ST
SKOKIE   ILL
    60076

If any inquiry, please bring this notice to the circulation desk of library from which book was borrowed.

LOANS: 2 weeks. Maximum of 3 renewals. All books subject to call-in if needed by another reader.

FINES: .10¢ for each day overdue. Additional penalty fine of $1.00 per day for late return of book needed by another reader.

LOST BOOKS: Report to circulation desk immediately. FOR COMPLETE REGULATIONS SEE LIBRARY HANDBOOK

NORTHWESTERN UNIVERSITY LIBRARY, Circulation Department, Evanston, Ill., 60201

P-14 — OVERDUE NOTICES — SPECIFICATIONS

These will be run once a week against the main circulation file.

The forms used are the same as for the daily notices, except one-part. Records will be printed in user number order.

All notices have the computer-printed heading at the top of the form:

OVERDUE NOTICE

Records are selected from the file if they meet one of the following conditions:

If a book is saved, and the processing date is greater than the call-in date. (An expired call-in)

If the book is overdue* by more than 4 or less than 12 days (first overdue) or more than 18 and less than 26 days (a second overdue) or more than 32 and less than 40 days (final overdue) or more than 46 days (delinquent bills)

The main line is printed as for the daily notices except that the date returned and amount due are left blank.

Expired call-ins get a message:

BOOK NEEDED BY (ANOTHER READER) (LIBRARY DEPARTMENT)
PLEASE RETURN IMMEDIATELY.

If the reader is not fine exempt or the loan period is not indefinite, the following message is also printed:

$1.00 PER DAY PENALTY FINE DUE AFTER XX-XX-XX

First overdues get no message; second overdues get the message: SECOND NOTICE; final overdues get the message: FINAL NOTICE; delinquent bills get the notice: DELINQUENT BILL.

---

*Fine-exempt books and indefinite loan periods are not **overdue**; they **may** be expired call-ins.

P-15—GENERAL LOGIC—OVERDUE NOTICE

	1	2	3	4	5	6	7	8	9	10	11
Saved book	N	N	N	N	N	N	N	N	N	N	Y
Process date GT call-in date	–	–	–	–	N	N	N	N	N	Y	Y
Fine exempt	N	N	N	N	N	N	N	N	N	Y	Y
Reserve Room call-in	–	–	–	–	N	N	Y	Y	N	Y	Y
More than 46 days overdue	N	N	N	N	Y	N	N	Y	N	Y	Y
More than 32 & LT 40 days overdue	N	N	Y	Y	N	Y					
More than 18 & LT 26 days overdue	N	Y									
More than 4 & LT 12 days overdue	Y										
No action	x										
Overdue notice required	x	x	x		x	x	x	x	x	x	x
No message	x		x								
Second notice message		x		x							
Message: FINAL NOTICE					x						
Message: DELINQUENT BILL						x	x	x	x	x	x
Message: NEEDED BY ANOTHER READER									x		x
Message: NEEDED BY RESERVE ROOM							x	x	x	x	x
Message: PLEASE RETURN IMMEDIATELY					x	x	x	x	x	x	x
Message: $1.00 PER DAY DUE AFTER x					x	x	x	x			

OVERDUE NOTICE   DATE: 02/11/70

	LIBRARY	CALL NUMBER		DUE DATE	DATE RETURNED	AMOUNT DUE
1	MAIN	230	T577 Z T	02/04/70		
1	MAIN	230	T577 Z H A	02/04/70		
1	MAIN	230	T577 Z K	02/04/70		
1	MAIN	230	T5777F	02/04/70		
1	MAIN	230	T5777 Z K E	02/04/70		

2351420758

HURLEY JOHN S
7250 N OAKLEY
CHICAGO   ILL
              60645

If any inquiry, please bring this notice to the circulation desk of library from which book was borrowed.

LOANS: 2 weeks. Maximum of 3 renewals. All books subject to call-in if needed by another reader.

FINES: .10¢ for each day overdue. Additional penalty fine of $1.00 per day for late return of book needed by another reader.

