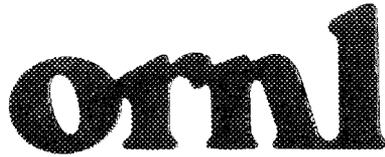




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**OAK RIDGE
NATIONAL
LABORATORY**

MARTIN MARIETTA

**BREEDING MULTIGENERATION
SUPPORT SYSTEM
REQUIREMENTS ANALYSIS FOR NCTR
04 February 1988**

**P. Y. Bengtson
R. Strand
A. Sjoreen**

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Energy Division
Decision Systems Research Section

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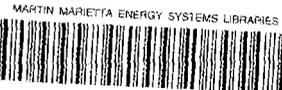
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BREEDING MULTIGENERATION SUPPORT SYSTEM

REQUIREMENTS ANALYSIS FOR NCTR

P. Y. Bengtson, R. Strand, A. Sjoreen

ABSTRACT

This study is a definition of the requirements for a Breeding Multigeneration Support System (BMSS) to be used by the National Center for Toxicological Research (NCTR). The BMSS will maintain management and planning information of a breeding colony of rodents maintained at NCTR. BMSS is a computer software support system which is being developed to collect and maintain information to: (1) manage the animal breeding functions, (2) the allocation of animals to experiments, and (3) control the breeding of animals within multigeneration experiments. Further work will result in an external design, internal design, and finally prototype software which will be thoroughly tested in actual use at NCTR.

NCTR REQUIREMENTS ANALYSIS

1. GENERAL INFORMATION

1.1 SUMMARY

This requirements analysis defines a Breeding Multigeneration Support System (BMSS) for the National Center for Toxicological Research (NCTR). It defines the hardware and software environment, and in general terms, the data, the data collection procedures and the standard reports required for BMSS.

In addition to system requirements, a time and cost estimate for system design and development, which includes external design, internal design, design walkthroughs, implementation, testing, sign-off procedures, documentation, and turnover to NCTR is also included.

1.2 ENVIRONMENT

Oak Ridge National Laboratory (ORNL) will develop the BMSS for NCTR operation on NCTR's computers. The target computer will be the VAX 8650 operated by the NCTR Division of Resource Information Management Systems (DRIMS). The target software will include:

- ADABAS version 1.3/T
- Natural version 1.1
- COBOL version 3.2
- TDMS
- VMS version 4.2

The hardware for data entry and terminal displays will be DEC VT 220s or equivalents hardwired to the VAX 780. Data entry will be performed with bar code readers, key entry, and signals received directly from the balance device.

The BMSS will be developed to serve four major groups of users:

1. The animal technicians who use the system to enter animal data and monitor their work,
2. Principal investigators who will be monitoring an

experiment and using the data for later analysis,

3. User Services personnel who must maintain the system, and
4. Quality Assurance personnel who monitor data quality.

The next stage of NCTR life cycle management is external design. The completed external design document will identify more specific hardware and software requirements.

The Experimental Breeding/Multigeneration portion of BMSS is likely to use capabilities of the new Breeding System and the existing INLIFE System. Specific portions of Breeding and Inlife to be used by Experimental Breeding will be described in the Internal Design Document.

1.3 REFERENCES

A number of documents are available to ORNL for the development of BMSS and to NCTR for the review and approval of BMSS.

1.3.1 Requirements Analysis References

The available documents are:

1. Research Proposal for Development of Breeding/Multigeneration Support System, submitted to National Center for Toxicological Research, Jefferson, Arkansas.
2. Task Order No. 1 for the Requirements Phase of Breeding/Multigeneration Support System
3. Interagency Agreement between the Food and Drug Administration (FDA) and the Department of Energy (DOE), Oak Ridge Operations (ORO). (DOE Number 1860-A024-A1, FDA Number 224-87-0004)
4. Inlife External Design, dated April 14, 1986
5. Inlife Data Collection System User's Guide DRIMS Doct. 4141-INL-1.0
6. Inlife Phase I Technical Documentation (DRAFT)
7. NARSS Data Definition Document dated 10/22/87
8. NARSS Project Status Report dated June 19, 1984

