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ABSTRACT

BALLOTS is a computerized system to support acquisitions and cataloging in the Stanford University Libraries. The system is divided into ten computerized functions, each supporting a specific type of library processing. The library staff communicates on-line with the system using four on-line files for searching: the MARC file, the In Process File, the Catalog Data File, and the Reference File. The files are identified and restricted by library; this allows multi-library access to BALLOTS files but only the library owning the file can update its records. The system has been in operation since November, 1972, and 90% of the technical processing is now automated. (CH)

FINAL REPORT OF THE BALLOTS PROJECT

TO THE NATIONAL ENDOWMENT FOR THE HUMANITIES

September 1, 1972 - January 31, 1975

Institution: Stanford University

Principal Investigator: David C. Weber

Project Director: A. H. Epstein

Project Title: BALLOTS--Bibliographic Automation of Large Library Operations Using a Time-sharing System

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NOTE

Publication of this report, which covers a period ending in January 1975, was delayed until October of the same year. BALLOTS has not stood still during these months, and readers should bear in mind that the system described here has been modified and extended, both in capabilities and in its use.

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I. BACKGROUND; MAJOR ACCOMPLISHMENTS UNDER THE GRANT

In January 1975, the Stanford University BALLOTS project* completed work under a grant jointly funded by the National Endowment for the Humanities and the Council on Library Resources to develop and implement an automated bibliographic service system for the Stanford University Libraries. Several years of design and development had preceded this grant.

In early 1967, following a period of rapid growth in library staff and in the volume of items processed, Stanford University submitted a proposal to and received a grant (and a subsequent extension) from the U. S. Office of Education (USOE) to create a flexible and reliable on-line system for bibliographic control. The focus was on supporting library technical processing in order to reduce the clerical workload by placing the burden of repetitive tasks on a machine system; using a time-sharing computer already serving several groups of users; creating an on-line system with multi-file and multi-index capabilities; and using video display units. The design of the system was to allow for its extension, in phases, from technical processing support to other areas of library operations and eventually to other libraries. Additionally, a long-term project goal was to reduce unit costs for acquisition and cataloging while allowing the library to handle more materials without a proportional increase in the size of the staff.

Under the two USOE grants, a prototype acquisition system (BALLOTS I) was designed and implemented by BALLOTS in collaboration with SPIRES ("Stanford Public Information Retrieval System"), a Stanford project funded by the National Science Foundation. BALLOTS I was operated for a nine-month period in 1969 in the Stanford University Libraries. At the end of this period, the system was evaluated and the design of the production version begun.

The requirements for the production system were: (1) reliability--minimum down time; (2) rapid recovery time; (3) file integrity--procedures had to be designed into the software that would protect all files from user-, program-, or equipment-initiated failure; (4) cost acceptability--the system would have to be able to handle an increasing volume of work at a cost equivalent to or less than the cost of a manual system handling comparably increasing workloads; (5) procedural integration--the system had to be integrated into the day-to-day work of the acquisition and cataloging departments rather than segregated in specialized units.

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*"Bibliographic Automation of Large Library Operations using a Time-sharing System."

In 1972, BALLOTS applied for and received the two-year joint grant from the National Endowment for the Humanities and the Council on Library Resources to implement ten cumulative technical processing "modules" or sets of capabilities that are part of the current BALLOTS II production system. The first module of the system, an on-line file of MARC (Library of Congress MAchine-Readable Cataloging) records, extensively indexed, which could be searched and used to produce computer-printed purchase orders, catalog cards, and spine labels, had already been developed with Stanford's own funds.

The development cycle for each system module included the following steps: (1) determine the system requirements; (2) prepare written specifications; (3) update these specifications in response to library and programming review; (4) program (including design, coding, testing, and documentation; (5) perform system acceptance testing (both BALLOTS systems analyst and library user testing); (6) train users; and (7) begin production.

The BALLOTS project was given a two-month, no cost extension beyond the original grant period; work on the final modules to be implemented extended beyond this period. This final report takes as its scope the completion of the work to implement BALLOTS II, which takes it five months past the two-year grant period. The modules put into operation between late 1972 and January 1975 were the following.

1. IPF (the In Process File module) established an on-line file of all the outstanding book orders created through the system and provided a means for recording each step of processing concerning these titles. Implemented in April 1973.

2. CDF (the Catalog Data File module) established an on-line file of permanent, machine-readable catalog data for all the roman-alphabet material added to Stanford's collection through BALLOTS II. Implemented in July 1973.

3. PO/OC (the Purchase Order and Original Cataloging module) extended the system to include purchasing and cataloging for titles not found in the BALLOTS MARC (MRC) File. Implemented in November 1973.

4. ACC (the Automatic Claiming and Canceling module) put the follow-up on undelivered items under the control of computer programs, and permitted automatic claiming (and automatic canceling, when necessary) of orders. The original implementation date was advanced, and this module was implemented in April 1974, ahead of schedule.

5. NPO (the Non Purchase Order Material Receipt module) accommodated the library's acquisition through BALLOTS II of materials by gift, exchange, approval, and blanket orders. Implemented in April 1974.

6. SO (the Standing Order module) accommodated acquisition of material on standing order, and enabled the library to acquire and catalog serials through the system. Implemented in August 1974.

7. OP (the Out-of-Print module) handled procurement of out-of-print titles. This module, originally combined with the SO module, was implemented in a separate cycle. Implemented in October 1974.

8. RP (the Reserve Processing module) enables Stanford's Meyer Undergraduate Library to process its reserve materials through the system. Completed in November 1974. Implementation of this module had to coincide with the beginning of the next academic quarter after its completion; therefore, library staff were trained to use the module in January 1975, in preparation for production use to begin in March 1975.

9. INV/BK (the Meyer Inventory File and Book Catalog modules) converted the Meyer Library tape data base (used to produce book catalogs) to the on-line BALLOTS Catalog Data File and thus made it available for on-line searching; they eliminated the previous punched-card method of inputting catalog data for book catalogs by providing for on-line updating of Meyer records in the BALLOTS Catalog Data File. These modules were moved back in the implementation schedule, and are listed here as a single, compound module rather than the two separate cycles originally proposed. Implemented in December 1974 and January 1975.

10. CIRC (the Meyer Library Circulation System module) was to be a self-circulation system, according to the Addendum to the Proposal dated 3 December 1972 (which is attached to this report as Appendix A). The Addendum stated a proviso agreed to by Stanford and the National Endowment for the Humanities that the implementation of the Circulation module was "highly dependent on external constraints, notably the existence of acceptable circulation hardware."

During the grant period, a hardware survey was made of other cooperative ventures in circulation systems and BALLOTS staff kept track of hardware usage and developments in these ventures. By mid-1974, it had become clear that the Stanford University Libraries preferred to pick up an automated circulation system at some point in the future, used by (and possibly designed for) other California state libraries. To design and implement a system tailored to Stanford alone was no longer considered economic or desirable. Therefore, as a result of information gathered and possibilities discussed over the two-year period, a conceptual specification of an automated circulation system for the Meyer Library was written and published. This specification suggests the basic ground that any automated system chosen would have to cover in order to be acceptable to Stanford in terms of the present manual circulation system. Completed in October 1974.

This development and implementation fulfilled the "DESCRIPTION OF ACTIVITIES" given in the Proposal Addendum, although the schedule actually achieved varied frequently from the one proposed. The following section describes the capabilities and uses of the BALLOTS II system and the design of its basic software.

II. THE SYSTEM

A. On the Outside -- From the User's Standpoint

General Capabilities

In the Acquisition Department of the Stanford University Libraries, the BALLOTS system supports the following:

- Ordering
- Claiming
- Canceling
- Receiving
- In-process Control

  } of monograph materials, microforms, film, phonotapes, phonodiscs, manuscripts, maps, pictures, theses, and pamphlets arriving on regular or standing orders

- Receiving and In-process Control

  } of materials received on approval, under blanket plans, by exchange, and as gifts

- Ordering
- Claiming
- Canceling

  } of serials, terminal sets and monograph series

- Procurement Control — of out-of-print materials

The claiming for serials includes automatic follow-up until the first piece of a new subscription is received; claiming for all other materials (including standing orders for terminal sets) includes automatic follow-up of orders on a regular schedule until the entire order is filled or canceled. The system supports approximately 94 percent of Stanford University Libraries acquisition activity. The only materials not processed through BALLOTS are film rentals, musical scores, and non-romanized foreign-language materials. Serial pieces are not checked in through BALLOTS, but all incoming pieces of terminal sets and separately classified monographs are controlled by BALLOTS.

The BALLOTS on-line In Process File (see below) has replaced the paper order and dealer files.

In the Catalog Department, the system supports the

- In-process Control (i.e., distribution and arrears control)
- Cataloging
- Records Maintenance
- Reference Input and Maintenance

for nearly all materials (monographs, serials, terminal sets, microtexts, phonotapes, phonodiscs, etc.) cataloged in the roman alphabet, including romanized alphabets (except for Arabic and

Hebrew). In December 1974, 79.2 percent of new title cataloging was supported. This percentage is expected to grow to over 90 percent in 1975, as the library adjusts to the complete production system.

The system also enables one to establish automatic, repeated standing searches against the BALLOTS MRC File; so that if a record needed for acquisition or cataloging is not yet in the on-line MRC File, it will be located after it has been added to the file from a future weekly Library of Congress MARC tape.

As one result of each day's on-line activity in the library, the following morning the library receives all the printed documents required in processing. Se-Lin spine labels are printed at a computer typewriter terminal in the library.

The BALLOTS system uses Sanders Associates 804 programmable CRT (cathode ray tube) terminals in the library that are connected to an IBM 360 model 67 computer, approximately one mile away. This computer also supports faculty and student academic and research computing. About 2,000 to 3,500 computing jobs, in addition to BALLOTS, are run on this computer each day. With 11 terminals operating throughout the day, the on-line portion of BALLOTS utilizes less than 3 percent of the computer capacity during normal working hours.

The Files Used and Their Indexes

The system supports several on-line files accessible through various indexes. Currently, in addition to the BALLOTS MRC File, there are three generic types of files:

- in process--containing bibliographic and acquisition or in-process control information
- catalog data--containing bibliographic and holdings (shelving location, copy number, and call number) data
- reference--containing "see", "see also", and explanatory references to catalog data

At this time, two libraries (the Stanford University Libraries and the Meyer Undergraduate Library) have their own records in the In Process, Catalog Data, and Reference files. (as of December 31, 1974, 57,200 Meyer records had been built into the Meyer Catalog Data and Reference files. The entire Meyer data base will be part of the Catalog Data File by March 1975.)

The in process, catalog data, and reference records look to the BALLOTS user as if they belong to separate files. In fact, there is a single file; index qualifiers specify the library to which a record belongs and whether the bibliographic record being searched is in process, has been cataloged, or both, or if it is a reference entry that refers to another form of entry used in Catalog Data File records. (Section II.B explains this arrangement further.)

The Standing Search Request (BSSR) File contains only search requests awaiting incoming Library of Congress MARC records. Requested may be entered in this file on-line, but data from it cannot be displayed on-line by the BALLOTS user. The BSSR File is used by batch programs to perform searches against the MRC File. After a rapid increase in the size of this file when the PO/OC module was implemented, the number of standing search requests has settled back to approximately 2,000.

The characteristics and use of the MRC and other files are discussed below, followed by a discussion of each index.

The MRC File. The BALLOTS MRC File contains only bibliographic records taken from the Library of Congress MAchine-Readable Cataloging (MARC) tapes. LC MARC tapes are converted into records in BALLOTS internal format and incorporated into the MRC File and its indexes. Records may be copied from the MRC File for inclusion in the In Process or Catalog Data File, and they may be altered in the In Process or Catalog Data File, but they cannot be changed by the user in the MRC File. If a revised MARC record arrives, the first record is deleted and replaced by the revised version. This automatic replacement of MARC data occurs only in the MRC File.

There are four indexes to the MRC File that may be used alone or in combination to search the file. These are:

1. Personal Name
2. Corporate/Conference Name Word
3. Title Word
4. Library of Congress Card Number

The In Process File (IPF). The IPF contains bibliographic and acquisition information for items on order or in process. If a title is ordered from a record found in the MRC File, the IPF entry for that book will contain a copy of the MRC record (either unmodified from MRC or modified at time of order by the user) and the acquisition information input at time of order. This ordering data includes, for example, vendor name, special instructions to the vendor, price, requester(s), number of items on order, etc. If a record is not found in the MRC File for the title to be ordered, and the title is not an added copy to a book already in the system (i.e., a record for the title does not already exist in the IPF or the Catalog Data File), then the Acquisition Department enters the most reliable bibliographic description available for the item. When the bibliographic description of an item is input, its source is indicated for later use in cataloging.

If the book ordered is an added copy to a title already in the Catalog Data File, the Catalog Data File record is used to order the added copy. Acquisition data is added and the CDF record can then be retrieved as an IPF record. Every physical item ordered or in process is represented by a separate set of data elements in the IPF record for that title, so that partial receipts, partial claims, and other partial record transactions

can be processed. Status information attached to each item clearly indicates the status and location of each item or items in the stream of technical processing activities.

When all the technical processing for a title in the IPF is completed (e.g., the items in process are cataloged), the IPF status of the record is deleted from the indexes to the record, the acquisition information is deleted, and only a Catalog Data File record remains.

The IPF has five indexes that can be used alone or in combination to search the file. Four of these indexes are the same as those for the MRC File, and function in exactly the same manner. The additional fifth index is:

5. BALLOTS Record Identification Number

The Catalog Data File (CDF). The CDF contains complete bibliographic descriptions and holdings information (i.e., the copy number and shelving location of each copy) for items cataloged. The IPF record becomes a CDF record at the time the book is cataloged through the automated system. Titles not ordered through BALLOTS (for example, cataloging arrears) may be entered directly into the CDF, either by keying cataloging information or by copying a MRC record and adding Stanford's holdings. The bibliographic descriptions of items cataloged may come from various sources, e.g., MRC records, LC or NUC book catalog copy, Title II cards, LC proof slips, or original cataloging efforts. All bibliographic descriptions except MRC copy are keyed into the system by the user, either at the time of acquisition or at the time of cataloging. These records are reviewed during cataloging and are upgraded or modified as necessary to conform to cataloging conventions.

The CDF has the same indexing scheme as the IPF plus two more valid indexes:

6. Library of Congress Subject Heading
7. Call Number

The Reference File (REF). The REF File contains cross-references required to locate a title in the Catalog Data File. These records are of three basic types: (1) "see" references, (2) "see also" references, and (3) explanatory/history references. The REF indexes are:

1. Personal Name
2. Corporate/Conference Name Word
3. Title Word
4. Subject Heading
5. BALLOTS Record Identification Number

The Standing Search Request File (BSSR). The library may, using this file, institute an automatic regular batch search of the MRC File for entries expected to appear in a future weekly LC MARC tape. These automatic searches of the MRC File may be

repeated for any number of months (up to 18) specified by the user. Successful matches are reported to the Catalog Department on three by five inch slips, so that material awaiting a MRC record can be processed through BALLOTS. Search requests are automatically removed from the BSSR File if a specified amount of time elapses without a match being made. This capability has replaced the old task of repeated searching of the paper Library of Congress Depository File. With this file, the library has the option of avoiding original cataloging if an expected MARC record arrives and is added to the MRC File. A BSSR File record contains the search request exactly as input by the searcher; the searcher's initials, the BALLOTS identification number of the In Process File record for the title, and the initial of the library that "owns" the IPF record. The BSSR File is not accessible to the BALLOTS user through any on-line index.

Figure 1 summarizes the indexing of the files just described. The Date Index mentioned in Figure 1 is not an on-line index for BALLOTS users. It is used primarily by batch programs for (a) automatic claiming and canceling of ordered materials; (b) purging BSSR records; and (c) Meyer Book Catalog Production. Figure 2 is a table of the data in each of the seven indexes for the MRC, IPF, CDF, and REF files.

Searching the BALLOTS Files

Searches of the BALLOTS files can be quite simple or quite elaborate. Simply stated, the user at the terminal keys a search request composed of the basic command "find", a valid name of the index to be used, and a value or values to be located. "Find t fire" will cause the system to gather a list of the records in the file that conform to this criterion--i.e., have the word "fire" somewhere in a data element indexed in the Title Word Index. "Find cal z699# and s libr# auto and a meadows" is a more complex search that asks for all the books whose call numbers begin Z699, with "libr" and "auto" appearing in their subject headings, and the name Meadows associated with the work (as author or editor, for instance). By using Boolean operators ("and", "or", "not") and requesting searches of more than one index at a time, the user can make his search broad or specific, depending on his purpose in searching the files. Parentheses can also be used in complex expressions.