LOST BOOKS: Report to circulation desk immediately. FOR COMPLETE REGULATIONS SEE LIBRARY HANDBOOK

NORTHWESTERN UNIVERSITY LIBRARY, Circulation Department, Evanston, Ill., 60201

OVERDUE NOTICE   DATE: 02/11/70

	LIBRARY	CALL NUMBER		DUE DATE	DATE RETURNED	AMOUNT DUE
1	TECH	519.92	P734 I #2	02/06/70		

2354422549

BENDER STEVEN K
2315 SHERIDAN RD
EV   ILL
              60201

If any inquiry, please bring this notice to the circulation desk of library from which book was borrowed.

LOANS: 2 weeks. Maximum of 3 renewals. All books subject to call-in if needed by another reader.

FINES: .10¢ for each day overdue. Additional penalty fine of $1.00 per day for late return of book needed by another reader.

LOST BOOKS: Report to circulation desk immediately. FOR COMPLETE REGULATIONS SEE LIBRARY HANDBOOK

NORTHWESTERN UNIVERSITY LIBRARY, Circulation Department, Evanston, Ill., 60201

OVERDUE NOTICE   DATE: 03/11/70

	LIBRARY	CALL NUMBER		DUE DATE	DATE RETURNED	AMOUNT DUE
1	MAIN	301	S714 CR #2	02/03/70		
			FINAL NOTICE			

2354422187

MILAN MAUREEN T
711 UNIVERSITY PL
EV   ILL
              60201

If any inquiry, please bring this notice to the circulation desk of library from which book was borrowed.

LOANS: 2 weeks. Maximum of 3 renewals. All books subject to call-in if needed by another reader.

FINES: .10¢ for each day overdue. Additional penalty fine of $1.00 per day for late return of book needed by another reader.

LOST BOOKS: Report to circulation desk immediately. FOR COMPLETE REGULATIONS SEE LIBRARY HANDBOOK

NORTHWESTERN UNIVERSITY LIBRARY, Circulation Department, Evanston, Ill., 60201

DATE 12/08/70

REMINDER OF BOOKS CHARGED TO YOU

MEMO TO

1 335200322

FROM   CIRCULATION SERVICES DEPARTMENT, UNIVERSITY LIBRARY

OUR RECORDS SHOW THE FOLLOWING BOOKS WERE CHARGED OUT TO YOU ON
THE DATE INDICATED FOR THE TYPE OF USE INDICATED. PLEASE VERIFY
THIS LIST AND RETURN THE CARBON COPY TO US BY 12/16/70.

INDICATING BELOW, IN THE PROPER COLUMN, WHETHER OR NOT YOU WISH
TO RENEW. IF THERE ARE ANY DISCREPANCIES, PLEASE LET US KNOW.

AS A COURTESY TO OTHER USERS OF THE LIBRARY, WE ASK THAT YOU
RETURN ANY BOOKS WHICH YOU ARE NOT ACTIVELY USING AT THE PRESENT
TIME.

DATE OF CHARGE	TYPE OF USE	LIBRARY	CALL NUMBER OF BOOK			RENEWAL DESIRED	WILL RETURN
11/02/70	HOME	TECH	311.2	V916	A #2		
05/16/70	HOME	TECH	658.562	B968	E #2		

PUNCHED BOOK CARDS — 13 CENTS A DOZEN

by Joseph T. Paulukonis, Acting Librarian,

Technological Institute Library, Northwestern University

One of the major considerations in designing a circulation system is deciding on the means to collect the book data. Either the data are reconstructed each time the book is presented for charging, or data are carried in machine-readable form by the book. In the former case, manual transcription can lead to many errors, and, depending on the type of data involved, it can be time-consuming and/or difficult to construct accurately. In the latter case, machine-readable data can be used over and over again, will not vary from time to time, and can be read very quickly by a machine.

In our own situation, we anticipated the use of at least the call number for book identification. Although the classification number is generally straightforward (Dewey is in use), the additional information, such as Cutter letter and numbers, work letter(s), and the edition, volume or copy, can become fairly complex. Also, in a collection of over one million volumes, many items differ in call number by only one or two out of twenty or more characters. Almost everything seemed to indicate that a punched book card was the way to go. (Optically scanning data, which could be imprinted on the spine or cover, would probably be quite superior, but suitable equipment is probably not even in the design stage as yet.)

