PURDUE UNIVERSITY

Computing Center

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USER'S MANUAL

MARCH 13, 1974

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1. GENERAL INFORMATION

1.1 INTRODUCTION

The computing center was established to provide computing facilities and services for the entire university. The staff of all research projects are encouraged to make use of these facilities. Graduate students may carry out computational portions of their thesis investigations in the center. Undergraduate and graduate classes which involve any aspect of data processing may use the facilities in connection with assigned work. Sponsored research projects are expected to pay for use of the computers at rates established by the university. Educational and non-sponsored research activities may apply for funds from the computer reserve.

The center operates on the basis that all those who use the computing facilities do their own analysis and prepare their own computer programs. However, the actual processing of the jobs and operation of the machines will be handled entirely by center personnel. A limited amount of programming service can be provided for research projects that require special assistance. The center conducts several non-credit programming courses which are open to university staff and students.

The center is interested in providing good, efficient service to its users; therefore constructive suggestions are always welcome. Suggestions may be submitted through the use of the SUGGEST PROCSY command, or written suggestions may be submitted to the consultants or the person at the I/O desk in room B10.

1.2 COMPUTING CENTER DIRECTORY

The Computing Center is located on the ground floor of the Mathematical Sciences building. The Center also has facilities on the basement floor, and the second floor of the Mathematical Sciences building and on the ground floor of the Engineering Administration building, and on the 7th floor of the Krannert building.

TITLE	NAME	PHONE	ROOM
Office			
Director	Prof. Saul Rosen	48235	G162
Associate Director	John M. Steele	48235	G172
Head Secretary	Donna Parker	48232	G175
Secretary	Aileen Bean	48232	G175
Secretary	Jean Seyfried	48232	G175
Fiscal Office			
Business Representative	Terry Thrall	48232	G166
Fiscal Clerk	Evelyn Parker	48232	G168
Secretary	Bonnie Van Kley	48232	G175
Business Systems Analyst	Edward Sullivan	48232	G165
Engineering			
Manager	Don Chandler	48234	G140
Engineering Clerk	Linda Powell	2989	G138
Technical Staff	Mike McNeal	32623	G136
	Art DeArmond	32623	G136
Remote Terminals	Jim Shoaf	2989	G128
Programming Systems			
Staff Consultant	Victor Abell	48234	G164
	Herb Schwetman	48232	G170
Manager Programming Systems	James Blair	48234	G160
Manager Operating Systems	Richard Kovarik	48232	G169
Manager Terminal Systems	James Roberts	48232	G142
Manager Special Projects	Ross Garmoe	48232	G144
Technical Staff	Ken Adams	39407	G148
	Dan Dorrough	39408	G146
	Tony Kunderd	32624	G134

TITLE	NAME	PHONE	ROOM
Operations			
Manager	Tony Keeley	48234	G171
I/O Desk		48529	B2
Supervisors:			
2nd Shift (8 a.m. to 4 p.m.)	Richard Peffley	48232	G132
3rd Shift (4 p.m. to midnight)	Tom McCann	48232	G132
1st Shift (midnight to 8 a.m.)	Don Kidder	48232	G132
Weekend	Bob Goellner	48232	G132
Remote Operations	Joyce Foster	33125	135A (ENAD)
		2730	761 (KRANNERT)
Keypunch Operations	Joyce Simons	2722	B9
User Services			
Manager	David Dodson	48232	222
Associate Manager	Ladd Wheeler	48232	220
General Consulting	Bette Bain	38367	204
Statistical Services	MaryAnn Ross	38369	208
Librarian	Carol Shelley	38368	206
Statistics Dept. Representative	Dr. George McCabe	48530	536
Technical Staff	Howard Cunningham	39351	212
	Charles Hatcher	38366	202
	Mary Keim	39354	218
	Maryjane Scharenberg	38360	210
	Bob Goellner	38360	210
Reference Manuals & Document Station			B4
General Consulting Office		45937	B3
General Consulting Office		Ground Floor (ENAD)	
Statistical Consulting Office		45936	B47
After Hours Consulting Office			B4
Calculator Lab			543

