THE AUTOMATING OF A LARGE RESEARCH LIBRARY

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INTRODUCTION

In the late 1960's, The Ohio State University Libraries like many other libraries were unable to cope with the manual card files which were necessary for the operation of the Libraries. Four types of Library records were causing problems and were considered for computer solution. These were cataloging, acquisitions, serials or periodicals, and circulation. At Ohio State we began using the OCLC, Inc. on-line cataloging service in August 1971. OCLC planned to provide an acquisition system and a serial control system in 1974-75. Thus, the Libraries chose to automate the control of book circulation.

The manual circulation system had collapsed. Symptoms of this failure were 1) no growth in circulation from 1965-1970 which was a period of rapid student, faculty, and collection growth; 2) average wait of 45 minutes for materials to be retrieved from the Main Library stacks during busy periods; 3) less than 50% of the items requested were located; and 4) a backlog of overdue notices resulted in one year moratorium on mailing notices.

The OSU Libraries system is composed of one large main library, 26 department or subject libraries, and 2 undergraduate libraries. The collection contains 3.4 million volumes representing 1.4 million titles and grows at a rate of 130,000 volumes per year. The Libraries serve a user community of over 70,000 students, faculty, and staff with an annual circulation of nearly two million items.

Currently, The OSU Libraries circulation records are controlled by the Library Control System or LCS. LCS is available on-line 16 hours a day on an IBM 370/168 in the University Systems. At the same time, this computer supports Computer Based Education, on-line student records, and on-line personnel records. The University Systems also provides programming support for maintenance of existing programs and development of improvements for LCS.

Eighty-five computer terminals provide access to LCS. Six of these terminals are in the LCS telephone center where operators with telephone headsets are seated at terminals. Any item in the Libraries file may be requested over the telephone. The item will then be charged to the requestor and held at the library for pick-up or delivered via campus mail to office or dormitory.

The remaining 79 terminals are divided into three groups depending on their functions. Twenty terminals are available in several library locations for the Libraries users to query LCS. Eight terminals are used in the cataloging and book acquisition procedures. Fifty-one of these terminals are located at circulation desks in the 29 libraries linked to LCS. From these 51 terminals, books anywhere in the system may be charged, renewed, or saved for a patron.

COMMAND TRANSACTIONS

The LCS is command based. Each transaction begins with a three character command. These characters are mnemonic representations of the transaction name. The fourth character is normally a slash. The transaction command is followed by the argument of the command. The argument required is specified by the command. For instance, the DSC/ command which is a detailed search by call number requires a call number as the argument.

A terminal table controls which commands can be used on a specific terminal. There are 55 transaction commands in LCS. Public use terminals are permitted 16 commands (Figure 1), which is the minimum available on any terminal. These public use commands are used to access titles in the on-line catalog. The remaining commands are used for circulation functions or file maintenance functions and are permitted only at staff use terminals.

FUNCTION	COMMAND	ARGUMENT
SEARCH FOR SHORT	DSC/	CALL NUMBER
BIBLIOGRAPHIC RECORD AND	DST/	TITLE NUMBER
CIRCULATION DATA	DSL/	LINE NUMBER
SEARCH BY AUTHOR NAME	AUT/	AUTHOR 6/3 KEY
SEARCH BY TITLE	TLS/	TITLE 4/5 KEY
SEARCH BY AUTHOR/TITLE	ATS/	AUTHOR/TITLE 4/5 KEY
SEARCH OF THE SHELFLIST	SPS/	CALL NUMBER
SUBJECT INDEX SEARCH	SIS/	SUBJECT HEADING
SEARCH FOR TITLES ON A SUBJECT	SBL/	LINE NUMBER
SEARCH FOR	FBC/	CALL NUMBER
FULL BIBLIOGRAPHIC	FBT/	TITLE NUMBER
RECORD DATA	FBL/	LINE NUMBER

Figure 1. Public use LCS commands

CIRCULATION

LCS circulation transactions (Figure 2) provide centralized circulation control and rapid response to patron queries on the availability of books and journals in the entire OSU collection. All circulation commands permit multiple books to be identified in a single input transaction. The charge function provides the ability to charge a book to a patron or a patron class such as Interlibrary Loan. The system determines the loan period based on patron type and the circulation code of the item. The charge function provides many options. A normal default situation of book-in-hand may be overridden by entering a remote/page keyword. The mail option indicates that the patron desires that the book be mailed to his campus address; LCS will print a mailing label. The normal due date may be overridden by entering a due date.