WHAT'S BEEN HAPPENING

Once this decision was made, it became necessary to determine the data elements to be converted and the way in which the book cards should be prepared. A survey of the literature led to several conclusions.* One was that there were two ways of approaching the problem — convert-as-you-go, that is, make book cards as books circulate, or convert-at-one-time, prior to implementation.

A most interesting discovery concerning the convert-as-you-go method was that its major salesman was R. W. Trueswell, and that the data on which he based his sales pitch were gathered in the very libraries in which we were working (3,4). Unfortunately, no actual cost comparisons were made by Trueswell. As for the one-time method, while several approaches can be taken, the only usable comparative information was provided by Chapin and Pretzer (5).

The other conclusion that rapidly became obvious was that little, if any, consideration was being given to the real need for the presence of certain data elements in the punched card and/or the circulation file. Identification of a book by call number (or accession number) and some or all of the author and title seemed to be taken for granted. Where this was not so, no reason was given for the particular data elements used or omitted. Our answers were not in the literature!

IF IT'S DATA — CONVERT IT!

The data elements to be converted were obviously given first consideration. Since the items to be controlled are normally shelved by call number and retrieved by call number, this would be the most direct means of identification. Also, the call number is unique, or at least is supposed to be; only by error would two or more items have the same call number.

An accession number would also be unique, but in looking for a particular book it would become necessary to utilize both the accession number and the call number — a bit cumbersome and redundant. Also, if the circulation file were ever to be analyzed in terms of usage of parts of the collection, the accession number would be absolutely meaningless.

To use only the author and/or the title would introduce some sticky problems: it is not always very easy to determine the exact author and title of a book; these data fields would often be longer than either the call number or the accession number and therefore more difficult to reconstruct accurately; it would be difficult to distinguish between multiple copies, volumes or editions; and foreign materials, especially items in Russian, Chinese or the like, could not be handled in the original language. Again, analysis of the file would be most difficult.

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* (There are two major bibliographies which cover the subject of automated circulation (1,2) — we will not duplicate them here.)

It became evident, then, that use of the full call number was the absolute minimum. But was it sufficient?

Admittedly, it would be "nice" to have at least some portion of the author/title data available in the book card and in the circulation file. This is especially true since the major use of such data would be for printed notices (overdues, fines, etc.) sent to users. Obviously there would be increased (one-time) costs in converting more than the call number. Carrying these extra data fields in the file would also increase the file size by at least one-third, and this would be an ongoing increased cost. But would these increases buy more than something "nice"?

A look at the Library's records indicated that less than five percent of the items that circulated required any kind of follow-up other than discharge. Those increased costs, then, would be magnified in terms of a percentage of usefulness. Also, if the time ever came when a more complete bibliographic conversion was attempted, such partial data would not be usable. Since no estimate of the increased costs due to conversion could be made at the time (the increased file costs could be estimated) no final decision was made — only a temporary one to forego author title during the comparative study to be undertaken.

A MODEST STUDY

While Trueswell said that convert-as-you-go was cheaper (if you buy several years of headaches instead of several months of concerted effort?), the library staff was not too anxious to live for an extended period under two systems. Moreover, two of the major benefits of the automated system, fast response and self-service, could not be completely implemented for a long time. It was decided to run a short experiment in order to determine the best and cheapest method for one-time conversion.

Two alternative methods were chosen for study: keypunching directly from the shelf list, and typing sheets, directly from the shelf list, to be later scanned by optical character recognition (OCR) equipment and converted via computer to punch cards. Table 1 summarizes the findings of the study.

Because of the constraints imposed by the scheduled implementation date, very little time was available for rigorous experimentation. While work continued on design of the system, only two to four hours a day, over a period of seven days, were devoted to the conversion testing. The results, then, are indicative rather than precise.

Keypunching, though requiring a somewhat longer period of time, appeared to be the cheapest method. (OCR was less expensive until the computer time for producing the cards was included.) Use of keypunches would also permit a complete in-house operation and would allow day-to-day control over the final product. Moreover, since the testing indicated that error rates in the OCR might be significantly higher, it would be easier to read punched cards than the typed sheets. (This was due to the fact that the OCR input had to be encoded in a manner that made proofreading difficult.) The question of adding author/title data was reopened at this point. Comparing our cost of 0.0137 cents per card to the Chapin figures of 0.0663 to 0.0707 cents per card with author/title, indications were that an additional $50-60,000 would be needed if these two fields were to be included for each record. The call number would have to suffice, and an in-house keypunch operation would produce the book cards.