TITLE	ROOM	BUILDING
User Preparation (Vending Area)	B40-44	Math Sciences
User Preparation	Ground Floor	ENAD
IBM 026 Keypunches	B18	Math Sciences
IBM 026 Keypunches	Ground Floor	ENAD
IBM 026 Keypunches	760	Krannert
IBM 029 Keypunches	B18	Math Sciences
IBM 407 Tabulating Machine	B22	Math Sciences
IBM 407 Tabulating Machine	Ground Floor	ENAD
IBM 83 Card Sorter	B18	Math Sciences
IBM 519 Reproducing Punch	B22	Math Sciences
IBM 557 Alphabetic Interpreter	B22	Math Sciences
IBM 557 Alphabetic Interpreter	Ground Floor	ENAD
PROCSY Terminals	B5	Math Sciences
PROCSY Terminals	Ground Floor	ENAD
PROCSY Terminal	760	Krannert
Input of Jobs for Processing	B6	Math Sciences
Input of Jobs for Processing	Ground Floor	ENAD
Input of Jobs for Processing	760	Krannert
Output	B22	Math Sciences
Output	Ground Floor	ENAD
Output	760	Krannert

1.3 DOCUMENTATION

The computing center offers a wide range of services to its users. These services require a large amount of detailed documentation. In order to provide all users with the type and amount of up-to-date information required to effectively utilize the desired services, detailed documentation is provided in the form of individual documents.

The user's manual should serve for the beginner as well as for the experienced user, as a general introduction to all facilities and services available at the computing center. In addition, it will provide references to detailed documentation.

An index of all documents which are distributed by the center is maintained. Each document is assigned a name and classification code. The index contains a brief abstract for each document. It is ordered by classification code and has two cross-reference sections (ordered by name and ordered by keyword). The cross-reference sections should help the user to locate documents. Users may also contact the general consultants or the librarian to assist them in locating documents.

A current index (for reference purposes) and a complete set of documents is available at the documentation station. Documents are distributed at no cost to the user; however, some documents are available on a loan basis only and must be obtained form the documentation office.

Each month a list of all documents that have been changed and all new documents that have been added to the library is published in the newletter.

Users may obtain their own copy of the library document index. See library document ZO-CSCINDX for details.

1.4 TECHNICAL NEWSLETTER

Each month the computing center publishes and distributes a newsletter. The purpose of this newsletter is to keep users up-to-date on center developments. It is probably the best means that the center has of communicating with users. Users should contact the PUCC secretary to have their names placed on the newsletter mailing list.

2. EQUIPMENT

2.1 THE CDC 6500 SYSTEM

The CDC 6500 computer is a multi-processor version of the CDC 6400. There are two 6400 series central processors sharing a common main memory.

The hardware configuration is as follows:

QUANTITY	UNIT NUMBERS	DESCRIPTION AND SPECIFICATIONS (K=1024)
1	6500	Computer System 96K 60-bit words of memory 2 - 6400 central processor units 10 - peripheral processor units each having separate 4K 12-bit memories 12 - data channels
1	821	Disk System 419 x 10**6 char. capacity 4.19 x 10**5 char/sec data transfer 33 milliseconds rotational time 145 milliseconds maximum seek time
2	6638	Disk Systems 167 x 10**6 char. capacity 1.67 x 10**6 char/sec data transfer 52 milliseconds rotational time 110 milliseconds maximum seek time
1	6633	Extended Core Storage 125952 60-bit words of storage 2.5 x 10**6 words/sec data transfer
4	854	Disk Pack Drives 8.2 x 10**6 char. capacity 2.0 x 10**5 char/sec data transfer 25 milliseconds rotational time 145 milliseconds maximum seek time
4	604	Tape Drives 6.0 x 10**4 char/sec data transfer 7 track
1	415	Card Punch 250 cards per minute maximum
2	405	Card Readers 1200 cards per minute maximum binary or Hollerith
3	501	Line Printers 1040 lines per minute maximum 63 available characters 136 print positions