An author's name in the Personal Name Index can be searched for in a variety of forms. For example, the following variations, or any combination of them, would be accepted as valid search terms and would locate the same record:

WHITE, J.E.M.	(initials, surname first)
White, M.	(some initials omitted)
White, J E M	(initials without periods)
white, jon ewbank manchip	(capitalization ignored)
J.E.M. White	(surname last)
Manchip White, J.E.	(surname embedded)

Files

Indexes	MARC	IN PROCESS	CATALOG DATA	REFERENCE
PERSONAL NAME	X	X	X	X
CORPORATE/ CONFERENCE NAME WORD	X	X	X	X
TITLE WORD	X	X	X	X
LC CARD NUMBER	*	X	X	
BALLOTS ID NUMBER		*	*	*
LC SUBJECT HEADING			X	X
CALL NUMBER			X	

*Stored as the key of the record but accessed by the user in the same way as the other indexes.

NOTE: There is also a Date Index. It is not accessible in on-line searching as are the indexes shown here, but is maintained as an adjunct to various system routines.

Figure 1. Indexes to BALLOTS Files

White, Jo Ewb Man	(implicit truncation of forenames)
Whi#, J.E.M.	(explicit truncation of surname through use of pound sign)

The BALLOTS system makes extensive efforts to recognize different versions of a personal name because the exact form of an author's name is not always known. Compound surnames (for example, "Teilhard de Chardin, Pierre") are indexed on both the first element of the surname (e.g., "Teilhard") and on the last element of the surname (e.g., "Chardin"). This facility is particularly useful for Spanish and Portuguese names, where the person frequently uses only the first element of his last name.

A user may truncate an index value using the pound or number sign; e.g., "find CN librar# automation" will retrieve all the entries in the Corporate/Conference Name Word Index beginning with "librar" (libraries, library, librarian, etc.) and the word automation. The words need not occur in that order since each word is indexed separately. As another example, "find CAL QD450#" will retrieve all records indexed in the Call Number Index with a call number that begins with QD450. Truncated call number searching is useful for browsing through the files according to the Library of Congress classification scheme. The degree of truncation determines the limitations of the area browsed.

A subject heading search can be made as specific or as general as desired by the user. For example, "find subject Art# will retrieve all entries in the Subject Index that have "art" as the first three letters (artists, artistic, art nouveau, etc.). This, of course, is liable to result in unmanageable search results, so the user could specify a further criterion--"find subject art# 19th Century", which would retrieve all the entries in the Subject Index with the character string "19th Century" coming somewhere after the string "art". When the truncation symbol is used to stand for words interior to the subject heading, there is implicit truncation at the end of the subject heading.

As Section II.B explains, within the BALLOTS file structure each index term is qualified to indicate to which logical file (MRC, IPF, CDF, or REF) and to which library the associated data belongs. The user can specify the files he intends to search, or BALLOTS will establish a default sequence of files. If the initial search of a file yields nothing, the system automatically goes on to search the next file in the sequence. If a single record is found in a file, the system automatically displays it for the user. If more than one record is found that meets the search criteria, the system informs the user of the number of records matched. At this point, the user can narrow the search by specifying additional requirements in an interactive session with the system. If he ends up with too few results as a consequence of his commands, the user may issue the "backup"

ON-LINE INDEXES ACCESSIBLE TO THE BALLOTS II USER

1. Personal Name (PN) Index. If values exist in a record for any of the following data elements, the personal name portions of those values (i.e., excluding dates and relators like joint author or title) are indexed in the PN index. For the following files, the data elements indexed are:

MRC, IPF, CDF:	Personal names from the main entry, added entry, series statement, series added entry.
CDF additional:	Personal name subject.
REF only:	Personal name referred from.

Title portions of author/title entries are indexed in the Title Word index. A series statement personal name is indexed only if it is traced in the same form.

2. Corporate/Conference (CN) Name Index. The CN index is a "word" index. In a word index, every significant word in the value of an indexed data element is indexed. Frequently occurring words, such as institute, are not indexed. For the following files, the data elements indexed are:

MRC, IPF, CDF:	Corporate/conference entries from the main entry, added entry, series statement, and series added entry.
CDF additional:	Corporate/conference subject.
REF only:	Corporate/conference names referred from.

Title portions of author/title entries are indexed in the Title Word Index. A series statement corporate or conference author is indexed only if it is traced in the same form.

3. Title (T) Word Index. The T index is a word index like the CN index. The data elements indexed are:

MRC:	Title words from the main entry (title and uniform title), short title, added entry, series statement, and series added entry.
IPF, CDF:	Data elements listed for MARC plus the title portion of author/title added entries.
CDF additional:	Subject that is a title.
REF only:	Title words referred from.

4. Library of Congress Card (CRD) Number Index. The one BALLOTS data element indexed in this index is the LC card number, and only the numeric portion (excluding revision, prefix, and suffix notations) is indexed. It is indexed for MRC, IPF, and CDF records.

5. The BALLOTS Identification (ID) Number Index. Each record in an IPF, CDF, or REF file has a unique ID number that is added to the record when the record is created. The final digit is a check digit.

Figure 2. The Data Elements Indexed in Each of the BALLOTS Indexes to the MRC, IPF, CDF, and REF Files

ON-LINE INDEXES ACCESSIBLE TO THE BALLOTS II USER cont.

6. Subject (S) Index. Only topical and geographic subject headings are included in this index for records in a CDF or REF file. The subject index is not a word index, the whole subject heading is treated as a single index term.

7. Call Number (CAL) Index. The CAL index is valid only for records in a Catalog Data file. The only data element indexed is the holding library's call number.

Figure 2 cont. The Data Elements Indexed in Each of the BALLOTS Indexes to the MRC, IPF, CDF, and REF Files

command to reinstate the previous result stack. If he ends up with zero results, the system will back up to the previous result stack automatically.

The user can now give the command "display", and BALLOTS will show him the first record of the result stack (the records retrieved in the search) on the CRT terminal screen. Paging commands (the "+B" and "-B" function keys on the BALLOTS CRT terminal) can be used to see each record in turn, moving forward or backward though the result stack.

Technical Processing

To describe all the technical processing possible in BALLOTS as searching has just been described (still an abridged explanation) would take up many pages of text. In June 1972, the BALLOTS project began publishing the "User's View of BALLOTS" series in order to give some idea of the techical processing made possible with each newly implemented module in the BALLOTS II system. The final publication in this series, "A User's View of BALLOTS, Numbers 4-7", (September 1974, 65 pages) summarizes the activities possible in the system as it stood after implementation of the Out-of-Print module, but before implementation of the Meyer Inventory File, Reserve Processing, and Meyer Book Catalog modules. Figures 3-6, following, are taken from the BALLOTS Reference Digest, which is a brief summary of system information used by library staff at the terminals. Figures 7, 8, and 9 are three sample outputs from technical processing: a catalog data slip, a claim notice, and a partial set of catalog cards. Without accompanying explanatory text, these figures give some idea of the nature and scope of the technical processing carried out in BALLOTS II.

Daily Operations in the Library
and at the Computer Center

The BALLOTS system is used daily by both professional librarians and support staff as part of their daily technical processing activities.

During BALLOTS on-line production hours, from 8:30 am to 5:00 pm Monday through Friday,* when the library staff are searching BALLOTS files and inputting data at the CRT terminals, computer operators and library staff communicate with each other via the telephone about problems with hardware and software. The

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*The system is available from 8:30 am to midnight, although technical processing activity in the library presently ends at 5:00 pm. During the evening (as well as throughout the day), the on-line files are searched for bibliographic, reference, holdings, and location information.

operators notify the library if any part of the system must be taken out of service. Operations staff are also responsible for seeing that the terminals are working properly. The goal of BALLOTS' coordination with the Academic Computing Operations Group has been to allow computer operations staff to carry out their responsibilities without intervention by BALLOTS staff, except in case of emergency.

All printed outputs except the Se-Lin spine labels are printed on a high-speed printer at the Academic Computing Services center of operations. BALLOTS batch production programs are run during Academic Computing's third shift (midnight to 8:00 am). Third shift operators control all the BALLOTS overnight jobs, from submission of the run through printing and processing of the final outputs. These jobs are run on a regular daily, weekly, biweekly, and monthly schedule. A courier delivers printed outputs to the library every morning.

CRT SCREEN FORMATS

Searching/Display			Input/Update		
AF1	-	Full Acquisition Display	BI1	-	Bibliographic Input
BF1	-	Full Bibliographic Display	BI2	-	Additional Bibliographic Input
BH1	-	Partial Bibliographic/ Full Holdings Display	HH2	-	Holdings Input
GS1	-	General System	HU1	-	Holdings Update
HF1	-	Full Holdings Display	OR1	-	Order Input
PR1	-	Acquisition Display	RI1	-	Reference Input
RF1	-	Reference Display	RP1	-	Reserve Processing Input
SI1	-	Search Inquiry	RX1	-	Acquisition Matrix
SI2	-	Search Continuation			

Figure 3. The BALLOTS II CRT Terminal Screen Formats

FUNCTIONS

Any file for any library except the BSSR File can be searched through the SET FILES command in any function except SCRATCH. If the default file search for a function is "LI dependent", only the files of the library specified in the SET LI (Library Identifier) command (q.v.) will be searched. If the default file search for a function is not LI dependent, the files of all the libraries in the system will be searched. The MRC file cannot be qualified by LI since no single library owns this file.

The default display format for a record varies with the file being searched:

CDF - PR1 (Acquisition Display Format)
IPF - PR1 (Acquisition Display Format)
MRC - PR1 (Acquisition Display Format)
REF - RF1 (Reference Display Format)

ORDER - Used by the Order Division to order material or to request a search and quote of material from vendors. - (ORD)
- Default Files for Searching (no LI dependence): REF, CDF, IPF, MRC
- Required Input/Update Format: OR1
- Valid Source Records to Begin Build: CDF, IPF, MRC plus CREate, DUPlicate, or IMItate command

NON PURCHASE ORDER MATERIAL RECEIPT - Used by the Order Division to receive blanket order and approval order books. NPO is also used by the Gift and Exchange Division to input gift and exchange books, and by the Catalog Department to input cataloging arrears. - (NPO)
- Default Files for Searching (no LI dependence): REF, CDF, IPF, MRC
- Required Input/Update Format: OR1
- Valid Source Records to Begin Build: CDF, IPF, MRC plus CREate or DUPlicate command

RECEIPT - Used by the Order Division to receive books acquired by purchase orders and to process them if certain criteria are met. - (REC)
- Default File for Searching (no LI dependence): IPF
- Required Input/Update Format: RX1
- Valid Source Records to Begin Build: IPF

CLAIM/CANCEL - Used by the Order Division to initiate a claim or cancellation for books on order and to record dealer report information; or to vary the automatic claim cycle. - (CLA)
- Default File for Searching (LI dependent): IPF
- Required Input/Update Format: none
- Valid Source Records to Begin Build: IPF

DISTRIBUTION - Used by the Distribution and Searching Unit of the Catalog Department to (1) process selected categories of new titles with MRC records; (2) update an IPF record to show the status of an item in process; and (3) update an IPF record with various information, such as an additional requester. - (DIS)
- Default Files for Searching (LI dependent): IPF, CDF, MRC
- Required Input/Update Format: none
- Valid Source Records to Begin Build: IPF

Figure 4. BALLOTS II Technical Processing Functions

FUNCTIONS (continued)

CATALOG - Used by the Catalog Department to record the addition of a book to the library's collection and to produce catalog cards and spine labels. - (CAT)
  Default Files for Searching (LI dependent): REF, CDF, IPF, MRC
  Required Input/Update Format: HH2
  Valid Source Records to Begin Build: CDF, IPF, MRC plus CREate or DUPlicate command

REFERENCE - Used by the Catalog Department to create or update "see", "see also", and explanatory records in the Reference File (REF). The reference records facilitate the use of the Catalog Data File (CDF). - (REF)
  Default File for Searching (LI dependent): REF
  Required Input/Update Format: RI1
  Valid Source Records to Begin Build: REF plus CREate or DUPlicate command

RESERVE - Used by the Meyer Reserve Processing Unit to search for items to be placed on reserve and for the production of reserve catalog cards. No on-line file of reserve records is maintained. - (RES)
  Default Files for Searching (no LI dependence): REF, CDF, IPF, MRC
  Required Input Format: RP1

MAINTENANCE - Used by the Catalog Department to update records in the Catalog Data File. - (MAI)
  Default File for Searching (LI dependent): CDF
  Required Input/Update Format: none unless REC changed on BI1 in which case HU1 required
  Valid Source Records to Begin Build: CDF

SCRATCH - Used by the Catalog Department to remove standing search requests from the BSSR File. - (SCR)
  Default File (no LI dependence): BSSR
  Default Display Format: none
  Required Input/Update Format: none

Figure 4 cont. BALLOTS II Technical Processing Functions

Searching/Display*

BACkup - Used after a search inquiry has been modified; has the effect of removing the last modification made. Valid only on SI2.

DISplay - Causes first record in search results to be shown on a display format.

FINd - Starts a new search inquiry.

KEEp - Causes the current search inquiry to be established as a standing search request. KEEp followed by an IPF record I.D. number is a valid command to link the standing search request to the IPF record waiting for a MRC record, by including the record I.D. in the BSSR.

LOGOFF - Terminates user session with both BALLOTS and the computer.

(Paging Commands) - There are five, used to display search results.

+, -	go from frame to frame of a record;
+B, -B	go from record to record in search results;
+A	goes to next acquisition structure in a record.

These five commands are also function keys on the terminal.

REMove - Combined with a BSSR number, REM deletes a record from the Standing Search Request File (BSSR) in the SCRATCH function.

RESume - Causes the search inquiry to be processed against the next on-line file available for searching.

SET - Establishes the (1) function, (2) user I.D. (OID), (3) files for searching, (4) library's files to be searched, (5) CRT display format, and (6) system log. The word "set" is optional. That is, "fun cat" is a sufficient command to set the function to CATALOG.

Input/Update*

CANcel - Ends input/update part of current processing. Nullifies input or update transactions just made.

CONtinue - Gives user a blank frame on which to continue inputting a data element. Used on the BI2 and RI1 formats.

CREate - Requests a blank Reference Input (RI1) format in the REFERENCE function or a blank Bibliographic Input (BI1) format in the ORDER, NPO, or CATALOG function. (BI2 optional.)

DUPlicate - Initiates an input sequence to create a new record with a new ID that contains the same bibliographic data as an already existing record. The record to be duplicated is displayed and the DUPlicate command is issued. The system responds with the input format (HH2, OR1, or RI1, depending on the function) that is required to complete the build sequence.

ELIminate - Deletes stop or desiderata records from the IPF. ELIminate must be issued from the AF1 format in the ORDER or CLAIM function. Also deletes reference records from the REF File. ELIminate must be issued from the RF1 format in the MAINTENANCE function.

ENTer - Ends input/update part of current processing. All input or update transactions processed.

EXAmine - Prompts current input/update format from the beginning, as modified during current user processing.

IGNore - Causes BALLOTS to disregard all actions taken concerning current frame; prompts the frame as it existed before the current user processing.

---

*Screen format names (e.g., "BI1") may be used in both command categories.

Figure 5. The BALLOTS II Command Language

COMMANDS (continued)

Searching/Display*

WYLbur - Terminates user session with BALLOTS; returns user to WYLBUR system.
IMItate - Initiates an input sequence to create a new order with data prompted from an already existing order. The acquisition structure to be imitated is displayed on an AF1 format and the IMItate command is issued. The system responds with an OR1 format prompted with the same data.
MORe - Gives the user additional MDY input areas on RX1, additional blank input areas on RI1 and BI2, additional MASH and/or LOC/BDX pairs on HH2, and additional MASH input areas on HU1.
REPlace - Prompts current input/update format from the beginning, as it existed before the current user processing.
TRAnsfer CRD - Replaces the entire bibliographic portion of a record in the IPF. The command is given from a display format of the IPF record and contains the CRD number of the MRC record that is to replace the bibliographic portion of the displayed IPF record.
TRAnsfer ID - Replaces the entire bibliographic portion of a IPF record with the bibliographic portion of another IPF or CDF record. The command is given from a display format of the record to be replaced and contains the ID of the record that is to replace the displayed record.

---

*Screen format names (e.g., "BI1") may be used in both command categories.