KEEP PUNCHING!

The actual conversion was begun in April. A seminar room in the Library was made available, and four IBM 029 keypunch machines were installed. A supervisor was chosen from the Circulation Department, primarily because of familiarity with the shelf list. Since the format of all cards would be the same, keypunch experience was not thought to be necessary. Part-time student help was hired, with typing the only requisite. Students were told, at the time of hiring, that they were expected to produce upwards of 400 cards per hour within two weeks. This output rate seemed very reasonable, based on the study, and only three of the students hired failed to make the grade.

The students not only did the actual keypunching, but spent part of their time checking for errors in each other's output. New acquisitions and changes in the shelf list were kept under control and were phased in to the project. A log book was kept, recording each person's time and the number of cards punched (errors found and corrected at the machine were not included). Charts were kept on the wall, showing total daily outputs and total outputs to date. (This seemed to provide considerable psychological incentive.)

TABLE I

COMPARISON OF CONVERSION COSTS: OPTICAL CHARACTER RECOGNITION VERSUS KEYPUNCHING; BASED ON A STUDY CONDUCTED IN MARCH, 1969

Comparative Factors	Keypunch	Optical Character Recognition
Output rate per hour	400 volumes	700 volumes
Total number of hours required to convert 800,000 volumes	2,000 hours	1,140 hours
Time required to convert entire file using 4 operators working 7½ hours with 6 hours actual output	84 days	48 days
Total salary costs (four operators at $2.50/hour working 7½ hour day)	$6,300	$3,600
Supervisor for project ($500/month)	$2,500 (5 months)	$2,000 (4 months)
Input equipment	$ 960 (4 029 KP at $60/month for 4 months)	$ 360 (4 typewriters, $30/mo. for three months)
Book card stock (tab cards)	$1,180 (850,000 cards)	$1,120 (800,000 cards)
Output equipment		
Interpreter	....	$ 80 (1 month)
Interpreter operator	....	$ 300 (1 month/$2 per hour)
Optical scanning	....	$ 720 (60,000 lines at $12 per 1,000 lines)
Reel of tape	....	$ 50
Programming tape to card conversion	....	$ 600
Computer time to convert tape/disk to cards)	....	$3,900 (12,000 cards/hour)
Total costs	$10,940 (0.0137/card)	$12,730 (0.015/card)

Note: Cost of typewriter equipped with special character sets and the optical scanning costs provided by Input Service, Inc., Dayton, Ohio

On the 64th day the major portion was finished — the shelf list for the main Library's collection was converted. The projected total of 800,000 cards was not reached because of decisions to exclude a significant number of bound journal volumes and many old, mostly foreign-language, bibliographies. Also contributing to the decrease were records set aside due to inability to interpret holdings data and items rejected due to obvious need of reclassification.

The figures for this major effort were as follows:

Cost for operators	$4,200
Cost of equipment (4 months)	960
Cost of card stock	980
Cost of supervisor (4 months)	1,600
	$7,740

In 64 days, 700,749 cards were produced at an average cost of 0.011 cents per card.

This was, of course, not the end of conversion. Several smaller collections were also converted — Business, Africana, Curriculum and the Technological Institute. And with new acquisitions and correction of errors, keypunching became part of everyday operations for the Circulation Department.

THE TELL-TALE TAPE

As the punched cards were being produced, it was felt that a permanent record of these cards should be made. They were taken to the University's Vogelback Computer Center (with a CDC 6400 for research activities), read onto reels of tape and listed. This tape file can be brought up to date periodically, since a duplicate (add) card is made for every new acquisition, corrected or reclassified book and the original (delete) card is kept for errors, withdrawals or reclassifications already on tape.

This file will give the Library subtotals by class numbers and totals for the various circulating collections.

THE MATING GAME

It was also decided that the cards should be put into their respective books as soon as possible. Part of this operation would also include an inventory of the collection. Thus, instead of a punched card being matched to a book, each book was matched to the cards. When there was no match, a notation was made to have a card punched. This allowed subsequent follow-up through the shelf list to determine if the corresponding catalog card was skipped or missing. An average of 113 cards per hour were put into books, and just over 20,000 errors were found. Most of the errors were in serials where holdings were difficult to interpret.