QUANTITY	UNIT NUMBERS	DESCRIPTION AND SPECIFICATIONS (K=1024)
1	512	Line Printer 1040 lines per minute maximum 63 available characters 136 print positions
1	3691	Paper Tape Reader-Punch System Five, seven, and eight level tapes may be read and punched. 110 characters per second maximum punched rate. 350 characters per second maximum read rate.
1	250	Graphic Display System Character display 64 characters Dot display 1024 x 1024 matrix Line display variable length variable direction Light pen Function keyboard 19 inch screen
60	KSR-33	Teletype Terminals The current system includes 60 terminals. This number should increase to 100 in the future.
1	3266	Terminal Controller Currently accepts jobs from and transmits output to up to 8 IBM 360/20 or IBM 1130 computers used as remote batch terminals.
1		MODCOMP III Communications Controller Used to interface the remote batch sites at Purdue's regional campuses. It will also connect 16 high-speed (300 to 9600 baud) lines to the PROCSY 2.0 time-sharing system.
1	4800	Gould Electrostatic Printer 250 (approx.) lines of dots per second. 80 dots per inch horizontal and vertical 10 inch wide print line.

2.2 THE IBM 7094 SYSTEM

Three IBM 7094 computers are available. One 7094 is used for PROCSY (Purdue Remote On-line Computing SYstem) while the other two are used for PUFFT (Purdue University Fast Fortran Translator) jobs.

The hardware configuration is as follows:

QUANTITY	UNIT NUMBERS	DESCRIPTION AND SPECIFICATIONS
3	7094-1	Computer Systems
8	729-VI	Tape Drives 9 x 10**4 char/sec data transfer

2.3 THE IBM 1401 SYSTEM

The 1401 system is used for I/O support to the 7094.

The hardware configuration is as follows:

QUANTITY	UNIT NUMBERS	DESCRIPTION AND SPECIFICATION
2	1401	Computer Systems 4K - 6-bit characters of memory 1 - central processor
2	1402	Reader-Punch System 800 cards per minute maximum reader 250 cards per minute maximum punch
2	1403	Printer System 600 lines per minute maximum
2	7330	Tape Drives 7 track 3 x 10**4 char/sec data transfer

2.4 THE CALCOMP PLOTTER

QUANTITY	UNIT NUMBER	DESCRIPTION AND SPECIFICATIONS
1	563	CALCOMP Digital Incremental Plotter Plots may be 10" (optionally 29") in the y direction and 120 ft. in the x direction.

This plotter allows users to prepare graphs, charts, maps and other graphic representations of computer output. To facilitate using this plotter several programs have been developed which are available on the CDC 6500.

2.5 PERIPHERAL EQUIPMENT

The peripheral support equipment at the computing center is made available to provide special card processing facilities. The equipment is available to all users on an open shop basis. The equipment includes:

IBM Model 026 and 029 Card Punches

IBM Model 407 Tabulating Machine

IBM Model 83 Card Sorter

IBM Model 519 Reproducing Punch

IBM Model 557 Alphabetic Interpreter

See 1.4 Computing Center Directory for location of peripheral equipment.

3. PROGRAMMING SERVICES

3.1 THE CDC 6500 SYSTEM

MACE, the CDC 6500 operating system is a multi-programming multi-processing oriented system. That is, it will allow multiple jobs to be resident within the machine at the same time and because of multiple processors will allow two or more of these jobs to be executing simultaneously.

The MACE system/hardware interface and file structure are described in library documents LO-CDCMACE and LO-LOADER. The basic control cards available under the MACE system are described in LO-CONTROL.

There are several major subsystems available to the user under the MACE system. They are as follows:

1. FORTRAN

   FORTRAN Compiler

   References:
   CDC 6000 Fortran Reference Manual
   Publ. No. 60174900
   Library Documents L2-FORTRAN, L2-FTNUSE, L2-MNF, PO-FORTERR, ZO-FORSTAT, ZO-FORTBEG

2. COMPASS

   COMPASS Assembler

   References:
   CDC 6400/6600 Reference Manual
   Publ. No. 60100000
   CDC 6000/7000 Compass Reference Manual
   Publ. No. 60279900
   Library Document L1-COMPASS, ZO-COMPMOD

3. ALGOL

   ALGOL Compiler

   References:
   CDC 3000/6000 Algol Generic Reference Manual
   Publ. No. 60214900
   CDC 6000 Algol Reference
   Publ. No. 60306100

4. COBOL

COBOL

References:
CDC 6000 Cobol Reference Manual
Publ. No. 60253000
Library Document L2-COBOL

5. SORT/MERGE

SORT/MERGE System

References:
CDC 6000 Sort/Merge Reference Manual
Publ. No. 60252600
Library Document M2-SORTMRG