Figure 5 cont. The BALLOTS II Command Language

PRINTED OUTPUTS

Alert Slips
Cancel Slips
Cancellation Notices
Catalog Cards
Catalog Data Slips
First Claim Notices
Fund File Slips
Invoice Alert Slips
MARC Use Statistics
Matched SSR (Standing Search Request) Notices
Meyer Audio Catalog Cards
Meyer Short Catalog Cards
NPAC Notices
Order Slips
Purchase Orders
Purged SSR Notices
Reference Catalog Cards
Requester Notices
Reserve Catalog Cards
Search and Quote Notices
Second Claim Notices
Spine Labels
Standing Order Claim Notices
Title II Slips
Void Slips

The following outputs are not distributed to users but are used in system control and maintenance:

MARC Conversion Error Records
MARC Conversion Catastrophic Error Records
MARC Conversion Statistics
File Check Log and Statistics
SPIRES Overnight Processor Log and Statistics
BALLOTS Overnight Print Processor Log and Statistics
Daily Printed Output Statistics
System Log
Deferred Queue Listing
Standing Search Request Log and Statistics
SPIRES File Statistics
Available Space Report
Automatic Claiming and Canceling Program Log and Statistics

Figure 6. Printed Outputs Created in BALLOTS II Technical Processing

BT28.D8

6454195 1
STK
SST:2S

CAT:BEn.SNnada. xxCard

Dubach, Alfred.
Glauben in saekularer Gesellschaft. Zum Thema Glaube und Saekularisierung in der neueren Theologie, besonders bei Friedrich Gogarten. Bern, Herbert Lang; Frankfurt/M., Peter Lang, 1973.
viii, 196 p. 23cm. (Europaeische Hochschulschriften. Reihe 23: Theologie, Bd.17)

Publications by F.Gogarten after 1945: p.196.
Includes bibliographical references.

1.Theology - 20th century. 2.Secularization (Theology) 3.Gogarten, Friedrich, 1887-1968. I. TITLE. II.SER.
CRD:73-367247

ORD:09/19/74 ADD:01
PRO:PO SI:DI BAC:NRP301 SNI:2
VENDOR:HARRAS
REQ. BY:RHH PR:32.00P

1.1 MRI.12/18/74 DIS.12/18/74

CP:SZ L:GER REC:AN CI: MS:

PRNT:
RTC:
HARV:

INPUT BY:

DATE:

SUL-222

Figure 7. Catalog Data Slip

STANFORD UNIVERSITY LIBRARIES | CLAIM CLAIM CLAIM | DATE OF ORDER | ORDER NO.

NO COPIES

CLAIMS SECTION, ORDER DIVISION
STANFORD UNIVERSITY LIBRARIES
STANFORD, CALIFORNIA 94305 12/30/74

We have failed to receive the material indicated on the claim notica(s) attached and previously ordered on the date(s) shown. Please use the copy of the claim notice to report the status of the order and return to the above address. If an order is not in your files, please consider each claim notice as authorization to fill that order.

In the event you have already shipped the material, please disregard this claim.

Thank you.

TOTAL EST PRICE ▶ | VEND. NO | BILL IN DUPLICATE TO: ORDER DEPT - STANFORD UNIVERSITY LIBRARIES STANFORD, CALIFORNIA 94305

DEALER LEAVE BLANK ▶ | INV DATE | LP | NP | S. TX. | SP | SUL-200 (1.69)

DEALER: SEE OTHER SIDE

STANFORD UNIVERSITY LIBRARIES | CLAIM CLAIM CLAIM | DATE OF ORDER | ORDER NO.

NLC001 09/24/74 654701S1

NO COPIES 1

Tye, J. R.
Periodicals of the nineties; a checklist of literary periodicals published in the British Isles at longer than fortnightly intervals, 1890-1899, compiled by J. R. Tye. Oxford [Eng.] Oxford Bibliographical Society, 1974.
([Oxford Bibliographical Society] Occasional publication, no. 9)

ISBN:0901420107

BILL IN DUPLICATE AND SHIP TO:
Order Division
Stanford University Libraries
Stanford, CA 94305 U.S.A.

AC1FL

TOTAL EST PRICE ▶ | VEND NO STEVENS | BILL IN DUPLICATE TO: [illegible] | PO

DEALER LEAVE BLANK ▶ | INV DATE | LP | NP | S TX | SP | SUL-200 (1.69)

DEALER: SEE OTHER SIDE

Figure 8. Claim Notice

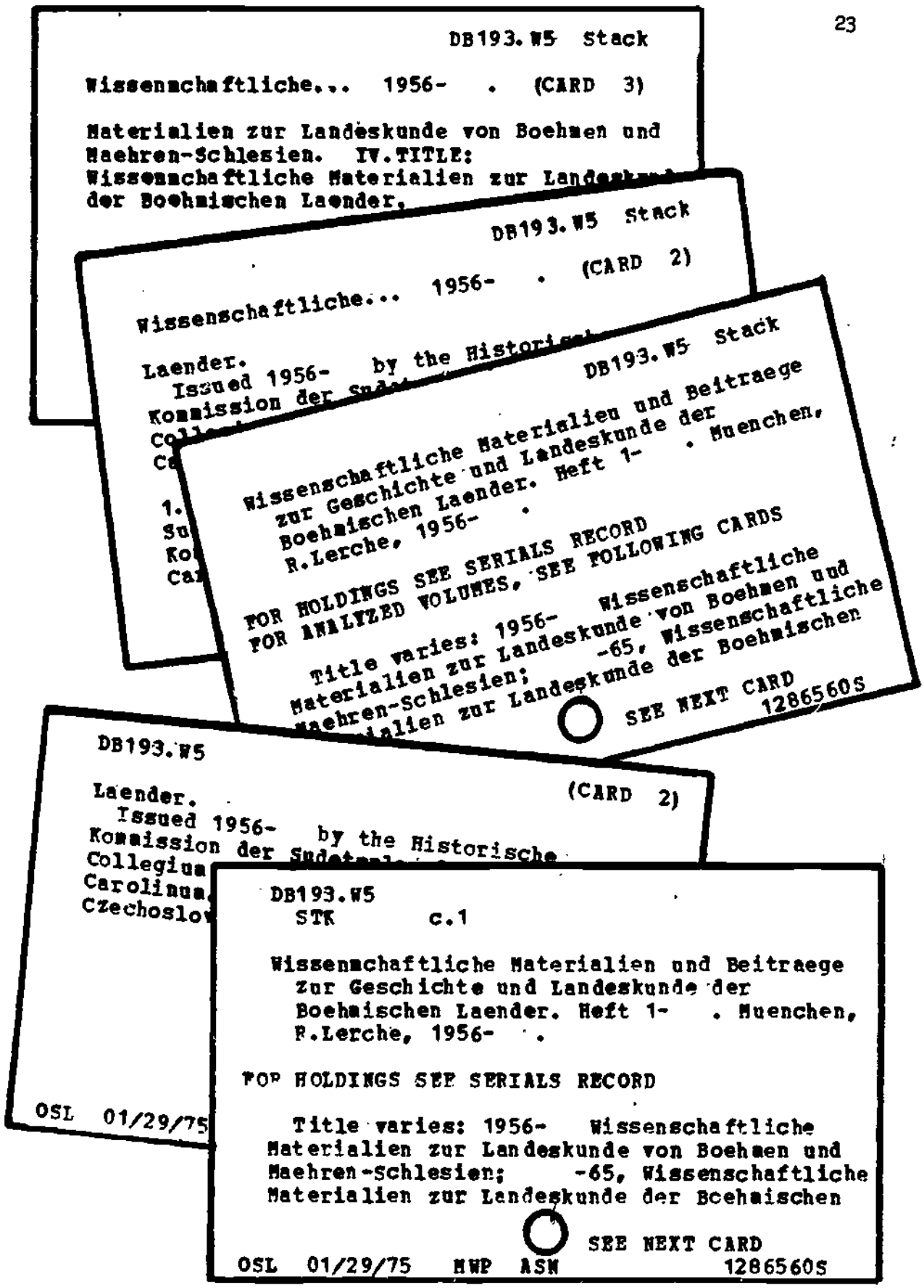

Figure 9. Catalog Cards

B. On the Inside -- From the Programmer's Standpoint

The Environment; Introduction to BALLOTS Software

The BALLOTS software was designed to operate within the hardware and software configuration sketched in Figure 10. To elaborate on this figure, the BALLOTS CRT terminals are located in the Stanford Main Library in the Acquisition and Catalog departments. These terminals are connected via twisted pair cables to a multidrop box (Stanford-built modem) that acts as a shared data set, and then to a PDP-11/40 minicomputer in the academic computing branch of the Stanford Center for Information Processing (SCIP). The PDP-11, in turn, is connected to an IBM 2701 parallel data adapter which is connected to a selector subchannel on the 360/67 computer. The 360/67 runs BALLOTS along with general time-shared and batch campus computing jobs.

BALLOTS is an on-line program that is executed by ORVYL, the time-sharing monitor developed at Stanford. ORVYL allows access (with search and update privileges) to the BALLOTS on-line files, which are stored in the ORVYL file system on CDC 23142 double-density, direct-access drives.

All record modifications, additions, and deletions within the file system and requests for printed outputs are entered on-line and queued in a temporary data set (print data queue). The daily and weekly batch programs process this data set to produce the required printed outputs as well as to update the files and their associated indexes.

The on-line program communicates with the BALLOTS terminals along a software path leading through an ORVYL I/O interface routine, MILTEN (the terminal executive), and the PDP-11 control program. MILTEN is currently able to connect simultaneously about 125 interactive terminals of various types through both an IBM 3705 and the PDP-11 front-end communications controllers.

The PDP-11 supports all the high-speed CRT display terminals. Simple display terminals such as the Tektronix 4023 are supported one to a line, while the intelligent terminals used by BALLOTS are multidropped (up to eight terminals share a line). The PDP-11 provides polling, buffering, translation, device transparency, terminal program loading, and some diagnostic capabilities. Whereas the 360/67 can interrupt the PDP-11 whenever the 360/67 has data to send, communication between the terminals and the PDP-11 is done on a polled basis. The PDP-11 repeatedly asks each terminal in turn if it has data to send. If

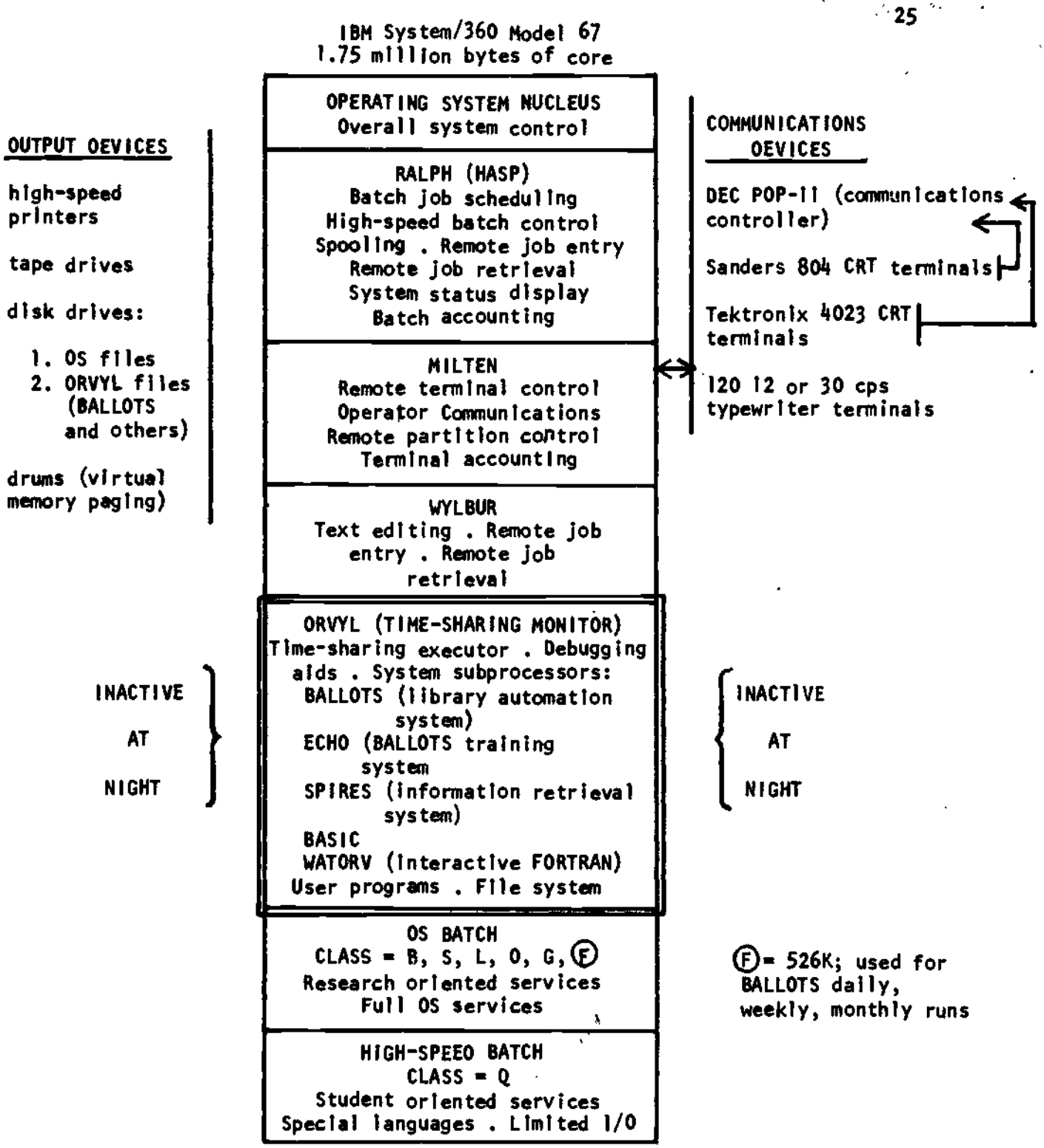

Figure 10. BALLOTS II On-line and Batch Operating Environments

a terminal is not active, the PDP-11 places it in a lower-priority status and polls it less often than the active terminals. Once the terminal becomes active, it requires the more frequent polling status. The PDP-11 buffers the transfer of data back and forth between the terminals and the 360/67. Data is transferred from the buffers in the PDP-11 directly to memory in the BALLOTS subprocessor within the time-sharing monitor on the 360/67. Therefore, unlike the support of the low-speed typewriter terminals, the PDP-11 implementation does not require buffering within MILTEN to handle the data.

The 360/67 sends and receives all data in EBCDIC character code. The PDP-11 does the translation for ASCII character code terminals. The PDP-11 also translates control codes, such as "clear screen" and "home cursor", to fit the particular needs of each terminal. This provides a degree of device transparency to the programs in the 360/67. The PDP-11 contains a copy of the program that runs in the BALLOTS programmable terminals. On request from one of those terminals, the PDP-11 can transmit a fresh copy of the program. This is necessary because the memory in the terminals does not retain the program when the power is turned off. The PDP-11 relieves the 360/67 of the core and programming requirements necessary to support all of these functions. The PDP-11 also supports rudimentary diagnostic and statistical services for the display terminal system.

The terminal used in the BALLOTS II system is the Sanders PDS 804 programmable CRT terminal. This terminal includes a microprocessor and 4,096 bytes of programmable memory that permit specific computer programs to be loaded directly into the CRT terminal. These programs control the display of data, the keying, and the communication of the data to the main computer. This terminal can display 1,920 upper- and lowercase characters on a screen, in 24 eighty-character lines. Specific functions have been assigned to certain keys (such as paging through records retrieved from a search, or paging through portions of a record display).

The IBM 360/67 computer runs under OS MFT, which permits the division of core storage into various partitions so that several types of jobs can be run at the same time. All the BALLOTS batch programs run in a partition that has a charging algorithm weighted favorably toward low CPU - high I/O computing operations. All printing is performed through RALPH, a Stanford version of HASP. The high-speed printer used is an IBM 1403 Model N1, which prints at about 350 lines per minute when the upper-lower case print chain is mounted.

The software for BALLOTS was developed over a period of two years, by adding modules of programming code to satisfy the production requirements designed by the library and BALLOTS analysis staff. Most of the software development utilized the debugging tools of the ORVYL time-sharing system (which permit the programmers to start and stop code in order to examine data storage and registers) as well as the remote job entry and text-editing facilities of WYLBUR.

The code for all the programs was written in PL360 and a modified version of Backus-Naur Form (BNF), with the exception of the MARC records conversion program (written in PL/1) and the ORVYL I/O interface routine (written in Assembler Language). Several intermediate program steps use IBM 360 utilities for sorting and printing. All the programs have been written so as to minimize code redundancy--common routines are shared as much as possible. System maintenance is facilitated by the overall design, which isolates sections of code to perform particular functions, and by the generalized nature of each section, which permits modification by parameter manipulation rather than through changes in the code itself. The total program library for all aspects of the system exceeds 75 object decks.

The BALLOTS software can be grouped into the daily, weekly, and monthly batch programs, and the on-line program mentioned above. (The execution of the batch programs is controlled by the computer operations staff with reference to the BALLOTS II Operations Manual, which contains operator instructions and procedures, job control language, and production control procedures.) Incorporated into the batch and on-line software are the interface routines that permit use of the ORVYL file system. BALLOTS file records are retrieved and updated by modified file management routines selected from SPIRES software. SPIRES--the Stanford Public Information REtrieval System--is a generalized information storage and retrieval system originally developed as a sister project to BALLOTS.

The following sections describe the major portions of the software.

The BALLOTS File Structure

The BALLOTS file system comprises 13 individual files containing over 300 unique data elements (standardized units of information). The reading, formatted display, and manipulation of these units of data are accomplished by BALLOTS programs. The definition of the files and their maintenance, under the ORVYL time-sharing system, is done through the SPIRES file definition language and file services software.