When the automated circulation system began operation on January 19, 1970, over 800,000 books had their punched book cards in place and less than 70,000 cards were as yet unprocessed. The cost of the matching and inventory operation was under $20,000.

FINAL WORDS

With the automated circulation system in operation for over a full year now, our major decisions appear to have been correct—especially in regard to the author/title question. There have been literally only a handful of complaints about the lack of these data elements.

It should also be noted that only through the full cooperation of all the staff in the Catalog, Circulation, Processing and Stack Control Departments was this project able to be completed in such fine fashion.

Northwestern University's experience indicates that conversion for automated circulation need not be a major cost consideration. For about $30,000 (about 4 cents a book), book cards had been punched, proofed, and inserted, and the entire central library book collection had been inventoried. A reasonable approach to a problem can yield a reasonable solution.

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COMPUTERIZED CIRCULATION — THE STAFF POINT OF VIEW
by
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Northwestern University Library's on-line computer circulation system has now been in operation for a full year. The Circulation Services Department staff, which consists of two professionals, five full-time assistants, and one half-time assistant is enthusiastic about its operation. And all of these staff members, with the exception of myself as the Head of the Department, had experience with the old manual system.

When the new Library was opened in January 1970 the main desk 1031/33 reader-printer and the 2740 typewriter terminals were installed. All but 70,000 of the 800,000 punch cards had been matched with the books in the collection and the computer system was ready to begin operation. None of us had any experience with automated circulation systems and we were unprepared for the problems that occurred. We maintained both the old and the new systems, charging and discharging every item twice. It had been decided to parallel the systems for three months to safeguard the charge records. However, we found that it was nearly impossible to maintain both systems with our small staff. All of the staff were forced to work long hours, for much time was needed to concentrate on new problems and instigate new procedures. To complicate matters, there were many telephone line problems and equipment failures. However, at the end of two weeks the computer system was working well. Because the manual system filing and discharging were very badly behind, we happily abandoned the manual operation.

The new system's advantages are manifold. The charge record is "filed" instantly and therefore can be consulted at once. There is no time needed for manual filing of the charge card as was needed in the past. Charging and discharging are simple, quick operations.

The circulation of the main collection has increased at least five percent in the new building. In addition, the department has taken over the circulation functions of the Africana Collection, the Curriculum Collections, the School of Management Collection, and the Oriental Collections. Total circulation for all collections from 9-1-70 to 12-1-70 was 53,817. There were 6,265 renewals and 919 saves. This three-month period includes an intersession period as well as a peak circulation period at the quarter's end. Even with this increased load, the department has not had the terrific backlogs which were experienced with the manual system.

The computer record can be modified easily. The record can be altered for call-ins (saves) and for renewals. It also can be deleted if the punch card is not available for discharging.

The procedure for putting on a save is a simple operation. At the point of discharge a save notice is printed out while the attendant still has the book in hand. Nothing has to be done with the book at that time except to set it aside. On the following day the "Book Available" notices are printed. Before the notices are sent out they are matched with the saves which have gathered on the shelves.

Renewals are easy to process, but the high percentage of renewals (16 percent) caused us to reexamine the two-week loan period in favor of a four-week loan period for the main Library. We found that most of the 2740 time was being used for renewals. The new four-week loan period has been favorably received.

Statistics are tabulated weekly and give us the data we need. Totals of charges by categories of users, charges to Reserve, and total circulation by each Dewey classification number in each collection are listed.

Use of the "Lost/Missing" category has been effective. If a "Locate" is not found after several searches in the stacks, a charge is made to Lost/Missing. With the record in the file, the book can be found if anyone tries to check it out or if it is returned. Some Lost/Missing records are cleared daily, and at the end of a year those which remain in the file are truly missing. Departments are encouraged to use the computer rather than maintain their own manual files. By using different "missing" numbers for each department, control is maintained and in addition, departments can receive quarterly lists of their missing items. With the manual system, only periodic searches for missing titles could be made.

Charges to departments are easily processed. Departments also receive quarterly reminders of books still charged to them.