6. PROCSY (Purdue Remote On-line Console SYstem)

Remote Terminal System

Reference:
Library Document LO-PROCSY

7. PURDUE EXPORT/IMPORT

Remote Entry Batch Processing System

References:
Library Document VO-EXPOPDU, VO-DIVERT

8. CALCOMP PLOTTER

CALCOMP Plotter Subroutine Package

References:
Library Documents J5-CALCOMP, J5-QIKPLT

9. MIMIC

MIMIC Compiler

References:
CDC Mimic - Publ. No. 44610400
Library Document 00-MIMIC

10. UTILITY

Utility routines, file and record copy, compare, positioning, dump routines, core load and punch routine, and library-maintenance routines.

References:
Library Documents VO-CATALOG, VO-CODECVT, VO-COPY80, VO-GET, VO-FILEDMP, VO-LIBEDIT, VO-LOADER, VO-LTAPERW, VO-MODIFY, VO-SEQUPD, VO-UTILITY, etc.

11. SNOBOL4

String Manipulation Language

References:
"The SNOBOL4 Programming Language" by R. E. Griswold, I. P. Polonsky, and J. F. Poage (Prentice-Hall, 1969).
Library Document RO-SNOBOL4

12. OPTIMA

Linear Programming System

References:
CDC 6400/6600 Optima Reference Manual
Publ. No. 60207000
Library Document H1-OPTIMA

13. BASIC

BASIC Interpreter, ALFIE Compiler

References:
Library Documents L2-BASIC, L2-ALFIE, L2-ALFCALC, L2-ALFINST, L2-ALFLANG, L2-ALFREF

14. SIMSCRIPT

Simulation Language

References:
CDC 6400/6600 Simscript Reference Manual
Publ. No. 60178300
Library Document H4-SIMSCRP

15. PERMANENT DISK FILE STORAGE

There is a limited amount of space available in the permanent disk file system for active user files. Users may also purchase their own disk packs for permanent file storage.

References:
Library Documents QO-PFILES, QO-PRMFILE, QO-XFILES

16. MAGNETIC TAPE

There are four magnetic tape drives available on the CDC 6500. Each drive is capable of reading and writing 1/2", 7-track magnetic tape. Magnetic tape format and usage is described in library document IO-MAGTAPE. The discussion in LO-CDCMACE and VO-UTILITY may also be helpful to magnetic tape users.

17. PAPER TAPE

The paper tape reader-punch is capable of reading and punching five, seven, or eight level paper tape. Library document IO-PAPRTAP.

18. GOULD ELECTROSTATIC PRINTER

The Gould electrostatic printer is a hard-copy graphic output device which prints in dot mode. It can be used to print text, low resolution plots, halftone photographs, and more.

Library Documents J8-GOULDEP, J1-WRITEEP, J4-TXTLIST, J5-ILLUSCC. New documents are being produced, so check the current CSCINDX for others.

19. OTHERS

There are many other programs and subprograms available under the MACE system. The user should see the library index for a complete list.

3.2 THE IBM 7094 SYSTEMS

The IBM 7094 is used primarily for PROCSY and for PUFFT (Purdue University Fast Fortran Translator) Fortran jobs. The system is not generally available for other user jobs. For PUFFT jobs see library document LO-PUFFT. For PROCSY see library document LO-PROCSY.

3.3 CONSULTING SERVICES

As computer speed and complexity increase, the probability of user error through subtle misuse of the system becomes increasingly higher. Since the majority of users utilize the computer facilities as a tool (in contrast to considering the computer itself as the main object of interest), it is desirable to make the use of this tool as efficient and pleasant as possible with the resources available. The average user is not expected to become an expert on the internal workings of the operating system. On the other hand, the computing center cannot successfully undertake to do programming for users. A realistic approach is to provide guidance, in the form of consultants, for users who experience difficulties that they cannot overcome by their own efforts. The center realizes that guidance concerning the use of the computer facilities cannot be approached casually; hence, a consulting staff and permanent consulting rooms are maintained.

The general consultants can give information on the use of the computing center facilities. They can answer questions about program control cards, deck setup, the use of library subroutines, and help with program debugging.

If the consultants are unable to solve a user's programming problem immediately they will request from the user pertinent data, i.e. listings, decks, etc. and refer the problem to the user services staff. The suggested solution will be returned to the user via the consultants. Users must not contact staff members directly with programming problems. All user programming problems will be referred to the consultants.