The SPIRES file definition language enables one to define files and associated data elements by specifying sets of simple parameters. Compiling these parameters generates the files, directories, and characteristics needed for maintenance and manipulation. Processing rules are included in the definition, to be applied to individual elements within the file at time of input, output, or interface with other data sets.

Within certain limitations, SPIRES permits the modification or complete change of files as requirements are expanded or problems occur. As the system develops and new files and services are added, additional data structures can be added to modify the files without reconstructing the files or otherwise sacrificing work already done on them. The use of this independent software system to develop and maintain the BALLOTS files has proved to be a valuable approach.

The BALLOTS design involves several interdependent modules. The file system was developed and test records with new data elements or structures were added via SPIRES software. Parts of a module could be tested with these existing files before all the necessary routines were ready. For example, the catalog card print program in the second module required that a certain data element be in upper case. This could be accomplished in SPIRES and the program tested, without waiting for the BALLOTS on-line routine that produced that data element to be completed. The BALLOTS files underwent many iterations through the days before scheduled implementation; they could be redefined, compiled, and rebuilt with a nucleus of test records within a few hours, and with minimum impact on program testing.

The SPIRES files design also provides BALLOTS with an effective file security measure. All on-line activity (item processing done by library staff at video terminals during the day) is queued in a temporary data set (the "deferred queue data set") that is not used to update the files until all on-line users are off the system and the data set has itself been dumped to a back-up tape. During the day, when a user is trying to access a record that has already been changed or created that same day, SPIRES software presents the user with the changed version of the record from this deferred queue data set. Although the files have not yet been actually updated, they appear updated to the user. If any problems occur in printing the overnight batch outputs, recovery procedures are available that use the back-up tape dumps.

Figure 11 is a diagram of the BALLOTS data files that shows the hierarchy of their use by BALLOTS and SPIRES programs. The two main BALLOTS files (shown in Figure 11) are the MRC File, which contains records from the Library of Congress MARC service,

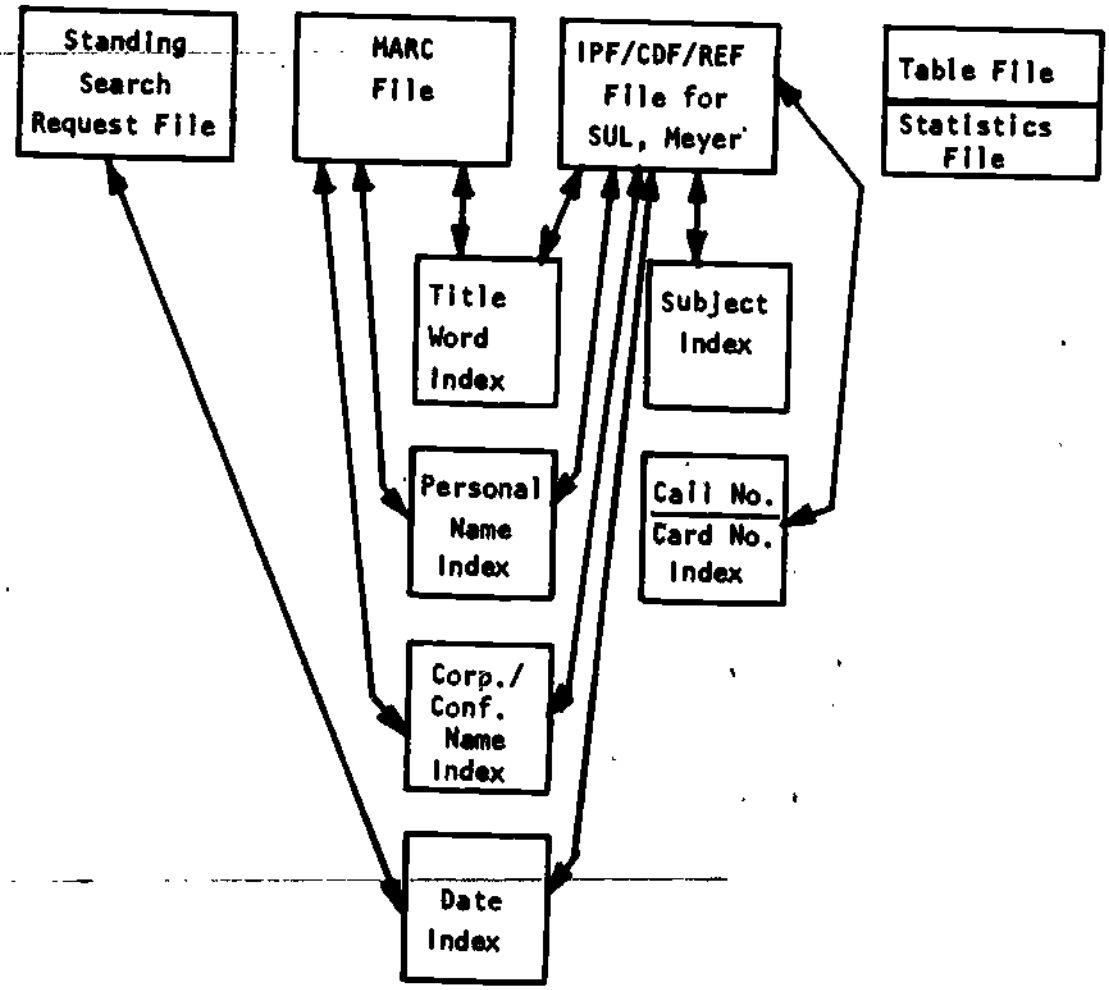

Figure 11. BALLOTS Files

and the In Process - Catalog Data - Reference File (IPF/CDF/REF), which contains records for Stanford University Libraries and for the Meyer Undergraduate Library. This latter file is physically one file within the system, but under SPIRES and with the associated indexes it is logically treated as six separate files. It is updated daily by activity in the Stanford Library's Acquisition and Catalog departments. A nucleus of 80,000 Meyer Library records is also being added to this file (see the inventory file conversion described below). Bibliographic records are added to the MRC File every week from tapes provided by the Library of Congress.

There are four common indexes linked to both these files: Personal Name, Corporate/Conference Name Word, Title Word, and Date. [Date is an action index used for monitoring activity on the various files. For MRC records, the Date Index contains the date the record entered the BALLOTS files. For the IPF/CDF/REF File, the date indicates: (a) when a record is due to be claimed or canceled; (b) in the case of Meyer records, when the record was last updated. For the BSSR File, the date indicates when the record is due to be removed from the file. On-line users do not use this index.] In addition to these shared indexes, the IPF/CDF portion of the second file is indexed by the LC Card Number. (This is not necessary in the MRC File, since the record's LC card number has been declared as the record identification number, or key, and is automatically indexed when the record is added to the file.) The CDF portion of the second file is further indexed by the Stanford University Libraries assigned Call Number and Subject, and the REF portion is also indexed by the Subject.

How Records are Accessed

The MRC and IPF/CDF/REF files are organized to correspond as closely as possible to the organization of the data elements displayed on each screen format, as well as to keep the data belonging to a particular file together. To illustrste this, Figure 12 depicts the Bibliographic Input (BI1) screen format and then gives the part of the BALLOTS file definition that defines the BI1 structure.

Each record added to the MRC or IPF/CDF/REF File is assigned a unique block address within the ORVYL files by the SPIRES file services. (These "file services" are a set of SPIRES software routines used extensively by BALLOTS in building and accessing its file records and their indexes.) It is this block address that is passed to the various indexes and is used during searching. By way of example, one can trace the path of a simple

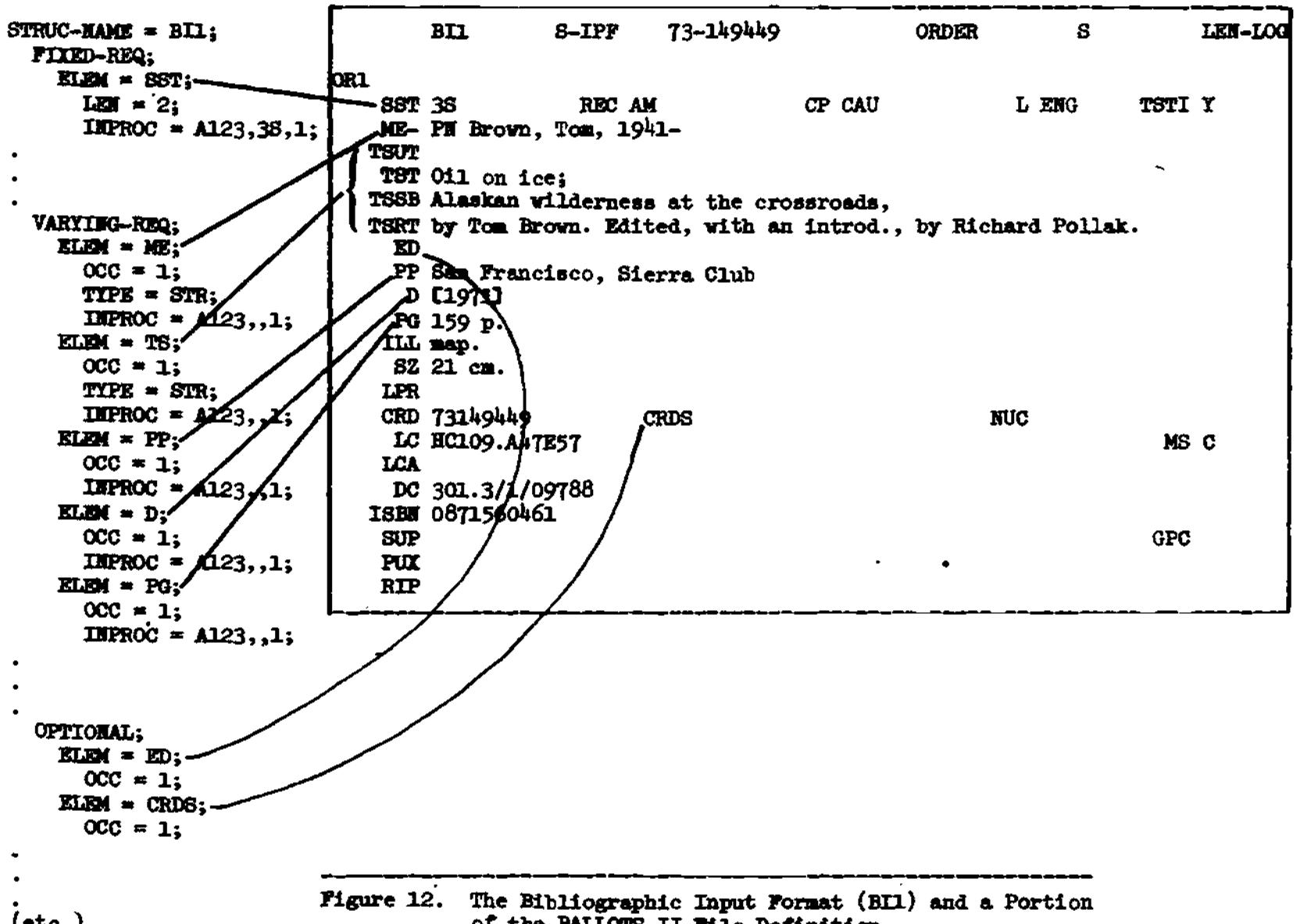

Figure 12. The Bibliographic Input Format (BI1) and a Portion of the BALLOTS II File Definition

IPF/CDF/REF record. Each data element of a record is identified by a BALLOTS mnemonic, e.g.:

Mnemonic	Full Data Element Name
MEPN	Main Entry Personal Name
TST	Title Statement
OACA	Other Added Entry-Corporate Author
SASU	Subject Added Entry-Topical Subject
CRD	Library of Congress Card Number
CAL	Call Number.
RCDM	Record Mask--i.e., logical file (IPF and/or CDF or REF) and library (Stanford or Meyer)

A simple record looks like this:

MEPN = Roth, Norman;
TST = The Great American Novel;
OACA = Stanford University;
CRD = 1234567
CAL = MN452.Q7
RCDM = IPF-CDF for Meyer Library (NOTE: the actual value of RCDM is an internally controlled field of one byte; the above value appears as 11000001 The two high order bits indicate (a) IPF and (b) CDF. The low order bit indicates the Meyer Library.)

When a record is added to the file, SPIRES file services routines find an available block, e.g., 17438, and store the entire record at that address. They then begin to build the indexes for this record by using the rules specified in the file definition.

To the Personal Name Index they pass the value of the MEPN field. The last name only is the main node, and the remainder of the name is a secondary value within that node. Thus, "Roth, Norman" will be passed to the PN Index along with the block pointer value qualified by the RCDM value. The index will look like this:

Node = ROTH
Remainder = NORMAN
Pointer = 17438RCDM

The index values are converted to upper case before they are stored in the indexes. Subsequent searches may be entered in upper or lower case; they are converted to upper case before the indexes are searched by the system.

If at some future time other records by this same author are added, the index will be expanded to look like this:

```
Node = ROTH
Remainder = NORMAN
Pointer = 17438RCDM
Pointer = 16295RCDM
Pointer = 14387RCDM
```

If another Roth (e.g., Roth, Philip) is added, the index will look like this:

```
Node = ROTH
Remainder = NORMAN
Pointer = 17438RCDM
Pointer = 16295RCDM
Pointer = 14387RCDM
Remainder = PHILIP
Pointer = 13842RCDM
```

The value of the TST field is passed to the Title Word Index. Each word of this field should become a new index node or be added as a new record pointer to an existing node. Therefore, the Title Index will receive three nodes, "GREAT", "AMERICAN", and "NOVEL" as well as the pointer value and the RCDM qualification. The title word "THE" is part of an indexing exclusion word list in the BALLOTS file definition; the system will not index any of the words ("the", "an", "a", and other very common words) in this exclusion list.

```
Node = GREAT
Pointer = 17438RCDM
Node = AMERICAN
Pointer = 17438RCDM
Node = NOVEL
Pointer = 17438RCDM
```

This process continues for all the indexes in the file system.

When a user keys the search "find a roth, norman", the SPIRES file services will look in the PN Index to find the node ROTH. It then looks within this node for the secondary value NORMAN. It finds three unique pointer values. But if the user

is looking for only Meyer CDF records by Roth, file services will examine each RCDM qualifier to determine which of the pointer values is qualified in this way. The result is two and this result is displayed to the user: "RESULT: 2 BOOKS." Internally, the pointer values are saved in a temporary work stack waiting for additional searches to be added.

If the user then adds to his search "and t GREAT", SPIRES file services will then go to the Title Index and look for the node "GREAT". Under this node the pointer is extracted and compared with the first result stack. Only the results containing this pointer are retained. The only record that is indexed for both "ROTH, NORMAN" and "GREAT" is at block 17438, so the system displays the message "RESULT: 1 BOOK." When the user issues the command "display", SPIRES file services go to the physical location in block 17438, retrieve, and display the record. In BALLOTS, if the result is only one book, the system automatically displays the record without waiting for an explicit user command to do so.

BALLOTS MRC File Building

Each week BALLOTS receives from the Library of Congress a tape of machine-readable cataloging records (MARC). It is necessary to convert this tape from MARC format to internal BALLOTS format, and from ASCII to EBCDIC, before adding the records to the file. In the process, the BALLOTS MARC conversion program eliminates all the MARC records that fall outside the scope of of the Stanford collection (e.g., juvenile literature.) [This exclusion will cease after February 1, 1975.]

After all the records have been converted, they are analyzed by the BALLOTS file check program to determine the type of transaction and whether or not they are already in the BALLOTS file. Because the BALLOTS MRC File is not complete (building was begun in May 1972 with the January 1972 MARC tape), and because an update (correction) record will fail in the SPIRES overnight processor if there is no existing record in the MRC File, the file check program examines all updates and changes them to additions if it finds no existing records. Thus, all the MARC correction records present are used either to supplant the existing BALLOTS MRC File records for the same title, or to create new ones. The file check program also examines all records to be deleted and suppresses them if it finds no existing records. All changes to the MRC File are made then by the SPIRES overnight processor.

The SPIRES Overnight Batch Processor

The SPIRES overnight processor processes the records accumulated each day in a data set (the combined deferred and print data queue explained below) created through on-line activity by BALLOTS system users. According to the contents of this data set, the processor adds, deletes, and changes records in the permanent BALLOTS files and their associated indexes. It accomplishes this by applying rules from the linkage section of the BALLOTS file definition that specify how the data elements in each record relate to the various indexes. For instance, from the file definition the processor knows that all occurrences of the MEPN, OAPN, and SAPN data elements should be indexed in the Personal Name index, whereas all occurrences of the MECF, OACF, and SECF data elements should be indexed in the Conference Name index. This enables the processor to index each new record correctly. The processor goes through a similar sequence when deleting an old record plus all its index references. In re-indexing changed data element values for an already existing record, the processor builds the index entries for the record as it was before it was modified, then builds the index entries for the record as it is after modification, and then compares the two sets of entries, deleting the older entries and replacing them with the new ones wherever it finds a difference. As a final step, after all record processing has been completed, the overnight processor re-initializes the data set so that it is empty and ready to receive the on-line activity of the coming day.