FUNCTION	COMMAND	ARGUMENT
CHARGE A BOOK	CGC/	CALL NUMBER
TO A PATRON	CGL/	LINE NUMBER
	CGT/	TITLE NUMBER
RENEW A BOOK	RNC/	CALL NUMBER
FOR A PATRON	RNL/	LINE NUMBER
	RNT/	TITLE NUMBER
SAVE A BOOK	SVC/	CALL NUMBER
FOR A PATRON	SVL/	LINE NUMBER
	SVT/	TITLE NUMBER
DISCHARGE A BOOK	DGC/	CALL NUMBER
FROM A PATRON	DGL/	LINE NUMBER
	DGT/	TITLE NUMBER
FINE PAYMENT	FPD/	AMOUNT PAID
SNAG A BOOK	SNC/	CALL NUMBER
	SNL/	LINE NUMBER
	SNT/	TITLE NUMBER

Figure 2. Circulation commands

The renewal function allows the renewal of a book currently charged to a patron. This may be done either remotely by calling the LCS telephone center or in person at any library's circulation desk. The system computed new date due may be overridden by entering a due date in the transaction.

The LCS provides the ability to place a patron save on a title when a copy of the title is unavailable. The save patron may optionally request the book be mailed to a campus address.

Discharging a book releases responsibility of the book from the patron. At the time of discharge the status of the book may be other than a normal return; the item may be reported lost or claimed returned. For over due items which have been recalled for another patron, a fine is computed by LCS. A save present will automatically cause a charge to occur to the next patron in save queue.

The fine payment capability credits a patron's account of money due for overdue charges and lost books. The dollar amount may be a true payment or a credit to the amount due.

A final type of circulation command is the snag. This function is used to indicate that a book cannot be found in the stacks when the book is retrieved for a patron.

AUTHOR/TITLE ON-LINE CATALOG

When LCS became available in 1970, the Libraries received a limited author/title on-line catalog. (Figure 3) The short bibliographic record, on which the 1970 on-line catalog was based, included call number, main entry, short title, edition statement, publication date, Library of Congress card number, and a holdings statement for each copy and volume. The holdings statements include copy number, volume number where applicable, library location, and circulation condition code.

```
DSC/HN17.5T641971
HN17.5T641971   TOFFLER, ALVIN   FUTURE SHOCK.
NOLC    1534121   1971        4   FBR
01      001 WTHDN UND
02      002       SOC
03      003 3WEEK UND RESENRCR  0 CHGD  790104/790405
04      004 3WEEK WCL
PAGE 1 END
```

Figure 3. LCS short bibliographic record retrieved using a detailed search by call number.

These short bibliographic records are available for all 1.5 million titles listed on LCS. When a copy is charged to a library user, the display also includes the borrower identification, the date borrowed, and the date due.

AUTHOR/TITLE ACCESS

The author/title, title, and the author searches use nine character search keys. For the author/title, or ATS/ search, four characters are taken from the first significant word of the author and five characters from the first significant word of the title. (Figure 4) For example, to search Toffler's Future Shock, the search key entered is TOFFFUTUR. A title, or TLS/ search, includes four characters of the first significant word of the title and five characters of the second significant word of the title. Thus, Future Shock is entered as FUTUSHOCK. The AUT/ author search key is composed of six characters of the first significant word and three of the second significant word. (Figure 5) For example, Alvin Toffler is entered in the author search as TOFFLEALV.

```
ATS/TOFFFUTUR
 PAGE 1                  4 MATCHES   (ALL DISPLAYED IN 1 PAGE )
01 TOFFLER, ALVIN            FUTURE SHOCK.          1971 FBR
02 TOFFLER, ALVIN.           FUTURE SHOCK.          1970
03*Toffler, Alvin.           Future shock.          1970 FBR
04 TOFFLER, ALVIN, COMP.     THE FUTURISTS $1ST ED. 1972
```