An after hours consulting service is also available to users with programming problems. The user must complete a form and file it along with a program listing and other pertinent material. This service is available 24 hours each day.

There is also a statistical consulting service specifically for users needing assistance in finding or using programs in our statistical program library. For information about this service, contact the statistical consulting office.

THE USE OF CONSULTANTS CANNOT BE EXPECTED TO SUBSTITUTE FOR A CAREFUL READING OF THE AVAILABLE MANUALS AND NOTICES. THE ULTIMATE RESPONSIBILITY FOR THE SUCCESS OF ANY PROGRAMMING PROJECT MUST LIE WITH THE USER.

3.4 ASSOCIATED PROGRAMMERS

Due to staff and budgetary limitations, the computing center cannot accept the responsibility of providing service programming on the applied problems of users. It is not even in a position to guarantee the effective recruiting of competent programmers who can be hired by users. On the other hand, it is willing to act as a clearing house in order to put persons wishing to program in contact with persons desiring programming assistance.

This is done by maintaining a file of information forms of those persons who have announced to the center their willingness to accept programming employment. Any persons wishing to be listed as available for such employment should contact the PUCC business office. Any persons wishing to hire programmers are invited to inspect this file by contacting the PUCC business office.

In order to keep the file up to date, those programmers who obtain positions should inform the PUCC business office they are no longer available so that the information sheets can be transferred to the inactive file.

3.5 KEYPUNCHING SERVICES

The computing center employs a small staff of professional keypunch operators to provide keypunching service for users with large volumes of data and/or programs. Users requiring this service should contact the PUCC operations shift supervisor.

3.6 PROGRAM LIBRARY SERVICES

There are many library programs available to users. An outline with references is given below.

The IBM 7094 PUFFT system includes the FORTRAN functions which are described in the IBM 7090/7094 FORTRAN IV (Form C28-6390-3) reference manual. The PUFFT system also has an extensive library of subroutines. Library document LO-PUFTLIB is an index for this PUFFT library. Individual write-ups for these PUFFT library subroutines are available at the document station.

The CDC 6500 system includes many sources of library programs and subroutines. Each compiler - FORTRAN, COBOL, ALGOL, etc. has its own library of subroutines. These subroutines are in the SYSTEMS library and documentation for them is in the appropriate CDC reference manual. For instance, the SIN routines is part of the FORTRAN library and documentation for it is in the CDC FORTRAN reference manual. In general, individual documents do not exist for these routines and the user is referred to the CDC reference manuals.

There are, however, many other routines in the SYSTEMS library for which library documents do exist. The user should see the library document index for a complete list.

In addition to the SYSTEMS library, the 6500 has three user libraries - RUNLIB, STATLIB, and EDLIB. The RUNLIB library contains a broad selection of FORTRAN subroutines, while the STATLIB and EDLIB libraries contain an extensive set of statistical programs. Again, the user is referred to the library document index to find RUNLIB and STATLIB routines. RUNLIB and STATLIB routines are maintained in both binary and source form so that the user may, by using the appropriate control cards, simply load the binary version of a program or subroutine and use it or he may choose to compile and possibly modify the source version. Library document VO-RUNLIB describes the use of RUNLIB library routines. Library document GO-STATPRF

describes the use of STATLIB library programs. Library document GO-EDSTAT describes the use of EDLIB library programs.

The computing center also maintains SPSS - Statistical Package for the Social Sciences. SPSS is an integrated system of computer programs for the analysis of social science data. The system provides the researcher with a unified and comprehensive package enabling him to perform many different types of data analysis in a simple and convenient manner.

In addition to the library programs described above, the computing center maintains documentation for programs from VIM (the CDC 6000 series users group) and some from various other sources. However, these programs have not, in general, been checked out on our computers. For information on these programs contact the PUCC librarian.

3.7 REFERENCE MANUALS

A set of reference manuals is maintained in B4.

Many of the reference manuals for the CDC 6500 system are on sale at the Military Bookstore located in the basement of the Armory building.

3.8 SHORT COURSES

The computing center conducts several non-credit short courses during the school year. These courses cover such topics as: Basic FORTRAN, Basic PROCSY, Using Statistical Programs, etc. All courses are announced in the newsletter and notices are posted on departmental bulletin boards. Contact the computing center secretary for additional information.