The overnight processor is also used as the final step of MARC conversion and file building. It processes the MARC records after they have been checked by the file check program, performing all additions, deletions, and changes and updating indexes in the manner just described.

The overnight processor also has a checkpoint restart capability. Periodically, as it is processing the day's deferred queue records, it writes out to a checkpoint data set the point it has reached in record building and indexing. Then, if for any reason the program must be restarted, it can skip to the last checkpoint recorded and proceed from there, rather than repeating processing already accomplished. Because of the computing time needed to build indexes, this is a valuable feature.

File Utilities

The BALLOTS system uses several file utilities provided by the ORVYL time-sharing system and the SPIRES information storage and retrieval system. These utilities are used for file backup and for gathering statistics regarding file usage and structure.

The utilities are run at varying intervals at night, when ORVYL is inactive (midnight to 8:30 am). Like most of the BALLOTS batch programs, the file utilities cannot presently be run when the ORVYL time-sharing system is running. This is because the ORVYL time-sharing system, in use during the day, does not provide access to tape drives and other facilities of the 360/67; the VAM ("virtual access method") system that is used to provide batch programs with access to the ORVYL files in conjunction with access to the tape drives, etc., cannot be run concurrently with ORVYL.

The first utility is used to dump the BALLOTS deferred queue data set to tape. This utility is run each evening prior to running any other BALLOTS jobs. In dumping the deferred queue, the program preserves all the changes to the files and all the requests for printed outputs made since a batch files update was last run. The saved deferred queue may be restored in the event of any error or damage to the deferred queue during subsequent batch processing, or if a reprint or recreation of the printed outputs is required for some reason after the SPIRES overnight processor has performed the batch update. The saved deferred queue is kept for possible future use in a full files restoration procedure.

The second utility used by BALLOTS is the full file dump. This utility is run once each five weeks and dumps all files to tape. This tape can then be used for later restoration in the event of catastrophe.

The third utility program used by BALLOTS is the partial dump program. This program is run each week and dumps to tape all the physical file blocks that have been altered since the last full dump was run. Because of the size of the files, only a portion of the records are altered in any period of time, and running the partial dump each week rather than the full dump results in substantial cost savings.

The dumps provided by the three preceding utilities are used in conjunction, whenever a file disaster occurs, to restore the BALLOTS files. The restoration procedure involves several steps. The first step is to restore each file using the tape generated by the last full dump. This leaves the file in the condition it was in when that full dump was taken, which may be up to five weeks prior to the restoration. Next, the tape generated by the last partial dump is used to rewrite those records that have been modified between the time of the last full dump and the time of the last partial dump. The files have then been updated to within a week of the time of the restoration. Finally, each of the deferred queues that have been created since the last partial dump are restored in chronological order, and the SPIRES overnight processor is run after each of these deferred queue restorations.

The file is thus restored to its condition at the time loss or damage occurred.

The final utility used by BALLOTS is a SFIRES statistics routine. This routine is run bimonthly* to determine the allocation of space within the files, as well as to count the number of records added, deleted, or modified. The statistics program also provides information about the efficiency of the structure of the files and any index nodes that have grown too large to be contained within one physical block. Unlike the other utility programs, the statistics program may be run on-line, since it doesn't require access to batch facilities (although as a general practice it is run in batch).

The On-line System

The BALLOTS on-line system provides a user interface to the BALLOTS files and output-generating routines. Using the on-line system, the user can search for, display, build, and update records, enter standing search requests, and request printed outputs. The on-line program provides access to the files; it also edits for correctness data that is entered or altered.

The BALLOTS on-line program runs under the ORVYL time-sharing system and uses the MILTEN terminal interface program for terminal communications. The ORVYL time-sharing system provides a virtual memory environment as well as a secure file system. BALLOTS runs as a "subprocessor" under ORVYL; this means that the program code is re-entrant and that only one copy of any page of code is in physical memory at any time; this copy may be shared by all of BALLOTS' users.

All operating system requests, including all I/O requests, are handled by calling the ORVYL interface routine, ORVINTF, which issues the proper SVC (supervisor call) instruction for requesting services from ORVYL. Thus, the BALLOTS on-line code is dependent on Stanford software only through the ORVYL interface routine.

BALLOTS attempts to optimize usage of core storage in several ways. First, the subprocessor code is all shareable; only one copy is needed, no matter how many users are logged on. Second, work space for each user is allocated only as needed, and is released back to ORVYL as soon as possible. Since ORVYL runs in a virtual environment, core thus released is available for use

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*This will change to monthly on February 1, 1975.

by other users. Each BALLOTS user who is logged on does have a minimum fixed amount of core that is always allocated to him; it contains communication areas for the various BALLOTS routines.

The BALLOTS subprocessor contains substantial amounts of software taken from the SPIRES retrieval system. This code is used for searching the data base as well as for updating and decoding records. Much of the software has been modified slightly to provide for the special needs of BALLOTS. The ORVYL interface mentioned above is an example. In addition, BALLOTS has developed a special routine called GETDE that is used to access individual data elements within a record retrieved by SPIRES code. This routine manages the interface with the SPIRES routines to retrieve an individual data element. Another major modification was made to the routine UCSEM, which controls the updating of records. The routine has been totally rewritten to provide the update facilities required by BALLOTS. Like GETDE, this routine provides the major interface to a set of SPIRES routines, but in this case they are the SPIRES update routines.

The BALLOTS subprocessor consists of numerous routines. Figure 13 is an extremely simplified diagram of these. For purposes of examination, these routines can be grouped under three major functions.

The first group contains the control routines. It includes the ORVYL interface routine, the SPIRES software, and the code used for: searching, record creation and updating, and the processing of most commands. (The commands themselves are named and summarized in Figure 5.) BALLOTS command interpretation uses a parsing routine and a table generated from a language similar to Backus-Naur Form for parsing commands. The parsing routine makes calls on other routines as indicated by the table. These routines then perform the required operations or save information for later use.

The second group contains the format routines. They are called by a control routine to create the various display and input screen formats used by BALLOTS. They also process some of the commands that deal with obtaining screen formats. To perform screen formatting, BALLOTS uses the same parsing mechanism that is used for command interpretation, this time to read tables that provide the directions for screen formatting. The routines that are called from the parsing routine are responsible for obtaining data elements from the record via GETDE and using them to create the appropriate format on the CRT screen. In addition, the format routines build tables for eventual use by the update routines.

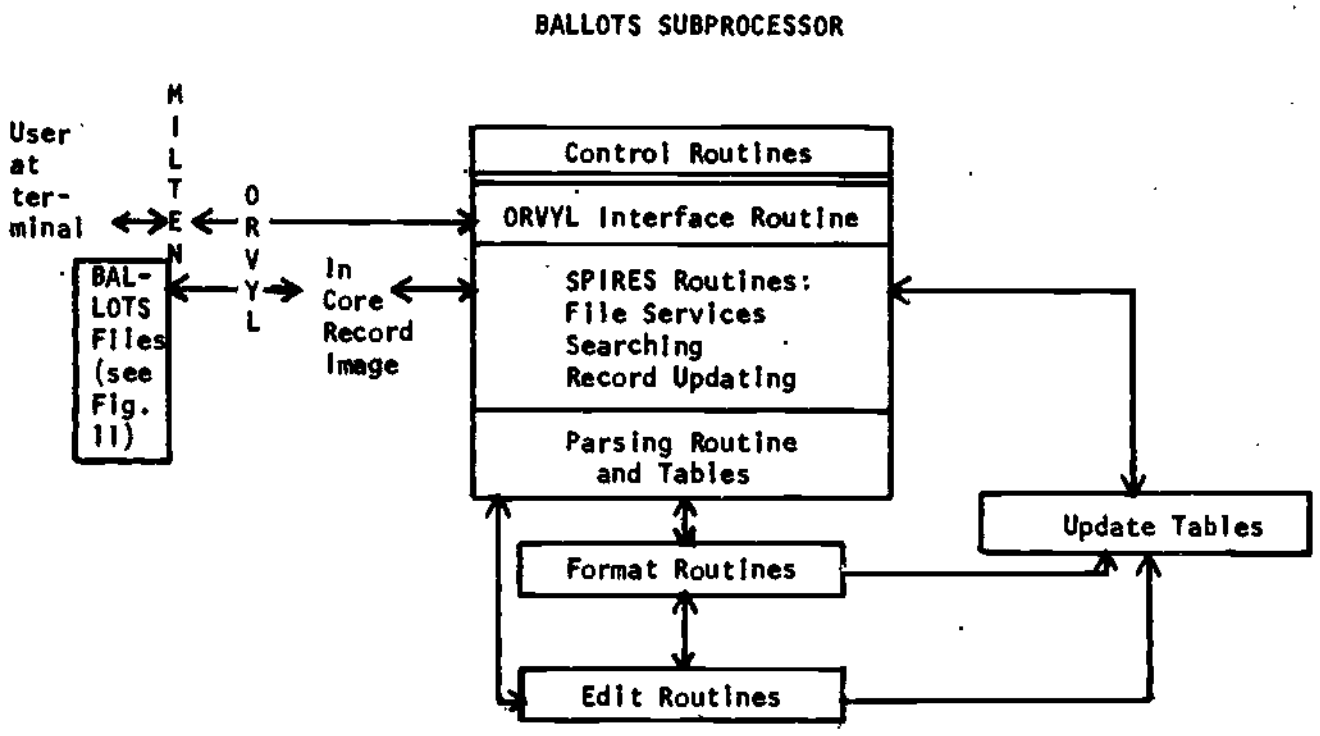

Figure 13. BALLOTS II On-line Program

The final major group in the BALLOTS subprocessor are the edit routines. These examine data elements as they are input on various input formats, to ensure that the data input by the user is correct and consistent. These routines are called repeatedly from a format routine as data is entered, one screen at a time, by the user. (They are called for each data element on the format or screen as well as once for the format as a whole, as a wrap-up.) They display error codes to the user in appropriate positions on the format and indicate to a format routine that a retransmission of the format is required for error correction. Figure 14 shows what the BI1 format used in Figure 12 would look like if the user had input incorrect data. Finally, a special set of routines within the edit group is used for building the various item and holding structures within the record that contain information about specific copies, volumes, reels, or films.

The Daily Batch Programs

During the day, all the transactions processed by the library are queued in a temporary data set called the deferred queue that is part of the BALLOTS file system. This deferred queue includes updates and additions to the various files, as well as the print data queue (PDQ) records. These PDQ records contain the information necessary to print the purchase orders, claims, cancellations, file and catalog data slips, catalog cards, spine labels, requester notices, and search and quote notices. (For a complete itemization of BALLOTS printed outputs, see Figure 6). This activity is accomplished by a series of programs collectively referred to as "daily batch".

The first of these programs is the utility dump that saves on tape a copy of the above mentioned temporary data set. (This is the first of the file utilities described above.) BALLOTS also prints, in external SPIRES format, the contents of the PDQ records, to be used as a record of daily activity for error correction and historical reference.

The main program of the daily batch series is the batch format program. Figure 15 diagrams this program. It comprises a driver routine and subsidiary format routines. The driver determines which output format is needed for the PDQ record and calls the appropriate format routine. Each routine constructs the sorting keys as well as formatting the data for printing.

The outputs are then sorted, using the IBM standard sort utility, and several small programs are applied to strip the sort keys and direct the record to the printer. The IBM utility IEBPTPCH is used to print the catalog cards and purchase orders.

```
      BIl       S-IPF    73-149449          ORDER        S          LEN-LOG


03  ME- Brown, Tom, 1941-
    TST Oil on ice;
   TSSB Alaskan wilderness at the crossroads,
   TSRT by Tom Brown. Edited, with an introd., by Richard Pollak.
     ED
     PP San Francisco, Sierra Club
      D [1971]
     PG 159 p.
    ILL map.
     SZ 21 cm.
    LPR
    CRD 73149449         CRDS                    NUC
     LC HC109.A47E57                                        MS C
    LCA
     DC 301.3/1/09788
40 ISBN 087L560461
    SUP                                                     GPC
    PUX
    RIP
```

03 = INVALID MNEMONIC (i.e., incomplete without "PN" added; MEPN is the mnemonic tag for Main Entry Personal Name)

40 = ERROR IN ISBN NUMBER

Figure 14. The Bibliographic Input Format (BIl) with Error Codes Displayed

The file slips and catalog data slips are printed by a BALLOTS program. A spine labels data set is stored for subsequent printing on a library terminal.

Throughout this process there are several data checkpoints; in the two years of BALLOTS operation, no data has been lost because of computer failure.

As a final step in the daily batch, the daily deferred queue is processed by the SPIRES overnight processor, which updates the main files and their associated indexes. The deferred queue is then initialized for the next day's processing.

An additional daily job is run as needed to print all the commands that were entered into the on-line system during the previous day. This monitoring capability is called the System Log and is employed during user training periods or during the installation of a new version of the production system. Commands are logged only when the user (the terminal operator) instructs the program to do so.

The Automatic Claiming and Canceling Weekly Batch Program

The Automatic Claiming and Canceling (ACC) module added to BALLOTS a program that is run once a week to examine the status of all records in the In Process File that represent incompletely filled orders. When a user enters a record in the In Process File, he determines an appropriate claim period. The period depends on the type of material he is ordering; it can be any number of months from one to ninety-nine. He enters the number of months in the Claim Type data element (CLT) field on the Order Input screen format. The system calculates a date that is the date of entry plus the designated number of months. This date is then indexed in the Date Index. It indicates when the record should be reviewed, either to claim the item or to cancel the order for it. The ACC program reads the Date Index to determine which records are subject to action. It prints the appropriate claim or cancel form and sorts the output by vendor. The program then automatically updates the record to reflect the action just taken and sets the date and nature of the next action to follow. This cycle is repeated (unless the Acquisition Department intervenes in a way to perturb the cycle) for two claims and then a cancellation, at which time the In Process File portion of the record is purged from the file. The Acquisition Department may, through on-line activity, reset the claim period, the claim date, or the notice to be printed (i.e., first claim or second claim). In addition, the Department may at any time force a claim or cancellation notice to be issued before the usual cycle would produce one.

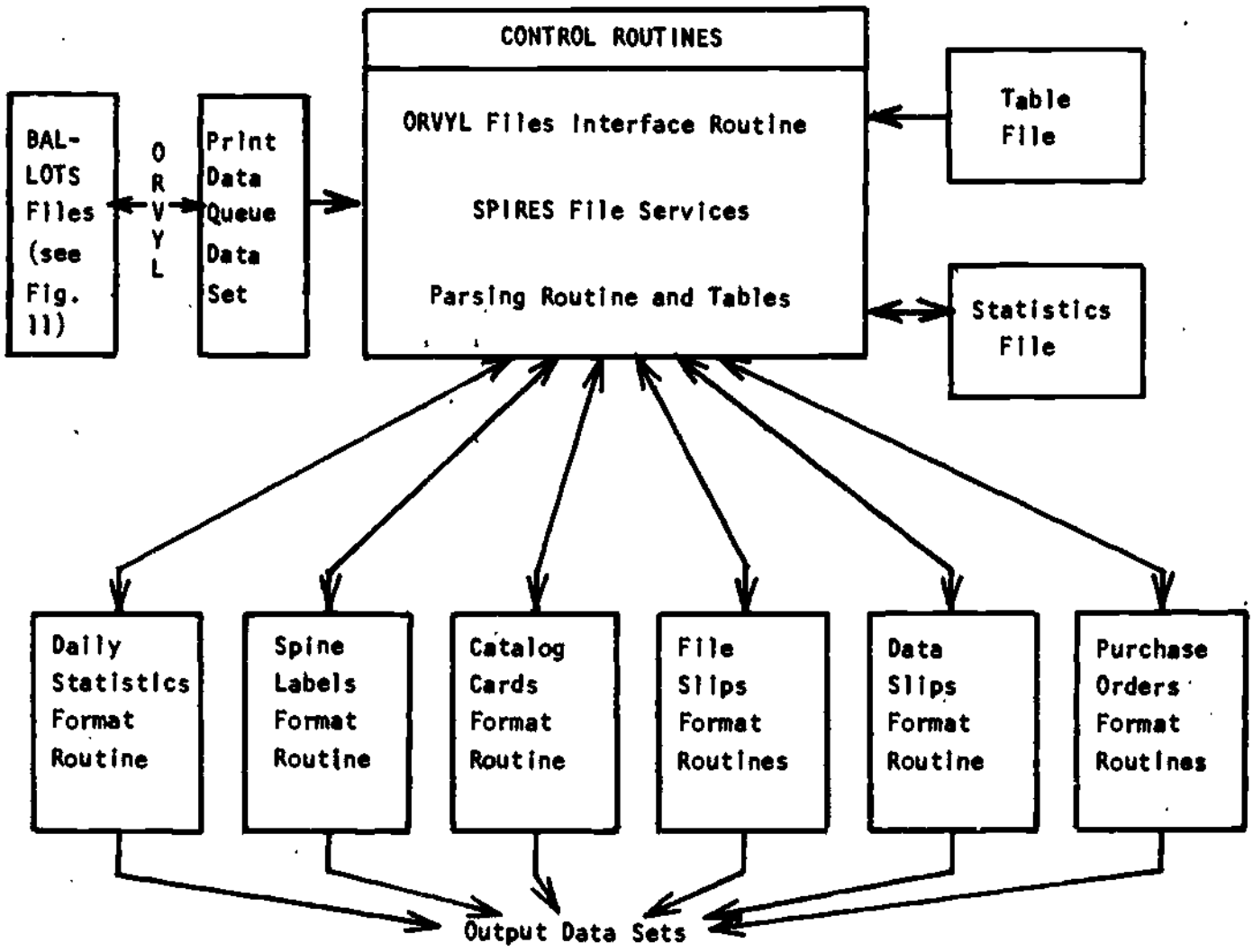

Figure 15. BALLOTS II Daily Batch Format Program

The Standing Search Request Report Program

Automatically repeated searches against the MRC File are made biweekly by the Standing Search Request Report Program, which is run after the MRC File has been updated with new records. The program extracts each search request in the Standing Search Request File (BSSR) and applies it against the MRC File in precisely the same way the search was administered on-line before it was stored in the BSSR File. At the conclusion of a successful search, standing search reports are formatted for each record found; these include the search request and all the bibliographic data in the records found to match it--unless more than five records are found, whereupon only the search request and the Library of Congress card numbers of the matching records are listed. If only one record is located, the standing search request is deleted from the BSSR File. The reports are sorted by the shelving I.D. of the volume being held for MARC cataloging and printed on 3 by 5 inch forms.