9. Toxicology Data Management Systems: Systems Development Guidelines, Standard Operating Procedures, TDMS Document 4505-SDG-2.0
10. Breeding Information System Terminal Operation Procedures, dated April 4, 1977
11. Breeding Information System Functional Specifications, prepared March 21, 1977
12. Standard Operating Procedures for Breeding Information System, dated November 1982
13. Guide to Accessing New Breeding Information System Database, prepared by Mike Holland, SISD on March 7, 1977
14. NCTR Computer Systems Designed for Toxicologic Experimentation III. Breeding Information System, prepared by Ron Barsh
15. Requested Changes and Additions to Breeding Information System, prepared by Charlie Schmieder in October 1987
16. Code of Federal Regulations Title 21, Chapter 1, Part 58-Good Laboratory Practice for Nonclinical Laboratory Studies
17. Breeding Information System Database Record Segment Definitions, received from Ron Barsh dated October 22, 1987
18. Breeding Information System Flags Values, received from Ron Barsh dated October 22, 1987
19. BIS Reports Number List
20. Kathy Carroll's Requirements List
21. March 7, 1977 Memorandum from Mike Holland. "Guide to Accessing New Breeding Information System Database".
22. Copies of reports: BS-013, BS-015, BS-016, BS-017, and BS-018
23. Copies of the two Daily Reports: BS-002 and BS-003.
24. Automated Breeding Information System with copies of reports and descriptions.
25. Six Flowcharts: (1) BIS Edit (Low Level), (2) E2GENER (Low Level Flow), (3) UPDATE (Low Level Flow), (4) E2GENER (High Level Flow), (5) UPDATE (High Level Flow), (6) BIS Data Flow.

26. Standard Operating Procedures for the Breeding Information System.

27. INLIFE Data Collection System Report Formats and Descriptions, #4114-INL/REP-1.0, November 1986.

28. INLIFE Data Collection System Report Formats and Descriptions, #4114-INL-REP-1.1 DRAFT.

29. INLIFE Group II Reports.

1.4 CHANGE CONTROL

Change control, or configuration management, is an important part of any software development effort. ORNL proposes to implement change control procedures to design documents, code tables, and test files in the project. Documents to which change control will be applied are the requirements analysis, external design, internal design, and data dictionary. ORNL will identify within a project management plan points in time when each of the controlled documents or items is to be approved by NCTR. ORNL will monitor proposed changes to the BMSS and ensure that all changes are reflected in a revised version of the controlled documents or items. Revised control documents or items must be identified as a revision and reapproved by NCTR. ORNL will transfer change control responsibility at completion of the BMSS to NCTR, along with the operation and maintenance of the BMSS. ORNL will provide more details on the change control process in later documentation.

2. CURRENT SYSTEMS

The proposed BMSS will be designed to service three functional areas (Figure 1) at NCTR- breeding, experiments, and experimental breeding. These three areas are currently either operational or are being established. The box in Figure 1 defines the generic functions required by investigators in the three functional areas.