Figure 4. The display of the titles retrieved from an author/title search.

```
AUT/TOFFLEALV

   PAGE 1                                      (ALL DISPLAYED IN 2 PAGES)
   01 TOFFLER, ALVIN.        LEARNING FOR TOMORROW $1ST ED.        1974
   02 TOFFLER, ALVIN         THE CULTURE CONSUMERS: A STUDY OF ART 1964
   03 TOFFLER, ALVIN         FUTURE SHOCK.                         1971 FBR
   04 TOFFLER, ALVIN.        FUTURE SHOCK.                         1970
   05 TOFFLER, ALVIN.        THE CULTURE CONSUMERS                 1973
   06*Toffler, Alvin.        Future shock.                         1970
   07 TOFFLER, ALVIN         THE ECO-SPASM REPORT                  1975
   08 TOFFLER, ALVIN         THE SCHOOLHOUSE IN THE CITY           1968
   09 TOFFLER, ALVIN, COMP.  THE FUTURISTS $1ST ED.                1972
   10*Toffler, Alvin         The schoolhouse in the city.          1968 FBR
          FOR MORE TITLES, ENTER PG2
```

Figure 5. The display of titles retrieved from an author search

The author/title, title, and author searches are considered general searches. A general search retrieves a list of titles which match the entered search. With an author/title search key, ninety percent of the LCS records display on a page of ten or fewer matches. With the AUT/ author search, eighty-three percent of the records are displayed on three pages (fewer than thirty-one records). The information for each title displayed in a general search includes the author, title, publication date, and availability of full bibliographic records. If the author or title is longer than the allocated space, they are truncated.

In the general search displays, each title is listed on a separate line which is identified by a line number. This line number is used in a detailed search by line number (DSL/) to retrieve the short bibliographic record and circulation data. Figure 6 is an example of detailed search by line number.

```
DSL/4
HN17.5T64   TOFFLER, ALVIN.   FUTURE SHOCK.    67-12744
        791445    1970         10
01      001        MAI RESEDUCR  0 SNAGD 790103/790103
02      004        SOC RESHEACR  0 CHGD   781220/790321
03      005 3WEEK UND RESEDUCR  0 CHGD   790104/790405
04      006 1WEEK EDU 390460022 0 CHGD   790118/790125
05      007 3WEEK WCL RESWCLWP  0 SNAGD 780409/780906
06      002 WTHDN BRW
07     ·003 WTHDN UND
08      008 WTHDN EDU
PAGE 1 MORE ON NEXT PAGE.  ENTER PD2
```

Figure 6. LCS detailed search by line number (DSL/)

SHELFLIST ACCESS

The shelflist position search (SPS/) is another type of general search. In this search, the list of titles displayed are in sequence as on the library shelves (Figure 7). The call number which was searched is displayed in the correct shelf sequence. On the same line, the call number is followed by 10 characters of the author's name, a portion of the book title, and the publication date. The same information is displayed for the other call numbers, which are displayed. If the requested call number is not present in the shelflist index, it is included in the proper sequence in the display fol-lowed by a blank line. The SPS/ display puts the holdings of all 29 library locations in a single shelf order with all books available on the shelves.

```
SPS/HN17.5T64

11 HN17.5R81977 / RUBINGTON, / THE STUDY OF SOCIAL PROBLE/1977
12 HN17.5S36 /    / SAN SHIH NIEN HOU TI SHIH CHIEH/1976
13 HN17.5S51974 / SILVA, ANT / HIPPIES, DROGAS, SEXO, POL/1974
14 HN17.5S75 / STEIN, GEO / THE INDIVIDUAL AND EVERYBODY/1973
15 HN17.5T5 / THOMASON, / THE PROFESSIONAL APPROACH TO C/1969
16*HN17.5T64 / TOFFLER, A / FUTURE SHOCK./1970
17 HN17.5T641971 / TOFFLER, A / FUTURE SHOCK./1971
18 HN17.5T681 / TOURAINE, / THE POST-INDUSTRIAL SOCIETY/1971
19 HN17.5U44 / UNITED NAT / POPULAR PARTICIPATION IN DECI/1975
1A HN17.5U45 / UNITED NAT / POPULAR PARTICIPATION IN DEVE/1971
1B HN17.5V57 / VIRILIO, P / ESSAI SUR L'INSECURITE DU TER/1976
   PAGE 2 OF 3.  FOR OTHER PAGES ENTER PG AND PAGE NUMBER
```

Figure 7. A display of the retrieved records in response to a shelflist position search (SPS)

Until June 1978, the shelflist position search was the only on-line subject search available on LCS. After June 1978, the shelflist position search continues to be the only subject access for titles cataloged before April 1978.