The Action Date Purge Program

When a MRC record or a BSSR record is added to its respective file, an action date is calculated and stored with a block pointer to the record in the Date Index. In the case of BSSR records, a purge date is determined from a retention date (in months) supplied by the searcher or by rules dependent on the technical processing function in effect. Monthly, a Standing Search Purge Program deletes all records from the BSSR File whose purge date does not exceed the current date.

The action date established for each MRC record is its creation date. The purge program can delete all MRC records with creation dates one year older than the current date; this program has not been executed owing to the cost of removing all index entries stored for each MRC record. A SPIRES utility capability is being developed to delete large numbers of records from BALLOTS files at a lower cost.

Inventory File Conversion and the Meyer Book Catalog

In December 1966, the Meyer Undergraduate Library began publishing its book catalog. This was accomplished through an automated system developed and maintained by SCIP Administrative Computing Services programmers, and has been in production for eight years. The resulting tape data base currently contains over 80,000 records. BALLOTS II's task as specified in the Addendum to the Proposal (see Appendix A) was to make these records available through the BALLOTS on-line files and to support Meyer cataloging through BALLOTS.

Each Meyer record was analyzed and converted to BALLOTS format. This involved expanding and renaming the existing bibliographic data elements to make them uniquely identifiable BALLOTS data elements.

The converted records were then printed, so that they might be manually edited over a period of time for any inaccuracies in the conversion algorithm. It is estimated that less than 10 percent will need special correction. The records were then added to the CDF portion of the BALLOTS files using the SPIRES overnight processor and the various indexes were built. This final step will be completed by the end of February 1975.

In addition to enhancing the BALLOTS files by adding a valuable undergraduate collection, the conversion permitted the library staff to review their entire data base, which was not as easily accomplished with the tape system.

After careful consideration, it was decided that BALLOTS would not attempt to write a book catalog production program that would use records directly from the BALLOTS II Catalog Data File. Rather, BALLOTS will "reconvert" the records in the Meyer portion of the Catalog Data/Reference File so that the results can be used with the already existing Administrative Computing Services book catalog production program. The Date Index will be searched to locate the Meyer records that have been added or updated since the book catalog was last produced. These records will be extracted from the BALLOTS files and changed to a format that can be used by the book catalog system to change or update records in its tape data base. These changes will then be printed in the quarterly supplement or the triennial publication of the book catalog.

III. THE IMPACT OF THE PROJECT

A. A Statement from the Stanford University Libraries

From the Director of Stanford Libraries

For the library system as a whole, the two years under this grant have been ones of achievement, substantial change, and great promise for the continued effectiveness of this university library system. Staff members in many departments besides the Acquisition and Catalog departments contributed time and effort that was not always easy to spare from the press of normal business. Representatives of the independently administered libraries at Stanford have participated throughout the BALLOTS development. Their participation has been valuable and particularly important since the system was developed for eventual use by all the libraries at Stanford as well as by other libraries in the state and region.

The library's operational environment has changed by stages, very rapidly during the calendar year 1974. The year ended with terminals being located in two public departments of the library: in the General Reference Department of the Main Library and at the Reference Desk of the J. Henry Meyer Memorial Library, which provides special support for undergraduate instruction. In the Meyer reference area, the printed book catalog has been moved to a low-use area, since its contents can now be accessed on-line at the new terminal. This is only the beginning of public use of terminals to access BALLOTS files; it will be a challenge in the year ahead to see how best to take advantage of this new facility while using it carefully so that expenditures are kept to a reasonable minimum. The prospect of faculty and students conducting their own keyboard searches is one that will need study; but it seems certain to be the eventual pattern for those who have taken a short course in the search language. Several hundred faculty and students who search the public SPIRES files, which include BALLOTS bibliographic files, have already done so.

One of the most significant impacts of automation on personnel work has been the changing approach to assigning work and revising catalog copy. This and the changing relationship among the technical processing departments to each other are the subject of more detailed comments that follow.

-- David C. Weber

The Acquisition Department

When BALLOTS was in the design stage, the Acquisition Department was promised a system that would, to a large extent, eliminate conventional paper files for controlling books in process. Stanford's paper file had but a single access point--a general hindrance to searching. In this regard, BALLOTS was

eminently successful. The bibliographical searchers and the receiving, claiming, and canceling personnel no longer maintain any manual files of order steps. The variety of access to BALLOTS files has added to the efficiency of the search process and has significantly reduced repetitive, error-prone typing of data. Additionally, typing orders and interfiling order slips are tasks that are no longer required; orders, requester notices, etc. are now generated by the computer. Claims and cancellations to vendors are now machine-generated (largely automatically). BALLOTS automatic claim support has increased the service that can now be offered to requesters, by ensuring timely, regular claims for materials. All of this translates into a staff saving of six positions or 33 percent of the Order Division.

Since BALLOTS was first implemented in late 1972, everyone in the Order and Gift and Exchange divisions has been fully trained in the system. People in the Serials and Binding and Finishing divisions have been trained as required. Although the rate of learning varied, no one failed to master the use of BALLOTS.

Work processes have changed since BALLOTS became operational. A limited number of available CRT terminals has necessitated scheduling terminal use and thus the batching of tasks. The decision was made to broaden searchers' duties; where they were formerly restricted to "African" or "Science" searching, these narrow specialities can now be eliminated in favor of a general list of duties. Searchers now make many more decisions (e.g., selecting vendors)--a necessity in interacting with the on-line system. Also, searchers now assume some responsibilities for claims and cancellations.

Although ordering and receiving backlogs have essentially been eliminated, there are new challenges for library administrators who must manage formerly manual departments that are now almost totally integrated with the BALLOTS services. First, the distinctions between acquisition and cataloging have blurred and a departmental procedural integration is now underway. The Acquisition Department will certainly arrive at nothing less than processing certain types of materials at time of receipt and producing catalog cards and spine labels. Such materials may then by-pass the Catalog Department and go from the receiver to the Binding and Finishing Division for stamping and labeling.

A second challenge is the value that staff place on their services once they are fully trained in the BALLOTS system. A significant learning process is required to master the BALLOTS acquisition functions; but does such learning significantly alter the personnel classification and pay of a bibliographical searcher? This is a question that has not yet been fully resolved.

-- Ralph Hansen

The Catalog Department

In the past year, the Catalog Department has evolved from technical services based on manual procedures plus some automation support, to an automated technical processing operation with some residual manual support. All staff members have been trained to use the BALLOTS system in some capacity and every functional unit utilizes the system in its daily work.

In 1973-74, the production level increased 3 percent over the previous year and the arrears were reduced by 5.7 percent. These advances were made despite a 5.6 percent reduction in the effective work force for the entire reporting period. BALLOTS was a major factor in the increased productivity of the Department. With the implementation of each module, production dropped during the periods of acceptance testing and staff training. Following a month of adjustment, there was a steady increase in production until implementation of the next module.

As of December 1974, approximately 80 percent of all titles cataloged were cataloged through BALLOTS (includes original cataloging and copy processing). Of all added copies processed, 33 percent were processed through BALLOTS and 46 percent of the added volumes were BALLOTS processed. By early 1975, BALLOTS should process an expected 90 to 95 percent of all titles handled by the Department. Much manual processing was still necessary when the Department began using the first module (BALLOTS-MARC), but with the accumulated capabilities of successive modules the only categories currently processed manually are manuscript collections, sheet maps, and non-romanized languages.*

Card preparation functions have been most affected by BALLOTS. Card duplication, heading typing, card set preparation, and card arranging were major activities in the manual system. These functions have been nearly eliminated, producing a positive offset of 5.5 FTE. The small amount of residual card duplication has been transferred to the Photoduplication Division, relieving the Catalog Department of all card duplication. Mainly as a result of BALLOTS card production capability, fourteen typewriters were released from the Department for use elsewhere in the library.

Involvement in BALLOTS development, testing, and training was a time-consuming but essential activity for several key members of the Department. Work with BALLOTS staff in the

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*The BALLOTS II system does have the facilities for processing manuscripts and maps, although the Catalog Department does not presently use them.

development effort on each module, review of system specifications, development of training materials, acceptance testing, and hands-on training had a considerable impact on the work and availability of these key staff members. Several staff members were involved full-time and several others part-time for one to two months with each module that had a major effect on cataloging procedures.

Work patterns have changed as a result of on-line bibliographic processing. Access to the terminals is scheduled for staff throughout the day. This scheduled access requires that work be batched and well-organized before a staff member comes to the terminal, and it affects each staff member's sequencing of preparatory work and other departmental activities.

Catalogers have the option of keying in their original cataloging or giving worksheets to support staff for input. When keying, the cataloger can use the on-line files as a cataloging aid, like the public catalogs or the shelf list. Faced with the question of how to handle revision of catalog copy before BALLOTS printed catalog cards, the library did a study of the results of this revision procedure. They found that the number of errors caught this way was so insignificant that it was decided to drop the revision cycle. Presently, twice a year each cataloger's work for one week is checked instead.

Differences in file organization between manual and machine systems have forced a re-examination of reference structure and search strategies. The card catalog brings files together through a reference structure. Machine file indexes are structured in such a way that files are split. The differences in required reference structure and search strategy between the two types of files have made it necessary to train and reorient the staff in establishing references and using the machine-based files effectively.

Several other areas affected by BALLOTS are discussed below, though the list is by no means exhaustive:

1. Titles with MARC copy -- are processed earlier in the flow of work, reducing the handling and the processing time lag. A procedure will soon be initiated to process these books in the Acquisition Department receipt function. The books will then bypass the Catalog Department and go directly to End Processing.

2. BALLOTS distribution function -- provides an on-line control of books in the Department, to the level of a cataloger's desk when necessary. This greatly reduces the need for searching for books in process when priority processing has been requested, and makes such books easier to find.

3. Standing search requests -- provide a more systematic approach in matching LC copy with books on the current imprints holding shelves and reduce the required staff time for this function.

4. Title II depository card filing -- has been reduced by about one-third since cards are not filed if the title is included in MARC scope. With an expanded MARC scope, filing of Library of Congress depository cards may be eliminated altogether.

5. Statistical counts -- have been simplified as a result of BALLOTS-generated statistics.

The Catalog Department staff have enthusiastically accepted the BALLOTS system and generally adapted quite well to an on-line environment.

-- Lawrence Leonard

B. Production Statistics and Costs

A BALLOTS program calculates daily, month-to-date, and year-to-date statistics on the printed outputs. Figure 16 is a sample tabulation for one month's production statistics. Appendix B contains these statistics by month since the system first became operational. BALLOTS staff prepare monthly basic cost sheets for development and production charges as well; Figure 17 is a sample of one of these.

BALLOTS operating and maintenance costs are part of the Stanford University Libraries budget. Operating costs are of five types: (1) file build and update costs; (2) on-line costs; (3) batch costs; (4) CRT terminal rental; and (5) CRT terminal connect time.

1. File costs (not including Library of Congress MARC tape subscription) consist of

- costs for converting the MARC tapes to BALLOTS internal format, building the BALLOTS on-line MRC File and indexes, and dumping the file to tape
- costs for adding records to and updating the other BALLOTS on-line files and dumping these files to tape
- file storage costs on CDC 23142 double-density disks ($800 per month per IBM 2314 equivalent disk)
- general file maintenance activities, such as restoring a file

The MRC File is updated weekly; the other BALLOTS on-line files are updated overnight as a result of the day's activity in the library.

2. On-line costs are calculated by adding up the computing accounts used by the library for work on the CRT terminals. This on-line activity includes searching the files, ordering, cataloging, establishing standing search requests for MARC records not yet received on the weekly tapes, and so on.

3. Batch costs are both fixed and variable. The fixed batch costs include the costs of mounting special forms on the high-speed printer; mounting a reserved disk pack for overnight processing; and renting the IBM 2741 typewriter terminal used to print spine labels. The variable batch costs are incurred for sorting, formatting, and printing the outputs for the library; for matching the Standing Search Requests File against the MARC File biweekly; for purging the BSSR File of outdated requests monthly; for running the weekly automatic claim program to determine orders for which claims must be produced; and for running monthly management statistics reports.

DEC 31, 1974 STANFORD

Output Statistics

DESCRIPTION	MONTH TO DATE
TOTAL TITLES ORDERED.	1522
PURCHASE ORDERS PRINTED	1522
ABEL FORMS PRINTED.	176
ORDERS EXCEEDING TWO FORMS.	
TOTAL ORDER SLIPS PRINTED	223
ORDER SLIPS FOR ADD = 02.	63
ORDER SLIPS FOR ADD = 15.	160
TOTAL FIRST CLAIMS PRINTED.	12
FIRST CLAIMS FOR ADD = 02,15	11
FIRST CLAIMS FOR ADD = 02	
FIRST CLAIMS FOR ADD = 15	1
TOTAL SECOND CLAIMS PRINTED	1
SECOND CLAIMS FOR ADD ¬= 02,15.	1
SECOND CLAIMS FOR ADD = 02.	
SECOND CLAIMS FOR ADD = 15.	
TOTAL TERMINAL SETS CLAIMED	
TERMINAL SETS CLAIMED WITH ADD ¬= 02,15	
TERMINAL SETS CLAIMED WITH ADD = 02 . .	
TERMINAL SETS CLAIMED WITH ADD = 15 . .	
TOTAL CANCELLATION NOTICES PRINTED. . .	53
CANCELLATION NOTICES FOR ADD ¬= 02,15 .	46
CANCELLATION NOTICES FOR ADD = 02 . . .	1
CANCELLATION NOTICES FOR ADD = 15 . . .	6
TOTAL CANCEL SLIPS PRINTED.	206
ALERT SLIPS PRINTED	
ALERT SLIPS FOR ADD=18.	
ALERT SLIPS FOR ADD=19.	
ALERT SLIPS FOR ADD=20.	
ALERT SLIPS FOR ADD=21.	
ALERT SLIPS FOR ADD=22.	
ALERT SLIPS FOR ADD=23.	
ALERT SLIPS FOR ADD=24.	
ALERT SLIPS FOR PRC=NO.	
TOTAL VOID SLIPS PRINTED.	178
VOID SLIPS FOR CATALOGING	
VOID SLIPS FOR CLAIMING	168
VOID SLIPS FOR DISTRIBUTION	
VOID SLIPS FOR MAINTENANCE.	10
VOID SLIPS FOR RECEIVING.	

Figure 16. Production Statistics for December 1974

Output Statistics cont.