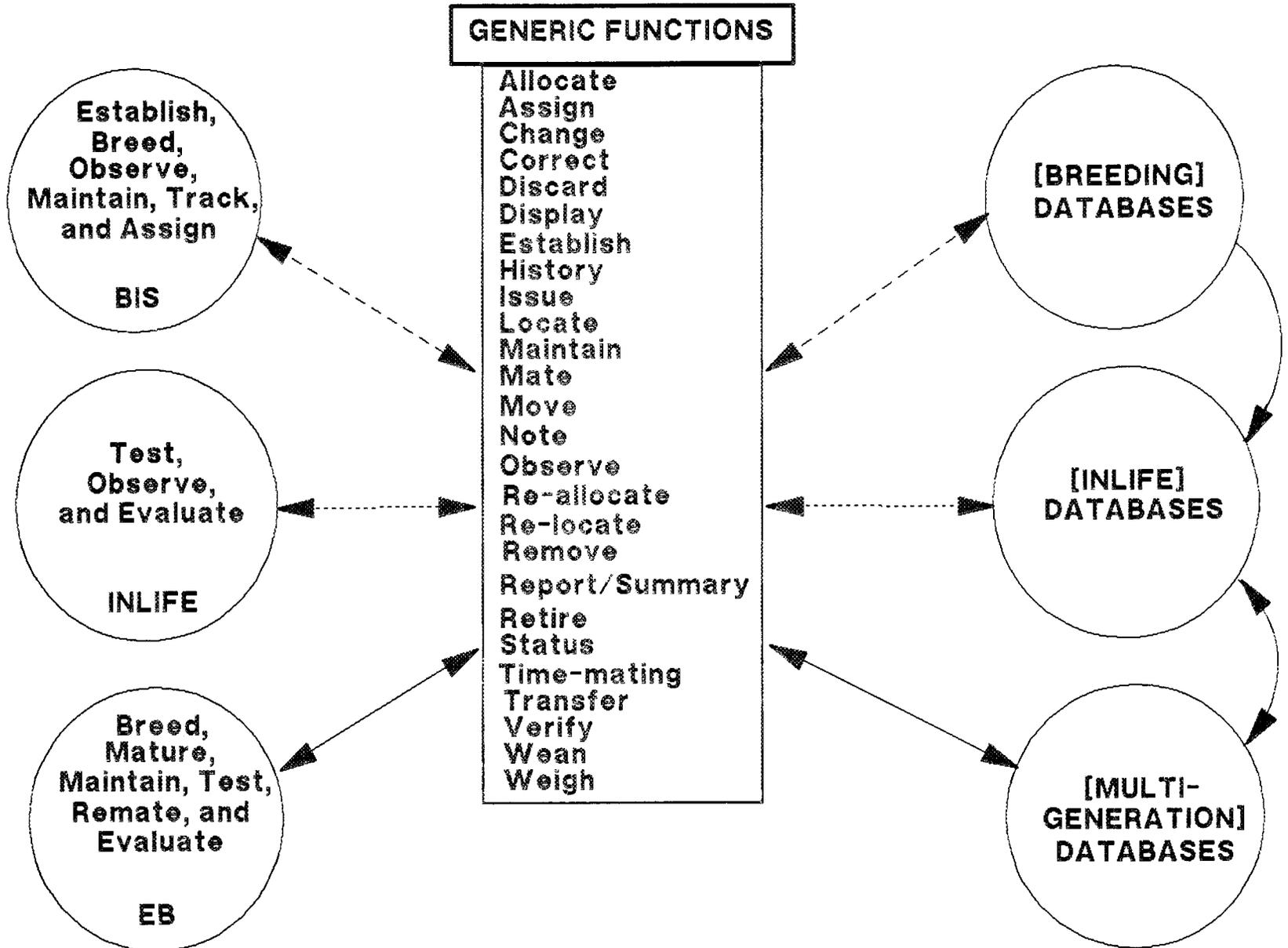
The Breeding Information System (BIS) is an existing system that keeps track of breeding pairs, assigns UIN's, allows observations on the animals to be recorded, and helps maintain the integrity of the animal strains being produced. The BIS also tracks genealogical history and produces daily, weekly, and ad hoc reports on the status of the breeding colony. Animals are considered removed from this system when they are allocated to an experiment or are disposed.

The second functional area of testing and evaluating animals within an experiment is being serviced by the INLIFE system. INLIFE allows observations on test animals and tracks animals from start to end of an experiment and produces historical data bases as well as reports.

The third functional area of Experimental Breeding (EB) (also called multigeneration studies) is being established to test and evaluate animals where multiple generations of aged-beyond-weaning animals are required. Hence, EB must have capabilities of BIS and INLIFE, along with new capabilities, such as treating pups in a litter as individuals.

The sections that follow will discuss each of these functional areas in more detail and present diagrams of data flow as presently defined by available documentation.

FIGURE 1. BMSS---General Capabilities and Functions



2.1 BREEDING INFORMATION SYSTEM

The Breeding Information System (BIS) contains the information required for maintaining the NCTR breeding colony and for providing animals needed for experiments. It supplies both a genetic trace of the animals in the colony and data on status and numbers. The current BIS meets almost all of the user's needs. The new system is being developed to allow retirement of the hardware on which the present BIS resides. The enhancements that have been requested are included in this analysis.

The current Breeding Information System (BIS) requires about two megabytes of online disk storage on the disk drives attached to the MODCOMP hardware. The archival data base resides presently on the IBM 370/168. This ADABAS-based file contains daily transactions and is used to generate standard reports on the breeding colony. The standard line printers available to the VAX 8650 are used for reports. The INLIFE facility used to produce identification cards which are attached to animal cages (e.g. breeding pairs) will be used in the converted BIS.