LIMITATIONS OF CARD CATALOGS

As the Ohio State University Libraries approach the 1980's, new problems are on the horizon. The volume of information is ever increasing as are the printed sources in which information appears. Concepts change and new subjects develop, and the Libraries' problems of storing and accessing Information are increasing.

Like many libraries, the OSU Libraries have been unable to keep up with the maintenance of the card catalog. Our use of the OCLC computer-based cataloging system has made it possible to speed up the cataloging of materials by sharing cataloging with over 1000 libraries, but the automated catalog card production has caused the Libraries to fall behind in the filing of the cards into the card catalog.

Another problem will be created by the adoption by the library world of new rules for establishing names in catalogs (Anglo American Cataloging Rules, second edition or AACR II). These new rules intend to establish names as they are used by non-librarians. For example, the new rules will use "University of Michigan" rather than "Michigan. University" as is currently in the card catalogs. The Library of Congress anticipates that between 11% and 37% of the names currently in the card catalog will change to a new form following the new rules. Because the Library of Congress has announced the adoption of AACR II in January 1981 and since most libraries use Library of Congress cataloging, most large research libraries see no alternative but to adopt AACR II and to close their present catalogs.

FUTURE CATALOG

When planning for the closing of the current card catalog, any academic library can assume that by 1981 it will be producing the majority of its catalog records in machine readable form. Thus, the libraries can choose from one of the three computer supported catalogs: COM (computer output microform) catalog, book catalog, or on-line catalog. The COM and book catalogs are not economically viable if the catalog is to be current, because these catalogs need to be regularly recreated in order to keep current with new titles added to the file. Thus, the Ohio State University Libraries have begun developing the Library Control System into a full on-line catalog for titles received in the Libraries after Janaury 1974.

Capabilities identified which should be added to the previously described LCS in order to have a full on-line catalog are:

1) display of full bibliographic records
2) access to the Libraries' holdings by subject
3) expansion of the author/title index to include secondary name and title entries
4) provision of subject and name cross references
5) full character storage and display of upper/lower case alphabets and special characters
6) sufficient terminals to provide public access
7) tutorial instructions on-line available on request

In June 1978, the OSU Libraries received three of these capabilities in the LCS system for titles cataloged since April 1978 through OCLC.

FULL BIBLIOGRAPHIC RECORD

The Full Bibliographic Record (FBR) display contains all elements which are included on an OSU Libraries' catalog card. (Figure 8) The format was designed for a compact display without loss of information. The call number appears on the first line, the author on the second. Indented two spaces, the title paragraph includes title, edition statement, imprint, collation, and series note. All other notes are in a single paragraph, which is also indented. The subject headings are in a paragraph which begins "SUB:" and are numbered with arabic numerals. The secondary name and title entries are in a paragraph which begins "AE:" and also are numbered with arabic numerals.

```
FBL/6

S.301.24T571F
Toffler, Alvin.
  Future shock.  New York,   Random House  (1970) xii, 505 p.
23 cm. 8.95
  Bibliography: p. 461-483.
SUB: 1. SOCIAL CHANGE  2. SOCIAL HISTORY--1945-  3. REGRESSION
(CIVILIZATION)  4. CIVILIZATION, MODERN--1950-
LC CARD #:67-12744  TITLE #:2312555  OCLC #:0087496     &ZZ770701
PAGE 1 END
```

Figure 8. A display of the full bibliographic record in response to a full bibliographic record search by call number.

The full bibliographic record for a title, which has a FBR record in the file, can be retrieved by OSU call number (FBC/), LCS title number (FBT/) or by line number (FBL/) after a previous general search.