DESCRIPTION	MONTH TO DATE
INVOICE ALERT SLIPS PRINTED	9
FUND SLIPS PRINTED.	75
TOTAL REQUESTER NOTICES PRINTED	2020
REQUESTER NOTICES FOR SNI=2/3	2019
REQUESTER NOTICES FOR SNI=4/6	1
TITLE II SLIPS PRINTED.	220
NPAC NOTICES PRINTED.	134
CATALOG DATA SLIPS PRINTED.	2462
CATALOG DATA SLIPS FOR PRO ≠ E,G,C . .	1038
CATALOG DATA SLIPS FOR PRO = E,G. . . .	239
CATALOG DATA SLIPS FOR PRO = C.	5
CATALOG DATA SLIPS FOR ADD ≠ 02,15 . .	1052
CATALOG DATA SLIPS FOR ADD = 02	25
CATALOG DATA SLIPS FOR ADD = 15	101
SEARCH AND QUOTE NOTICES PRINTED. . . .	28
SEARCH AND QUOTE NOTICES FOR ADD=18 . .	18
SEARCH AND QUOTE NOTICES FOR ADD=19 . .	
SEARCH AND QUOTE NOTICES FOR ADD=20 . .	
SEARCH AND QUOTE NOTICES FOR ADD=21 . .	
SEARCH AND QUOTE NOTICES FOR ADD=22 . .	
SEARCH AND QUOTE NOTICES FOR ADD=23 . .	10
SEARCH AND QUOTE NOTICES FOR ADD=24 . .	
TOTAL SPINE LABELS PRINTED (MULTIPLIED BY 2)	2733=5466
SPINE LABELS FOR FUN REC.	
SPINE LABELS FOR FUN CAT/DIS.	2529
TOTAL CATALOG CARDS PRINTED	37,607

On-line Production Statistics--Cataloging

2.	Titles cataloged at CRT	3,609
3.	% cataloging through BALLOTS	79.2%
4.	Total added copies processed	230
5.	Added copies through BALLOTS	76
6.	% added copies through BALLOTS	33%
7.	Total added volumes processed	109
8.	Added volumes through BALLOTS	50
9.	% added vols. through BALLOTS	46%

Figure 16 cont. Production Statistics for December 1974

4. BALLOTS CRT terminals are rented for $270 per month with 4,096 bytes of memory. Purchase price of the Sanders 804 is approximately $8,000. (As part of a new development grant, the BALLOTS project will be selecting a new video display terminal to support the complete MARC II character set. One criterion in this terminal selection is a lower cost than that of the Sanders terminal.)

5. CRT terminal connect time is a fixed monthly charge of $1,200 for each group of up to ten CRT terminals connected to the IBM 360/67 through the PDP-11 minicomputer.

The total monthly production and maintenance charges for December 1974 were $30,338. Of this,

- file costs were 59.8 percent
- on-line costs were 13.6 percent
- batch costs were 14.4 percent
- CRT terminal rental costs were 8.2 percent
- terminal connect-time charges were 4.0 percent

Currently, the Stanford University Libraries pay the entire cost of running and maintaining the system. Fine tuning and improvements in the system and procedures, both underway and planned, will reduce this monthly cost. In the long run, a network of BALLOTS users sharing common costs, such as file building, will reduce the cost to each participating library. In addition, dividing and sharing original cataloging efforts and keying for non-MARC LC copy will mean direct savings.

The possibility of realizing labor savings was conceived in the original BALLOTS design. To measure the savings, four offset studies were conducted. The first was a theoretical model done prior to implementation; it estimated labor savings of $160,000. The second, third, and fourth studies were done at progressive intervals during the implementation of BALLOTS as a production system. Each of the latter studies addressed itself ONLY to modules in BALLOTS that were IN FULL PRODUCTION at the time of the study. Since each new module introduced new facilities and services, the tendency has been for the offset to increase with each study. However, the results to date have only reached five-eighths of the original estimate of $160,000. Currently, the offset is estimated at 11.5 FTE positions, all at a clerical level, equivalent to about $88,074 when 15 percent staff benefits are included. (This figure is based upon a beginning salary level; offset is actually higher if longer term employees are considered.) Additional offset is expected in both support and professional categories.

Production

INVOICE CHARGES BY MONTH AND PRODUCTION OR DEVELOPMENT ACCOUNT NUMBER

MONTH: December

Invoice Total ($)	Acct. No. (Name)	ORVYL pack rent ($)	($) Disk Storage Qty. / CPU Min.	($) Utilities Qty. / CPU Min.	($) ORVYL II Qty. / CPU Min.	($) Cards Read Qty. / CPU Min.	($) Std. Upper Qty. / CPU Min.	($) Expnd. Upper Qty. / CPU Min.	Rindr Set-up ($)	($) Batch Stk Qty. / CPU Min.	($) Large Stk Qty. / CPU Min.	($) Lwr. Case Qty. / CPU Min.	($) Transmit Recv Qty. / CPU Min.	($) Hi-Speed Stk Qty. / CPU Min.	Tape Rental ($)	Tapes ($)	Tape Storage ($)	Disk Mount ($)	Disk Pack Rent ($)	Compiler + 2741 ($)	Exec Idle ($) / CPU Min.
203.60	F858 (Installating)		67 / 3330		9 / 137	7 / 813.47	13 / 422.04			70 / 1070		29 / 603	4 / 5799	.00 / 8							43 / 2
21,926.82	F859 (MMC)	4,000	713 / 35626	16,894 / 301692	158 / 1311	11 / 304.66	36 / 969.64			25 / 545		28 / 430	15 / 12121	4 / 84	30	13	.50				
1,927.78	F860 (Acquisitions)				1,927 / 15989							.18 / 2	.00 / 349610								
366.52	F861 (Cataloging)				347 / 2895	3 / 71.73	3 / 35.93					2 / 20	.00 / 73343	2 / 17							
4,370.17	F862 (Forms)		.90 / 20	2,448 / 45486	1 / 10	2 / 63.50	810 / 18197.16		410			7 / 82	20 / 4938	.00 / 1	74			356	20	219	
1,513.06	F863 (Distribution)		.60 / 30		1,486 / 12.038	7 / 285.76	8 / 102.14					4 / 42	.00 / 358759	4 / 49	2						
336.50	F878 (Catalog Maint.)				326 / 2816	3 / 78.67	3 / 39.40					2 / 24	.00 / 56153	2 / 19							
137.75	F880 (Demonstration)				96 / 792	3 / 94.38	4 / 47.32					2 / 28	20 / 11178	2 / 24							
1.20	M500 (In Service Training)				.20 / 3								.00 / 220								
30,773.60		4,000	781.00 / 39006	19,342 / 347187	4,560.20 / 35988	36 / 1038.46	877 / 1975.45		410	95 / 1615		74.18 / 1221	69 / 573095	14 / 202	106	13	.50	356	20	219	43 / 2

Totals

EM/CM
2/27/74

Figure 17. Production Costs for December 1974

It may be thought that BALLOTS has realized NO offset in professional time. This is not true, in that certain activities assigned to professionals were eliminated through procedural changes (e.g., proofreading of overtyped headings on cards). Strictly speaking, these changes were not required by automation, but in fact were implemented in connection with it. Of course, much of the beneficial offset realized by these procedural changes has in itself been offset by the time required to train and supervise the support staff. But this will not go on at the intensive pace that was required during development. The greatest evidence that significant additional offsets will be realized is the fact that throughout the development, training for, and installation of numerous modules, production has consistently risen as staffing has declined. As the system stabilizes, less training and supervision will be needed, and additional procedural changes will be implemented. Foremost among the latter is physical repositioning and procedural integration of acquisition and cataloging to permit a straight-through flow of library materials. It is expected that this physical move will be followed by significant organizational change, aimed at obtaining additional efficiencies. No organizational changes are planned until the integrated operation has been sufficiently studied and observed to know what new procedures will make best use of the staff and the system. In combination, it is hoped that such changes will produce maximum realizable offset.

C. Sharing of Results

In an initial effort to communicate some of the results of BALLOTS development and implementation activity, the BALLOTS project and the Stanford University Libraries conducted a two-day seminar on July 2 and 3, 1973, at Stanford University, following the American Library Association (A.L.A.) meeting in Las Vegas. This seminar was attended by over 125 librarians and system development staff from libraries throughout the United States and Canada. Academic, public, industrial, and government libraries were among those represented. Various BALLOTS publications were distributed, the operational system was described in great detail,* on-line demonstrations were given, and samples of printed outputs were made available. The entire BALLOTS staff, members of the library staff, and members of SCIP Academic Computing Services contributed to this seminar. The response to the seminar was enthusiastic; the project received letters of appreciation and requests for additional information.

Various members of the project have given demonstrations and presentations of the system at numerous conferences and gatherings. Among these were the Fall Joint Computer Conference in Anaheim, California, on December 5, 1972; a meeting of state librarians in Honolulu, Hawaii, on April 16, 1973; the Association of College and Research Libraries' preconference network institute, held before the A.L.A. meeting in Las Vegas at the end of June, 1973; the American Society for Information Science (ASIS) conference in Los Angeles in October 1973; the California Educational Computing Consortium meeting in San Diego on December 7, 1973; a meeting of the California Library Association in San Francisco on December 11, 1973; an A.L.A. Information Science Automation Division institute in New Orleans, the last week in February, 1974; the meeting of the American Association for the Advancement of Science in San Francisco, on February 25, 1974; a meeting at Stanford University of the San Francisco Chapter of ASIS on March 19, 1974; the Eleventh Annual Clinic on Library Applications of Data Processing, at the University of Illinois, Urbana-Champaign, on April 30, 1974; the Western States Network Study and Planning conference held by the Western Interstate Commission on Higher Education (WICHE) in Denver, on September 19 and 20, 1974; a California State Library planning conference for public libraries interested in library automation in Sacramento, on September 25, 1974; a WICHE network study and and planning conference in Reno, on November 7 and 8, 1974; a meeting of the California Library Association in San Diego, on November 12, 1974; a WICHE Institute (funded by the U.

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*At that point it consisted of the features implemented in the BALLOTS-MARC, IPF, and CDF modules.

S. Office of Education) for interstate network planners held in Boulder, Colorado, on December 4 and 6, 1974; and a workshop on information delivery held by the Bay Area Reference Center in San Francisco, on December 11 and 12, 1974.

In general, it has been project policy to respond with information and, whenever possible, a demonstration of the system to interested inquirers. In addition to frequent participation at meetings and informal gatherings elsewhere, BALLOTS staff have spent a sizeable portion of working time over the past two years in explaining their work to visitors to the project. Library staff have also talked with many of these visitors and shown them the system in daily operation. These visitors include librarians, information scientists, systems programmers, systems analysts, educational administrators, staff from other library automation projects, professional data processing administrators, and vendors. They have come from all over the world; in addition to inquiries and to initial searching of the BALLOTS data base by groups in the San Francisco Bay area, BALLOTS has been investigated by visitors from Australia, Belgium, Canada, China, England, France, Germany, Israel, Italy, Japan, Korea, the Union of South Africa, Spain, Sweden, and Taiwan.

One spin-off from this information sharing has been publications that describe several aspects of BALLOTS II. "A User's View of BALLOTS" was a serial publication, a description of the operational system that was revised, expanded, and reissued each time a new module was put into production. Most of the transcription made of the 1973 BALLOTS seminar, originally intended for publication, was judged ill-suited to publication, based on the fact that speakers and audience were viewing dynamic system demonstrations as talks were given and questions asked. These demonstrations could not readily be recreated for the reader. However, much of the information shared at this gathering is contained in the "User's View". A presentation at the 1973 ASIS conference by project members concerned with different parts of the system development and implementation resulted in seven very brief papers. The paper delivered at the Eleventh Annual Clinic on Library Applications of Data Processing in 1974 by a member of the project staff was titled "Minicomputers and Library Automation: The Stanford Experience". All of these publications were added to the project bibliography "Selected Documents Relating to the BALLOTS Project" as they were published, and many copies have been distributed.

Other documents that have been made available are the system specifications drawn up for each module, the materials produced to aid the library in using the on-line system, and the operations manual maintained to aid the computer operators who run BALLOTS overnight batch jobs.

In February 1974, a film was made that illustrates uses of BALLOTS in the Acquisition and Cataloging departments of the Stanford Main Library. Shot in the library, the film shows the regular library staff at their routine daily work involving the automated system. Later, a cassette recording was made by one of the BALLOTS staff to accompany the film. Film and cassette have been used frequently where groups do not have the facilities to permit a live demonstration.

At the end of 1974 the Journal of Library Automation had accepted a paper describing BALLOTS II for publication in its March 1975 issue.

D. A Brief Statement Regarding the Humanities

At the conclusion of the BALLOTS II grant period, the BALLOTS files contained records (for items held or on order) for over 100,000 titles representing every aspect of the humanities. Including the MRC File, the total data base now available to BALLOTS' users exceeds one-third of a million records. This data base is growing at the rate of approximately 175,000 records per year, and its scope expands as does that of the Library of Congress MARC tape service. (I.e., when in 1975 the MARC tapes begin to include titles for German, Spanish, and Italian materials, these records will enter the BALLOTS MRC File as well, just as do MARC records for French titles now.)

A sampling of the BALLOTS files indicates that a substantial number of records in the humanities have been added during the past year: Archaeology, 863; Philosophy, 1,176; Music, 1,093; Mythology, 236; Renaissance, 288; Reformation, 141. Many hundreds of records can be found in each of the following diverse fields: painting, history, literature, poetry, religion, Bible, Shakespeare, medieval studies, feudalism, linguistics, song, dance, drama, theater, cinema. Likewise, numerous entries can be found under Plato, Aristotle, Milton, Mozart, Bach, Beethoven, Leonardo, Locke, Durer, Gauguin, and Van Gogh. Literary forms in the files include epic, saga, tragedy, comedy, novel, play, and musical forms include the sonata, quartet, symphony, opera, and concerto.

An analysis of the records for titles held at Stanford and processed through BALLOTS indicate holdings representing over ninety languages from all parts of the world and all historical periods. The languages processed are classical, American Indian, Finno-Ugric, Slavic, Oriental, South Asian, Semitic, African, and West European.

As one example of BALLOTS' benefit to the pursuit of the humanities, Stanford's Art and Architecture Library may be instanced. (Stanford's Art Library is the most comprehensive library of its type on the West Coast.) The Art Librarian reports that books are received much more promptly through BALLOTS than via the old manual system, and that orders are no longer misplaced, misfiled, or reported lost. The indexing in BALLOTS is cited by the Art Librarian as having "saved weeks of my own time" in conducting bibliographic research for her own professional needs and in support of faculty and student research.

In addition to data base access via two recently installed terminals in the Reference sections of the Stanford Main Library and the Meyer Library, and the ability for SPIRES users on campus to search the BALLOTS files through that system, the BALLOTS data base is also available to off-campus users who can dial up the Stanford 360/67 computer and search the files through SPIRES. External use is already significant. A single example is Mills College, an Oakland school with strong programs in the humanities, which has been regularly searching BALLOTS files in support of its library services. The BALLOTS II system has emerged as a tool of great power in furthering acquaintance with and research in the humanities. As more use is made of the system by other institutions, and as it becomes more accessible to the library patron, the value of this project will increase.

IV. PLANS FOR THE FUTURE

Applying computer technology to library operations, and developing regional and national networks of libraries based on this technology, promise to help solve the dilemma of tightening library budgets versus increasing patron demands. In contrast to manual library systems, which make widespread sharing of library resources cumbersome and slow, automated library systems have the potential advantage of being used rapidly and simultaneously by more than one institution. When an automated system is shared by a network of libraries, the price tag of the system to each user is reduced and the rising costs of the highly labor-intensive library environment are curbed. And the benefits of automated library systems are more than just economic. Libraries in a computer network can share the entire network's combined bibliographic resources with students, faculty, staff, and the community at large. Coordinated purchasing and interlibrary loans can be facilitated by network files accessible to all libraries in the region and by direct communication with other library networks.

Stanford has been exploring with in-state groups the possibility of a California library automation network. The plan is to utilize BALLOTS as the on-line vehicle for a network that would incorporate the major complementary capabilities and data bases of other existing systems in the state.

In October 1974, the California State Library awarded BALLOTS a Library Services and Construction Act (Title III) grant in the amount of $150,877 to

1. Develop a basic on-line network capability based on the BALLOTS system.

2. Run a demonstration project with seven California public libraries.

3. Demonstrate the delivery of data in machine-readable form to interface with the automated systems currently running in five of the seven demonstration libraries.

4. Modify BALLOTS to support the input, display, and output of bibliographic records in full MARC II format.

In conjunction with this project, BALLOTS plans to retain location information for each title cataloged by the seven libraries during the demonstration project. This information will be incorporated into a location file to test the feasibility of an on-line (or later, microform) file for interlibrary loan purposes.

In addition, BALLOTS has been asked by out-of-state groups to explore the possibility of communication between this emerging California network and other networks and bibliographic centers in the western United States. This work has proceeded mainly in cooperation with the Western Interstate Commission on Higher Education (WICHE) and with the Washington (State) Library Network (WLN). Preliminary conversations with WLN suggest that useful communication and exchange of data between the two systems is desirable and technically and politically feasible.

In January 1975, the Council on Library Resources agreed to award Stanford a grant for development to "lead to the establishment of a California library automation network." A principal aspect of the work done under this grant will be the design and implementation of a file structure in which non-redundant bibliographic records can be shared by a number of libraries that may own or have in process the same title. Other tasks to be carried out under the CLR grant are the selection of a new video terminal to support the complete MARC II character set; the development of efficient and standardized means of communicating machine-readable information between network members and to other networks; and the expansion of BALLOTS II serial processing capabilities to include the on-line input and output of records in full MARC-S format.