2.1.1 Functions

Table A.1 in Appendix A lists the over 30 discrete functions required for the BIS. These functions will be designed and implemented in the BMSS. Each function is designated as part of the current system by a function ID. These ID numbers also appear in the Data Flow Diagrams in Appendix B. In Table A.1 cross reference ID's are the section numbers from "Breeding Information System Terminal Procedures". All A and B numbers are from Section III. Note that no reporting functions are included except function ID 1.4. A function that has been requested is designated by the word NEW in the cross reference identification field. The input and output data used by these functions are included in Table A.1. The BS numbers in the output section refer to report numbers in the reports section of this document. Dates and UIN numbers are system generated.

Figures B.1 through B.6 in Appendix B are data flow diagrams which present the relationships among the BIS functions and data in Table A.1.

2.1.2 Data Elements

Table A.2 lists the data elements stored in the current BIS system. The current BIS output reports and the data included in them are shown in Table A.3. This table summarizes the data elements in the function descriptions in Table A.1.

2.1.3 Current Paper Reports

In Table A.3, the numbers in parentheses refer to function IDs in the BIS function definitions listed in Tables A.1 and A.2. The heading "Data Items" refers to user inputs; "Header" refers to information at the top of a report; "Summary" corresponds to calculations performed before printing.

2.1.3.1 Terminal Displays

The BIS variables shown in Table A.3 are to be queried for by the user at the terminal screen. For example, the user might want to query BIS for the status of a particular cage. The user would call up a screen for queries and enter a cage number. The following terminal displays are currently available in BIS:

```
Cage Status
Totals by strain for this CRT terminal
new born
issued males
issued females
issued unsexed
forced removals
All littered cages by room
All cages
```

The list of requested or new screen display functions for BIS are also shown below. Format and layout of these and all other requested items will be determined during the design phase of BMSS. All current terminal displays will be retained in some form.

```
Unproductive breeders by room by strain
Retirement candidates by room by strain
Feeders at a specific age
Daily work summary by room and strain
System orders on date needed
"System has been down" message
```

2.1.4 Limitations of Current System

The new system is needed because the current system's hardware is antiquated and difficult to maintain. In addition to this, the current system is incompletely documented. NCTR is phasing out its non-DEC equipment and consolidating its computer systems into DEC equipment. Because the current BIS operates interactively on a MODCOMP CPU with the master database residing on an IBM 4341, BIS must be rewritten to DEC equipment. Creating a new BIS will include an analysis of the data collection needs for the breeding colony as well as experimental breeding. This analysis will result in a system that more accurately meets the needs of the NCTR's Animal Husbandry and Experimental Breeding personnel.

2.1.5 Environment

BIS will run on the VAX 11/785 data entry CPU and VAX 8650 data base CPU. Input will be through standard DEC VT220 terminals or equivalents with either a keyboard template or custom-marked key caps. No dial-up access is anticipated. The VT220 keyboard layout will mirror the current BIS keyboard layout as much as is reasonably possible. Bar code readers will be used instead of the current punch card readers. Data will be input by animal technicians in animal rooms or from other locations.

Output will be both directed to standard line printers and to the VT220 screens. Screen copies or logs of daily activities will be required. Individual reports may be available on both devices or only on one, depending on the user's needs.

2.1.6 Operations and Maintenance

The BIS will be designed and implemented by ORNL personnel and their subcontractors under the direction of DRIMS personnel at NCTR. The system will be maintained and operated by DRIMS personnel and their contractors.

2.2 INLIFE SYSTEM

The INLIFE System is the first of the major modules designed to function as a component of NARRS. It is currently operational and

supports three major functions: Interactive Data Collection, Change Experiment/Test, and System Access.

INLIFE provides for the data collection, validation, storage, and reporting of information collected on animals used in experiments. Animals are assigned to a previously defined INLIFE experimental design through an allocation process in BIS. When the animals are removed from INLIFE, a Removal Reason and Disposition (not a required field) is entered in the record. All data on animals used in the system is maintained indefinitely. The Animal Unique Identification Number (UIN) provides a link back to the BIS. The Carcass Identification number (CID) provides a link to the systems that maintain pathology and other diagnostic information.

INLIFE may be modified as part of the BMSS software development effort. However, a large part of the functionality and software will be used as part of BMSS.