SUBJECT ACCESS

The subject access in the LCS on-line catalog uses a subject index search (SIS/) to display the subject headings available and also display the number of times each heading has been used.(Figure 9) The entered subject displays in alphabetical computer sequence as line 12 near the top of the second page, the user may request page 1 or page 3 to view additional headings.

```
SIS/SOCIAL CHANGE

11*   1 SOCIAL CASE WORK--RESEARCH
12   71 SOCIAL CHANGE
13   26 SOCIAL CHANGE--ADDRESSES, ESSAYS, LECTURES
14*   1 SOCIAL CHANGE--BIBLIOGRAPHY
15*   4 SOCIAL CHANGE--CASE STUDIES
16    1 SOCIAL CHANGE--COLLECTED WORKS
17    5 SOCIAL CHANGE--CONGRESSES
18    1 SOCIAL CHANGE--PERIODICALS
19    1 SOCIAL CHOICE--MATHEMATICAL MODELS
20   16 SOCIAL CLASSES


  PAGE 2 OF 3   FOR OTHER PAGES ENTER PS AND PAGE NUMBER
  FOR TITLES ON A SPECIFIC SUBJECT ENTER SBL/ AND LINE NUMBER
```

Figure 9. The display of a response to a subject index search

A subject index search can be done on a Library of Congress subject heading or on any word or words which come to mind. The entered search displays on line 12 whether or not it has been used as a subject heading in an LCS full bibliographic record. If the entered term has not been used, the number of items column is blank.