BALLOTS' approach is to seek to pool resources in order to form a reliable, flexible, and economical network to support and improve the services provided in common by every type of library in the state. The plan is to extend this state network so that, from being compatible with a regional network, it could become part of such a network, adhering to national standards and capable of communicating with other systems and networks in California and other states.

V. SUMMARY

In 1972, the BALLOTS project at Stanford University's computation center received a two-year grant of $650,000, jointly funded by the National Endowment for the Humanities and the Council on Library Resources. Under previous grants, the project had designed a computerized system to support acquisitions and cataloging in the Stanford University Libraries. The design was broken into sets of system features, called "modules", to be implemented in a series. The first module was implemented using Stanford Library funds. Under the N.E.H.-C.L.R. grant, nine additional modules were put into production operation between November 1972 and January 1975, resulting in the complete BALLOTS II system. ("BALLOTS I" was an earlier prototype.)

The system is divided into ten computerized functions, each supporting a specific type of library processing: reserve processing, ordering, receiving, non purchase order material receipt, claiming and canceling, cataloging, material distribution, catalog records maintenance, reference input and maintenance, and standing search removal. The library staff communicates on-line with the system through commands that are either command verbs or video terminal screen format names. Wherever possible, BALLOTS programs edit input data and return error codes whenever they find incorrect or missing data. Such errors must be corrected before the system will accept the processing transaction and carry it out. Outputs are printed overnight as the result of on-line transactions in the library during the day.

Four on-line files are available for searching: the MARC file, the In Process File, the Catalog Data File, and the Reference File. Each file is accessible through several indexes. These files are further identified and restricted by library identifier. This library file ownership identifier allows multi-library access to BALLOTS files, but allows only the library that owns the file entry the ability to update the record. Searches may be constructed using several indexes at the same time by using the logical operators "and", "or", and "not".

The data in BALLOTS files are divided into data elements, each identified by a one- to four- character mnemonic tag.

The BALLOTS II system has been in continuous operation in the Stanford University Libraries since the first module was implemented in November 1972. During the two years reported on here, Stanford has transferred over 80 percent of its technical processing from manual procedures to the automated system. In early 1975 this figure will rise to over 90 percent. Plans for the future of the system focus on its network use, initially by a group of California public libraries, and on communications with other systems and networks.

APPENDIX A

ADDENDUM TO THE BALLOTS II PROPOSAL

June 22, 1972

PROPOSAL ADDENDUM SUBMITTED TO THE

NATIONAL ENDOWMENT FOR THE HUMANITIES

BALLOTS PROJECT

Principal Investigator: David C. Weber
Director of University Libraries
415/327-8094

Deputy Principal Investigator: Allen B. Veaner
Assistant Director of
University Libraries
for Bibliographic Operations
415/321-2300, ext. 3151

Project Director: Hank Epstein
Director, BALLOTS Project
415/321-2300, ext. 3740

Transmitted by: Kathleen C. Butler
Assistant Research Administrator
415/321-2300, ext. 2883

Duration of Activity: September 1, 1972 -- August 31, 1974

Total Funds Requested: $650,000

Date Transmitted: June 22, 1972

INTRODUCTION:

The Addendum to the proposal dated 3 December 1972 changes the intent of the proposed activities from that of a bibliographic service network for the Stanford University Libraries and other San Francisco Bay area libraries to that of a bibliographic service for the Stanford University Libraries only.

All references to networks (CLAN) and to services to libraries outside of the Stanford University Libraries are excluded from this proposal, including the Law and Lane Medical libraries at Stanford.

This Addendum requires funds of $650,000 over a 24-month period, beginning September 1, 1972, to develop and implement a series of modules, described in the following section: "Description of Activities." The implementation schedule is shown in Figure 3.

The cost of the development and implementation of the BALLOTS-MARC module and the production expenses of operating BALLOTS-MARC and all future modules are borne by Stanford University and are not requested as part of this grant.

DESCRIPTION OF ACTIVITIES:

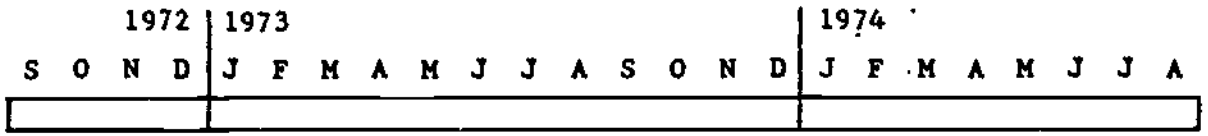
The bibliographic service design for Stanford will be implemented in a series of 11 modules. The first of these modules, BALLOTS-MARC, is currently being implemented using Stanford funds. The ten additional modules for which funding is required are described below in the order in which they will be implemented.

2. In Process File (IPF). This module adds an in process file and additional printed outputs. Only MARC material is handled; when a record is found in MARC it is transferred to the IPF and is retained there as an updateable record throughout technical processing. Since the record will not be purged from the IPF until module 3 has been implemented, the IPF will represent all titles ordered and cataloged by the library using the automated system. A record in the IPF can be used again if additional copies of a book are ordered.

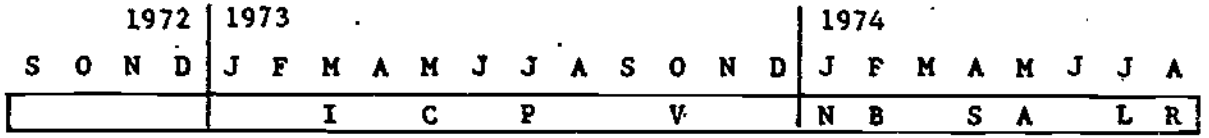
3. Catalog Data File (CDF). This module involves building the on-line Catalog Data File. Since the implementation of module 2, BALLOTS will have saved bibliographic information, and this data will be used to create the CDF. From this point on, all catalog records will enter the CDF after the record for a

BALLOTS IMPLEMENTATION AT STANFORD

Grant Development Period:



Module Implementation Date at Stanford (production costs not included in grant request):



Module Symbol	Module Name	Module Symbol	Module Name
I	In Process File	B	Book Catalog
C	Catalog Data File	S	Standing Orders and Out-of-Print Books
P	Purchase Order and Original Cataloging	A	Automatic Canceling and Claiming
V	Inventory File	L	Circulation
N	Non-Purchase Order Material	R	Reserve Processing

Figure 3. Module Implementation Dates

given title is no longer required in the IPF. As the CDF grows, it will become an increasingly valuable reference tool for acquisition, cataloging, and patrons' use.

4. Purchase Order and Original Cataloging. No new file is added with this module, but the use of the IPF is expanded considerably. Also, catalog work slips and National Program for Acquisition and Cataloging (NPAC) notices will be produced. The scope of material for which a record is created is expanded considerably. It adds all non-MARC roman alphabet material that requires a purchase order in ordering, and any material that requires original cataloging. Thus, if a record is not found in MARC, a new IPF record is created at the terminal. This module will process an additional 52 percent of acquisitions and 42 percent of cataloging beyond what is already processed by the BALLOTS-MARC module. Thus services at this point will cover 87 percent of acquisitions and 68 percent of cataloging.

5. Inventory File (INV). Machine-readable bibliographic and holdings records already exist for all books in the Meyer Undergraduate Library. In this module, these records will be converted to BALLOTS format and used to build an on-line Meyer Inventory File (INV). At this point, the Meyer Cataloging Group will work directly with the on-line file. This file will be used later on for reference and for patrons' access to the complete holdings of the Undergraduate Library.

6. Book Catalog. This module can be used to create any book catalog done in the Stanford format. At Stanford it will allow the Meyer Book Catalog to be produced directly from the INV without going through the punched card process presently used.

7. Non-Purchase Order Material. The scope of material added to the IPF is expanded to include non-MARC non-purchase order material--gift, exchange, approval, and blanket orders. This module will process an additional 7 percent of acquisitions and 6 percent of cataloging. Modules 1 through 7 will process a total of 97 percent of acquisitions and 82 percent of cataloging.

8. Standing Order and Out-of-Print Desiderata. The capability of establishing standing orders (. , and receiving the non-serial materials arriving with SO's will be added with this module. In addition, out-of-print items (OP) will be added to the IPF, and search-and-quote letters produced for OP dealers. If an OP item can be procured, it can be ordered using the record already in the IPF.

9. Automatic Claiming and Canceling. This module adds programs to review IPF records automatically to determine if ordered material is overdue. Material may be claimed several times and finally canceled if the dealer does not respond. The Acquisition Department may override a scheduled claim or a cancellation. The department may also initiate an unscheduled claim or cancellation.

10. Circulation. This module is designed to handle the complexities of the research library circulation system. Using data from the Inventory File, a Meyer Library self-service circulation system will be implemented including charging, discharging, initial check-in, circulation searching, recall, holds, and overdue processing.

11. Reserve Processing. This module adds reserve book ordering and processing for users. It will be added to the services already offered to Meyer staff through the use of the INV and IPF.

Although modules 5, 6, 10, and 11 will be implemented first at Stanford's J. Henry Meyer Memorial Undergraduate Library, each module will be generalizeable and its application not limited to Meyer Library.

The implementation of the Circulation module, unlike any of the other modules, is highly dependent on external constraints, notably the existence of acceptable circulation hardware. Acceptability must be measured from both a user and a cost standpoint. When BALLOTS first began looking for a CRT terminal, no manufacturer was yet producing a terminal that met the design requirements at a reasonable cost. Through close monitoring of new developments in terminal hardware, Stanford was able to select a very good terminal, the Sanders 804, in time to integrate it into the first BALLOTS module, BALLOTS-MARC. During the grant period, Stanford will design the circulation system and conduct an intensive survey of circulation hardware. It may become necessary to delay the actual implementation of the circulation system until acceptable hardware is available.

APPENDIX B

MONTHLY PRODUCTION STATISTICS SINCE INITIAL IMPLEMENTATION

November 1972 - December 1974

APPENDIX B

BALLOTS II MONTHLY PRODUCTION STATISTICS, 1972

(taken from the BALLOTS Monthly Reports of this period)

Printed Output	Month	
	Nov.	Dec.
purchase orders (backed by dealer report slips)	245	238
extra P.O. copies (to specified vendor)		
processing slip sets (6 different slips per set)	245	238
order slips		
catalog data slips		
invoice alert slips		
claim notices		
automatic claims		
claim notices - standing order		
cancellation notices		
automatic cancellations		
Cancel File slips		
requester notices		
catalog cards	2,500	4,403
spine labels* (in sets of two)		
matched standing search request notices*		
purged standing search request notices		
NPAC notices		
Title II slips		
Fund File slips		
search and quote notices		
TOTAL PIECES PRINTED:		
Total Titles Cataloged:		
Total Cataloged Through BALLOTS II:		
Percentage of Cataloging Done Through BALLOTS II:		

NOTE: The statistics on this page represent forms produced through the first BALLOTS II module implemented--the BALLOTS-MARC Module. The processing slips consisted of an Order File slip, a Dealer File slip, a catalog slip, a Fund File slip, a Requester Notice, and a catalog work slip. As more features of the system were implemented, some of these forms were produced separately, as later statistics show. Others were no longer needed, as on-line computer files replaced the use of traditional paper files.

Statistics on total pieces printed, total titles cataloged, titles cataloged through BALLOTS II, and percentage of BALLOTS II cataloging did not appear in the BALLOTS Monthly Reports.

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*These forms were not produced in 1972.

APPENDIX B

BALLOTS II MONTHLY PRODUCTION STATISTICS, 1973

(taken from the BALLOTS Monthly Reports and Library Computing Services Bulletins of this period)

Printed Output	Month											
	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
purchase orders (backed by dealer report slips)	305	325	358	256	359	472	420	515	412	373	939	1,631
extra P.O. copies (to specified vendor)								418	314	276	497	675
processing slip sets (6 different slips per set)	305	325	358	256	359	472	420					
order slips								384	345	334	353	386
catalog data slips											7	13
invoice alert slips								35	30	61	3	2
claim notices												
automatic claims												
claim notices - standing order												
cancellation notices									174	19	28	36
automatic cancellations												
Cancel File slips											84	108
requester notices						**	**	**	386	344	365	353	389
catalog cards	10,500	8,975	12,167	9,354	885 sets	861 sets	1,136 sets	17,524	11,733	13,348	13,340	20,140
spine labels (in sets of two)	*	1,586	1,768	1,512	1,724	1,844	2,564	2,836	2,258	2,286	2,270	2,936
matched standing search request notices	*	123	317	293	260	355	295	354	227	276	172	368
purged standing search request notices								111 ***			273	182
NPAC notices												7
Title II slips												6
Fund File slips												
search and quote notices												
TOTAL PIECES PRINTED:								22,597	15,837	17,338	17,184	26,873
Total Titles Cataloged:												
Total Cataloged Through BALLOTS II:								1,777	816	888	989	1,668
Percentage of Cataloging Done Through BALLOTS II:								22%	17.6%	18.5%	23.3%	55.4%

NOTE: The In Process File (IPF) Module was implemented in April, the Catalog Data File (CDF) Module in July, and the Purchase Order/Original Cataloging (PO/OC) Module in November 1973. With the CDF module the system began producing extra purchase order copies, catalog data slips, claim notices, and cancellation notices. A number of paper file processing slips were no longer needed, and starting in August, requester notices are listed separately. With the PO/OC module came invoice alert slips, Cancel File slips, NPAC notices, and Title II slips. Statistics on general totals began appearing in the first issue of the Library Computing Services Bulletin in September 1973.

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* Exact figures not available.
** A shift in statistics keeping--number of cards per set varies.
*** Initial running of purge program scheduled for eight months after first standing search requests were input.

APPENDIX B

BALLOTS II MONTHLY PRODUCTION STATISTICS, 1974

(taken from the BALLOTS Monthly Reports and Library Computing Services Bulletins of this period)

Printed Output	Month											
	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
purchase orders (backed by dealer report slips)	1,656	1,493	1,846	1,976	2,223	2,006	1,554	1,785	1,770	2,149	1,891	1,522
extra p.o. copies (to specified vendor)	639	647	916	770	791	887	523	480	428	561	442	176
processing slip sets (6 different slips per set)												
order slips								87	189	325	337	223
catalog data slips	673	1,237	1,162	1,216	3,459	3,588	2,685	2,451	2,607	2,555	2,761	2,462
invoice alert slips	58	7	53	18	12	13	8	6	3	10	5	9
claim notices	7	13	6	13	10	127	74	16	8	27		
automatic claims								722	197	725	23	13
claim notices - standing order								0	1	1	0	0
cancellation notices	64	74	91	72	53	71	66	188	30	41	*	*
automatic cancellations								0	0	0	56	53
Cancel File slips	171	217	264	225	435	546	480	381	195	435	172	206
requester notices	697	1,282	1,276	1,312	3,849	4,169	3,126	2,928	3,182	2,986	2,630	2,020
catalog cards	35,354	39,030	48,528	40,660	49,193	40,586	44,674	38,343	45,132	49,309	38,768	37,607
spine labels (in sets of two)	6,078	6,702	4,076	3,138	4,204	3,326	3,957	5,384	6,080	6,938	6,320	5,466
matched standing search request notices	216	370	197	566	251	285	272	160	340	325	**	**
purged standing search request notices	148	0	0	192	182	248	0	140	444	863	**	**
NPAC notices		1	3	4	7	0	0	176	212	105	51	134
Title II slips	15	17	15	11	14	0	0	370	403	344	250	220
Fund File slips					107	27	52	69	117	105	66	75
search and quote notices											68	28
TOTAL PIECES PRINTED:	45,776	51,090	62,509	53,311	68,994	59,205	61,428	53,680	61,338	67,804	53,970	50,392
Total Titles Cataloged:			4,433	4,918	5,620	4,583	4,516	3,631	3,758	4,316	3,729	3,295
Total Cataloged Through BALLOTS II:	2,616	3,893	3,570	2,894	3,672	3,060	3,328	2,661	2,853	2,889	2,851	2,609
Percentage of Cataloging Done Through BALLOTS II:	68.9%	75.0%	80.5%	58.8%	65.3%	66.8%	73.7%	73.3%	75.9%	66.9%	76.5%	79.2%

NOTE: The Non-Purchase Order Material Receipt (NPO) Module and the Automatic Claiming and Canceling (ACC) Module were implemented in April, the Standing Order (SO) Module in August, the Out-of-Print (OP) Module in October, and the Meyer Inventory File (INV) Module in December 1974. In turn, these led to the production of Fund File slips, automatic claims and cancellations, order slips, standing order claim notices, and search and quote notices.

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* Subsumed in figure below this line.

** Statistics not printed in Library Computing Services Bulletin.