2.2.1 INLIFE Functions

Table A.4 lists the functions currently operational as part of INLIFE. The input and output data used by these functions are included in the table. Figures B.8 through B.38 are data flow diagrams which represent the relationships of the INLIFE functions.

2.2.2 INLIFE Data Elements

The INLIFE data elements are contained in the NARSS Data Definition Document, dated October 22, 1987, and will not be repeated in this document.

2.2.3 Current Status and Limitations of INLIFE

INLIFE is currently being finalized even though most of the required procedures are fully tested and operational. Specific capabilities required by experimental breeding will be considered for inclusion in INLIFE as they become defined by the experimental breeding projects.

2.2.4 INLIFE Environment

INLIFE is designed to run on DEC's VAX 7XX or 86XX series machines under version 4.2 of the VMS operating system. It is written in COBOL with Terminal Display Management System (TDMS) as the screen Generator. The database is maintained on the VAX machines using ADABAS version 1.3/T.

The INLIFE hardware includes a terminal system consisting of a balance, a barcode reader, a DIGITAL VT220 terminal or equivalent, a DIGITAL VT220 or equivalent keyboard, and an interface box.

2.2.5 Operation and Maintenance

INLIFE is currently in operation at NCTR and is maintained by DRIMS staff and subcontractors. The development of BMSS will make no changes to the current operation and maintenance arrangement.

2.2.6 INLIFE Reports

ORNL will not make any changes to the following INLIFE reports and tables. Most of these tables and reports will be incorporated as part of BMSS. There will be some modification required to reflect the requirement of BMSS to deal with multiple generations of animals while INLIFE only deals with one generation.

A detailed description of the reports will not be included here because the information is readily available in existing NCTR documentation. The report titles and sources are as follows:

1. Individual Daily Consumption Table (contained in document #4114-INL/REP-1.0)
2. List of Rejected Food Consumption Values (contained in document #4114-INL/REP-1.0)
3. Feeding Schedule Report (contained in document #4114-INL/REP-1.0)
4. Animals Removed from Experiment Report (contained in document #4114-INL/REP-1.1)
5. Selective Observations Report (contained in document #4114-INL/REP-1.1)

6. Animal/Cage History Report (contained in document #4114-INL/REP-1.1)
7. INRP004A, Rack Configuration by Cage (contained in document #4114-INL/REP-1.1)
8. INRP005, PCR Report (contained in document #4114-INL/REP-1.1)
9. INRP006, INLIFE Animal Summary (contained in document #4114-INL/REP-1.1)
10. INRP007, Individual Body Weight Table (contained in document #4114-INL/REP-1.1)
11. INRP008A, Individual Daily Food Consumption Table (contained in document #4114-INL/REP-1.1)
12. INRP008B, Individual Daily Water Consumption Table (contained in document #4114-INL/REP-1.1)
13. INRP009A, Rejected Food Consumption Values (contained in document #4114-INL/REP-1.1)
14. INRP009B, Rejected Water Consumption Values (contained in document #4114-INL/REP-1.1)

2.2.7 INLIFE Screens

The following screens have been defined for INLIFE. Each screen is referenced by its location in the functional design specifications. These screens will remain intact for the purposes of BMSS development.

<u>SCREEN</u>	<u>LOCATION IN INLIFE USER'S GUIDE</u>
Inlife Data Collection System Main Menu	page 3.2
Procedure Definition	opposite pg. 4.5
Schedule Definition	opposite pg. 4.7
Balance Calibration	opposite pg. 4.9
Identification Correction	opposite pg. 4.10
Cage Menu Screen	opposite pg. 4.11
Cage Menu Screen	opposite pg. 4.13
Cage Menu Screen	opposite pg. 4.15
Weigh Old Feeder	opposite pg. 4.18
Weigh Old Feeder	opposite pg. 4.20
Cage Observations	opposite pg. 4.22
Select Animal	opposite pg. 4.25
Select Animal	opposite pg. 4.30
Select Unscheduled Actions	opposite pg. 4.34
Re-Identify Animals in Cage	opposite pg. 4.35
Re-Identify Animals in Cage	opposite pg. 4.36
Animal Weight	opposite pg. 4.37
Animal Weight	opposite pg. 4.40