After the user has determined the subject in which he/she is interested, a subject search by line number (SBL/) may be entered. (Figure 10) This display is in inverse order by publication date and within date in alphabetical order by the first four characters of the author. From this display a line number search for either the full bibliographic record or a short record can be entered.

```
SBL/12

 PAGE 1 OF 3        71 MATCHES.  FIRST       0 SKIPPED
 01 GN358E95 /  / EXTINCTION AND SURVIVAL IN HUMAN POPULA/1978
 02 HM101S626 /  / THE SOCIAL ECOLOGY OF CHANGE :/1978
 03 HN57B455 / BENDER, TH / COMMUNITY AND SOCIAL CHANGE I/1978
 04 S.HN57B455 / Bender, Th / Community and social change/1978
 05 HN80F18D58 / DIXON, MIM / WHAT HAPPENED TO FAIRBANKS?/1978
 06 HM281E37 / EISENSTADT / REVOLUTION AND THE TRANSFORMA/I978
 07 HV91G76 / GRONBJERG, / POVERTY AND SOCIAL CHANGE //1978
 08 HN57J2479 / Janowitz, / The last half-century :/1978
 09 S.HN57J2479 / Janowitz, / The last half-century :/1978
 10 HQ734K33 / Kando, Tho / Sexual behavior & family life/1978
 SOCIAL CHANGE                        FOR MORE ENTER PG2
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Figure 10. A display of the retrieved records in response to a subject search by line number (SBL/).

Although cross references are not included in the current LCS on-line catalog capabilities, the subject file has been designed so that it can serve in the future as a subject authority file. The plan is for subject cross references to appear in the subject index display. When maintenance of the subject file is available, a single maintenance transaction can be specified to change a subject heading in all records in which it appears.

JOINT AUTHOR ACCESS