4. POLICIES FOR USE OF COMPUTING FACILITIES

4.1 APPLICATION FOR USE OF EQUIPMENT

The facilities of the computing center are available to any individual or group connected with Purdue University. All prospective users must submit a request for services (Business Office Form 0006) to the computing center. All users supported by research funds will be required to pay an hourly rate as specified in section 4.3. Educational and non-sponsored research activities must also submit a request for services in which they certify that no funds are available and request that funds be made available from the computer reserve. Upon receipt of a properly executed request for services, the computing center will issue a 'Job Code Number' which will serve to identify the user for billing and job accounting purposes. Prospective users may obtain blank 0006 forms and assistance in preparing them at the PUCC business office.

In addition to the request for services, each user will be asked to complete a brief problem abstract or description. The purpose of this abstract is two-fold. First, it provides the computing center with a means of knowing for what purpose the facilities are being used, so that internal programming efforts can be directed toward fulfilling needs of the users; and second it provides a written record of the use of the facilities.

4.2 LOGGING AND BILLING OF COMPUTER TIME

Every job processed produces a single time record, which contains the job code number, execution time, etc., for that job. The file consisting of all these records collected for a given month constitutes the input data to several accounting, bookkeeping, and billing routines. Each month a statement of charges is sent to each user holding an active job code. This statement contains the job number, number of hours used, the total amount charged, the source of funds, and the pertinent university account number. Summaries of the accounting information are published each month in the newsletter.

4.3 BILLING RATES (Effective Feb. 1972)

CDC 6500 System	Rates Per Hour		
	Internal	Internal + Overhead	External
a) 0-150,000 octal words of memory			
Central Processor Time*	$275	$350	$ 500
Input/Output Units**	$.26	$.20	$ .28
b) More than 150,000 octal words of memory			
Central Processor Time*	$550	$700	$1000
Input/Output Units**	$.52	$.40	$ .56
IBM 7094 System	$ 90	$125	$ 500
Calcomp Plotter	$ 10	$ 14	$ 20
Keypunching	$ 5	$ 5	$ 6

*Central Processor Time - dollars per hours.

**I/O - Rate per 1000 INPUT/OUTPUT units.

All rates are in dollars per hour. Charges for keypunching include verifier, personnel time, and materials. The internal rates apply to any individual or group connected with Purdue University.

4.4 SUPPLIES

Supplies fall into two classifications, expendable and non-expendable. Under the expendable classification come such items as cards, printer paper, programming forms etc. All such items in normal quantities are supplied without charge. If unusually large quantities of such supplies or specialized forms are required, then the user must purchase them from University Stores or through some vendor of such supplies.

The major item which falls into the non-expendable category is magnetic tape. For those users who must preserve large quantities of information from one computer run to another, this is best done by using magnetic tape. In such cases, the user has two alternatives; he may use tapes owned and stored by the computing center or he may buy new tapes and have them stored by the computing center. If a user chooses the first alternative he is restricted to not more than three tapes at any time and may not hold any tape for more than one month. A magnetic tape assignment form must be completed and filed with the PUCC librarian. For those having University funds tapes may be purchased through General Stores, using Stores Form No. 100. The following information should be included:

Catalog No.	Description	Unit Price
0-09-001000	2450 Ft. Magnetic Tape	$9.80

Loan tapes or tape storage space may be requested through the PUCC librarian.

5. SUBMISSION OF JOBS FOR PROCESSING

5.1 SUBMISSION OF JOBS

Jobs may be submitted at any of the self-service job submittal areas listed in the directory. A green card with a 5 character job identification should be placed in front of the jobcard. A duplicate yellow card is the user's receipt. The first letter of the job identification indicates the category, the second letter indicates the current series. The next three characters are the job number. Check your deck carefully before submitting it. The last card of the deck must be a 6-7-8-9 (multipunch in column 1) end-of-information card.

5.2 PICKUP OF OUTPUT

Output is returned to the corresponding self-service output area. The job number on the receipt card gives the slot number in which output for that job is filed.

Card decks are returned in the tray in which they were submitted. It is therefore a good idea to note the tray number (e.g. 17C) when submitting a deck for processing.