The system has helped eliminate those periods of "limbo" when the book is not in its proper place on the shelves or charged. The entire Library is gradually being made aware that a book must be charged to the circulation file when it is taken out of its number sequence — or it is lost for our users. In eliminating these limbo periods the Circulation Department has had to work closely with all Library departments. The ultimate goal of having only two places to look — the shelves and the circulation file — is closer than we would ever have imagined. For example, when an added volume is entered in the shelf list card but needs pockets and marking, it is charged to the Marking Room. And if the Catalog Department must remove an item from the stacks for re-cataloging, the item is charged to the individual in the Catalog Department who is working with it. If a title is to be transferred from the stacks to a department, a charge is made to a department's "In Process of Being Transferred" number. When an item is being withdrawn an "In Process of Being Withdrawn" number is used.

Clerical time is greatly reduced for the sending of overdues, call-ins and fine notices. No longer is it necessary to decipher signatures and search for the borrowers' names in directories and registration cards. The notices come ready to stuff into window envelopes and are sent out the same day that they are picked up from the computer center.

Reminders to faculty are generated quarterly on forms that also fit into window envelopes. In the past Circulation Department could only find time to process faculty charges annually.

Professional staff time has been directed more and more to tasks that should have been part of the department's program all along. A systematic review of the collection's physical condition is being conducted and decisions on replacing, withdrawing, mending, or rebinding are made. Incomplete holdings of serials are identified and considered for order. In addition, the Circulation Department staff has found time to administer 352 open carrels, 174 studies, 18 seminar rooms, and 8 group study rooms.

The integrity of the computer file is never violated as was the manual file. In the manual system, charge cards were necessarily pulled from the central 3x5 card charge file for sending weekly overdues, for searching missing items, and for withdrawing items that had been missing for two years. It was never possible to keep up with re-filing, and cards stayed out of the main file for long periods of time.

Human error has been greatly avoided. There are still some instances of human error, of course, but many which did naturally occur in typing, filing, charging, and deciphering names have been eliminated.

The staff has been conscious of the need to streamline procedures and the need to operate efficiently. I have been grateful for the staff's cooperation and their good ideas for changes. Every old procedure has been examined and every one has been changed in some way.

A year ago, our manual circulation system contained a confusion of 55,000 3 x 5 charge cards. Over this past year these have been eliminated. Departmental charges have been transferred to the missing file or withdrawn. Student and faculty charges have been called-in. Every card has had a follow-through. One of the biggest projects has been to relocate 7,000 charges, which were long-term loans and are now considered to be permanent loans, to branch libraries.

This past year an additional 25,000 cards have been matched with books in the collection. This inventory, a by-product of the system, will be one of the greatest benefits. The main collection was established in the 1880's, and no adequate inventory has ever been taken. The punched book cards which will remain after several searches will be part of the missing record to be considered for replacement or withdrawal. After the collections are searched in the matching process, all books which remain without cards are compared against the catalog. In this way discrepanices in the author-title catalog and shelf list are discovered and corrected.

Machine failures have been our biggest problem. The self-service terminals have not been student-proof. While the attendant operated 1031/1033 at the main desk has had only a few breakdowns (hardware failures and telephone line problems), the self-service terminals in the stack levels have not been entirely successful. Users have not been able to follow what we consider to be simple instructions and operate the machines properly. To overcome this, the University Library has tried several adaptations on the 1033 to make the self-service operation as fool-proof as possible. The Standard Register punch machines, which are used for manual back-up when the computer is down, have proved to be useful, although there have been breakdowns of these too, and they sometimes cause errors. We are happy to use them, however, because their use saves much keypunching time in preparing a charge record which is fed into the 1031/33 when the computer comes back into use.

One disadvantage of the system is that the size of the present computer does not give us unlimited ability to block user numbers. Over the past year hundreds of students and faculty have reported lost, misplaced, or stolen identification cards. The present computer has the space to block only 50 numbers (raised from 25), which is very inadequate. This means that we must evaluate the reports and block only those numbers which we judge to be serious threats to the security of the collection.

Other problems this past year resulted from mis-punched plastic identification cards. While the supplier has re-punched the badges, the users have been inconvenienced and some charge errors resulted.

To candidly list disadvantages of the automated system is a hard task because the system has so many more advantages over the manual system. No one on the staff would consider returning to the manual system. The computer charge system has demonstrated that it can do the job better and faster.