As of June 1978, joint authors for which full bibliographic records are in LCS are included in the author/title and author search key indexes. The nine character keys are created from the joint author's name in combination with the title as it appears on the piece. When only a short bibliographic record is in LCS, the title can not be retrieved by the second author's name.

FILE STRUCTURE

The Library Control system is composed of 19 interrelated files (Figure 11). The primary file is the MASTER file which contains the short record for each title and for each patron in the

system. The Search Code File, Search Code X-ref file, Title Number file, Call Number file and the Call Number X-ref file are used when accessing the MASTER File. The files which are used for access are determined by the terminal transaction entered. The Circulation/Save file, Rand file, and Serial file are used in conjunction with the MASTER file short record displays. The Bibliographic Record file, Subject file, Bib Index file, Subject Code file and Subject Page file are used with the MASTER file to complete displays of the full bibliographic record.

For the detailed search or short bibliographic record retrieval (Figure 12), the LCS module OSLINQ uses the input argument to determine the method of access to the MASTER File. For a line number command, the General Page from the previous general search is retrieved to obtain the master record's file location. With a title number command, the title number is randomized to obtain the master record location. A call number provides immediate access to the Master File for the record location is determined by a randomizing scheme using the call number.

The master record provides short bibliographic information of the call number, main entry, short title, publication date, LC card number and holdings. For titles which are serials or monographic sets, the serial Title is accessed to obtain detailed information on bound pieces. For holdings of the Health Sciences Library, information on the book's location in the Randtriever is retrieved from the Rand File. Circulation and save information is obtained from the Circulation/Save File to complete the display.

The complete catalog or full bibliographic record display (Figure 13) results in a display as seen in the manual card catalog. The LCS module OSLFBR accesses the master record using a line number, a call number or a title number as is done for a detailed search by OSLINQ. In addition it retrieves the full bibliographic record from the Bibliographic Record File. Within the record is a subject code which is used to obtain via the Subject Code File the full subject heading. Thus, the three files: Master, Bibliographic Record, and Subject complete the catalog record display.

CLOSING OF THE CARD CATALOG

At this point in time, The Ohio State University Libraries have not determined when the card catalog will be closed. The development of the LCS on-line catalog is moving ahead under the assumption that the card catalog will be closed in two to three years. In addition to cross references for subjects, we also have to provide name cross references, analyzed serials, non-roman titles, and retrospective serial titles in the on-line files. When the LCS on-line catalog has proved itself to be at least the equivalent of the tried and true card catalog, The Ohio State University Libraries will close their card catalogs.
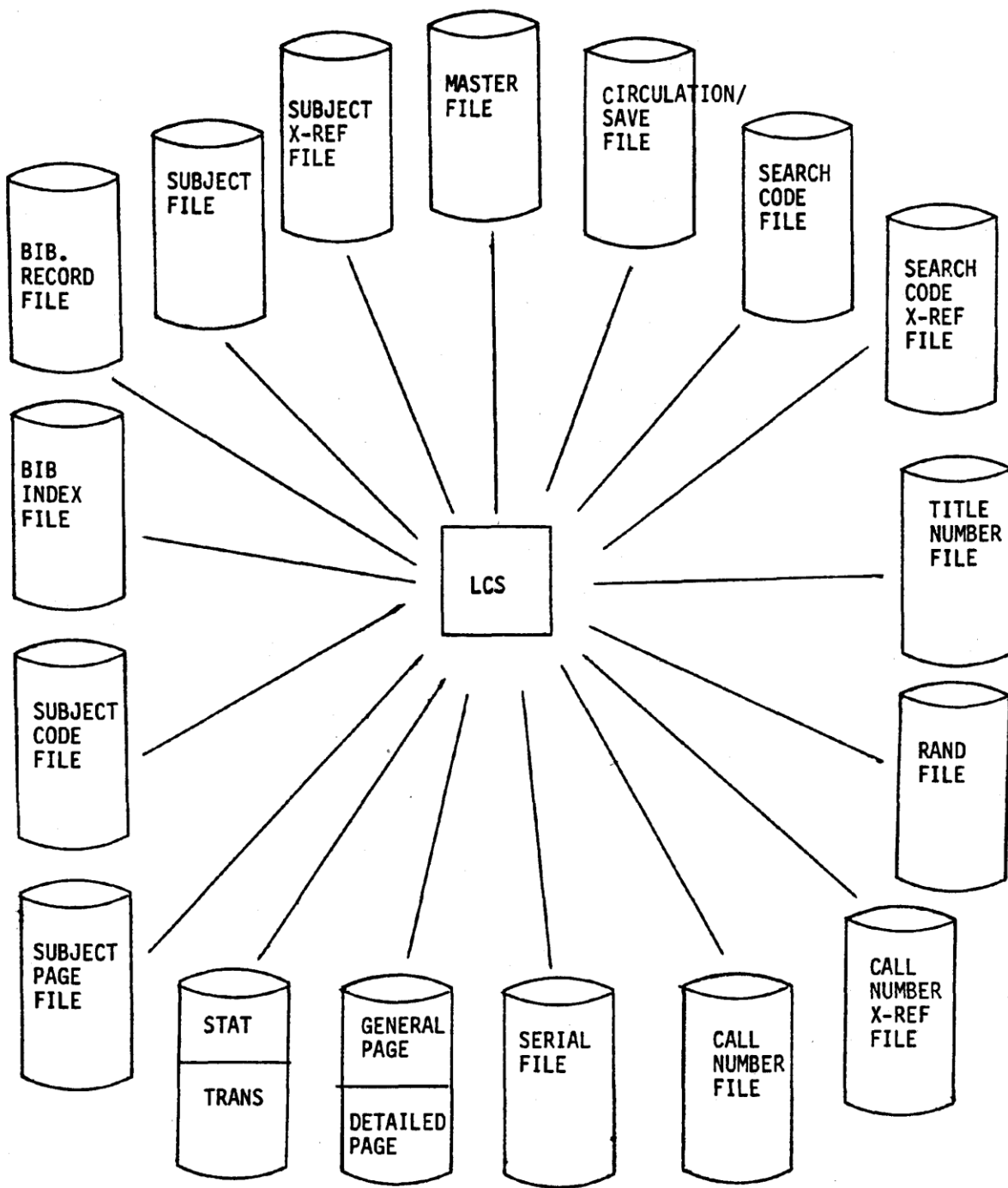
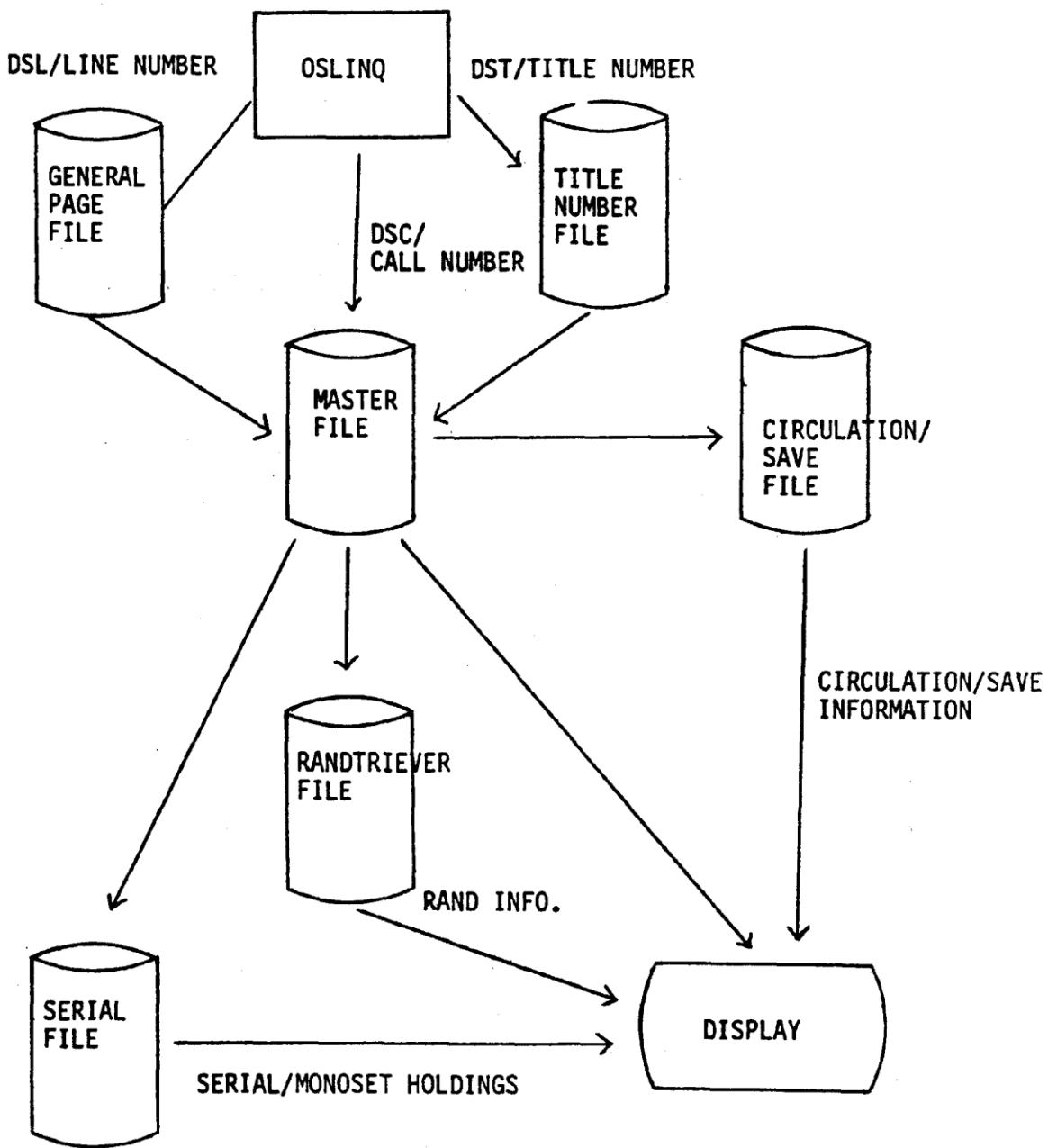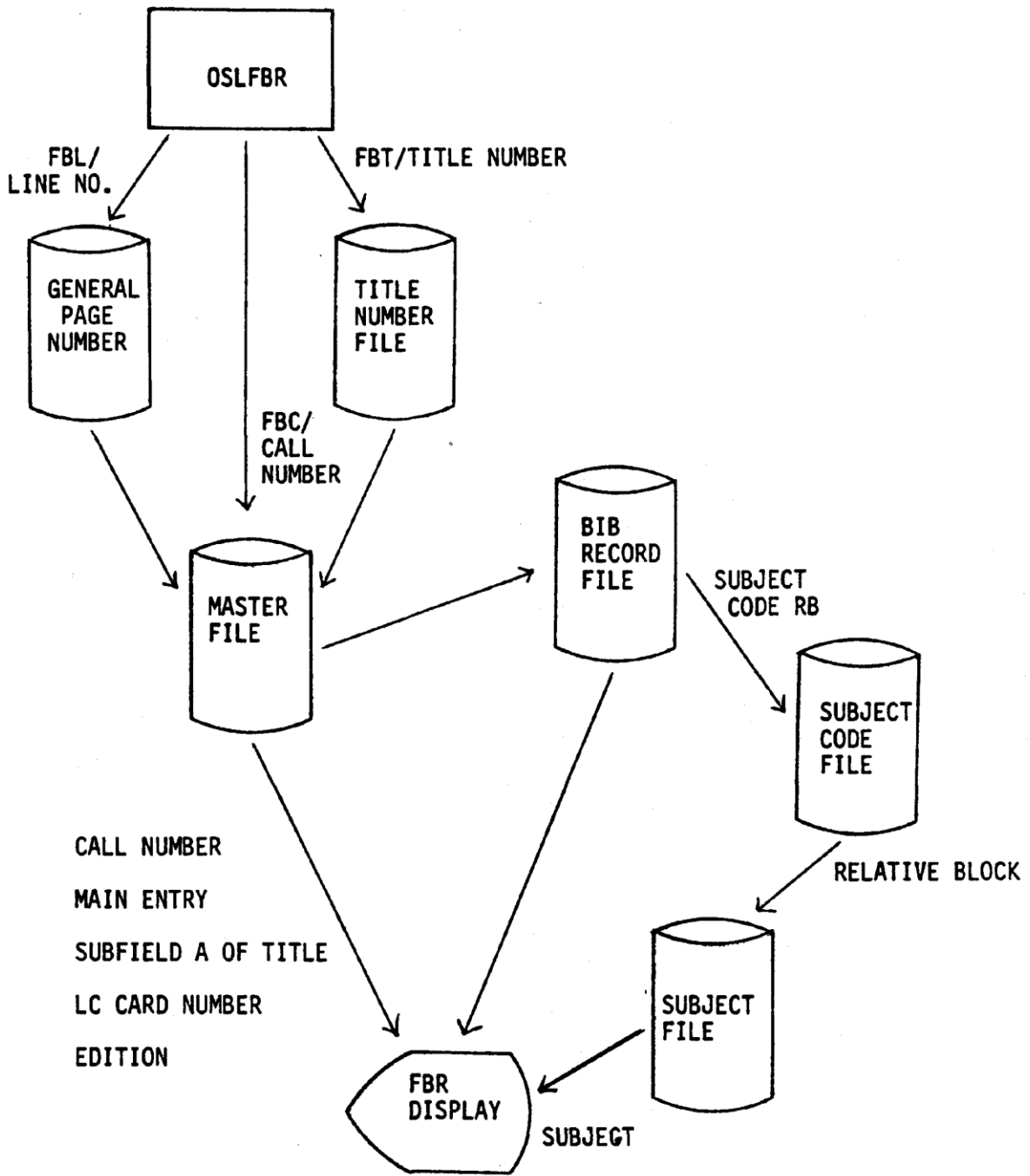Figure 11. Library Control System files

Figure 12. MASTER RECORD display

Figure 13.   Full Bibliographic Record Display