Animal Weight	opposite pg. 4.41
Clinical Observations	opposite pg. 4.44
Clinical Observation Table	opposite pg. 4.49
Site Table	opposite pg. 4.52
Size/Color Table	opposite pg. 4.54
Observation Summary	opposite pg. 4.56
Feed Check	opposite pg. 4.57
Death Check	opposite pg. 4.58
Cage Relocation	opposite pg. 4.59
Remove Animal	opposite pg. 4.61
Select Reason for Removal	opposite pg. 4.64
Select Dispositions	opposite pg. 4.65

2.3 EXPERIMENTAL BREEDING (Multigeneration Studies)

Experimental Breeding (EB) will combine many of the functions currently available in the existing INLIFE and BIS systems. All of the INLIFE functions will be available in Experimental Breeding. In addition, the BIS functions dealing with allocation, breeding, and littering will be available. This will allow scientists and animal technicians to perform experimental protocols which deal with multiple generations. Experimental Breeding will contain all the data checking, validation, and quality control procedures contained in BIS and INLIFE to ensure that the data stored in the Experimental Breeding meets NCTR and FDA standards for Good Laboratory Practices.

2.3.1 Experimental Breeding Functions

The functions of Experimental Breeding include a union of the BIS and INLIFE functions. Some BIS and INLIFE capabilities must be modified for use in Experimental Breeding. The data flow diagrams for INLIFE in B.7 through B.37 along with the breeding functions in B.38 to B.40 illustrate this relationship.

BMSS will need all the capabilities of INLIFE. In addition, the capabilities of the new BIS will be enhanced, where necessary, to take into account the needs of EB. For example, while BIS only allows an animal to be allocated once, BMSS will allow an animal to be allocated to several experiments in sequence. New reports will also be developed for BMSS, such as the Fertility report and Pup-Weight-at-Weaning report.

2.3.2 Why Experimental Breeding is Needed

Experimental Breeding is needed for multigeneration studies. It will allow scientists to store and access breeding data that must be kept entirely separate from the BIS data. Experimental Breeding will perform functions that are a part of INLIFE or are needed to breed animals within experiments. It will also ensure that the genetic trace data in BIS will not be corrupted by experimental breeding data.

3. METHODOLOGY

3.1 SOFTWARE OR LANGUAGES TO BE USED

The applications software used to implement BMSS will consist of TDMS, ADABAS, and COBOL. Other applications software available on NCTR computers that may be considered for the application are ADABAS/NATURAL report generation language, the Statistical Analysis System (SAS) and the interface between SAS and ADABAS (presently not on NCTR computers). The operating system software will be VMS/DCL. The conversion of the existing BIS on-line census and archival data bases on the IBM 4341 from IBM to DEC must be completed (by NCTR personnel or their contractors) before the new BIS will be functional.

3.2 STRUCTURED DESIGN FACILITY FOR CONTROLLING SYSTEM

To be considered during the initial stages of the design process is a structured design tool for creating data flows, dictionary, and other design data. ORNL is familiar with a number of tools and presently is considering which one to use for this project. The design phase of the project will consider this tool in more detail. In addition, ORNL will implement the project management plan to be used for monitoring and controlling this project on TIMELINE.

4. DESIGN AND DEVELOPMENT PLAN

ORNL proposes to design and implement the BMSS beginning with this requirements analysis and ending with the completion of final documents that describe the implemented system. The next phase of the life cycle will be to perform an external design of the BMSS (Table 1), including the finalization of the data dictionary, reports, and screens. A draft outline of the design phase has been provided to NCTR. The internal design phase follows the external design and will deal with data structures, test data base, functions, and file layouts. Implementation follows the design approval by NCTR. ORNL will update the implementation schedule and detail items within that schedule after the external design is completed.

Table 1. BMSS Design and Development Plan.

<u>Activities</u>	<u>Estimated Time Frame</u>	<u>Estimated Dollar Requirements</u>		
		<u>FY 87</u>	<u>FY88</u>	<u>FY89</u>
Project Management Plan				
Development & Update	Nov '87---Apr '89		47K	3K
Requirements Analysis	Oct 12-Dec 22 '87	62K		
External Design				
Dictionary	Jan '88-May '88		40K	
Screens	Jan '88-Apr '88		30K	
Reports	Jan '88-Apr '88		60K	
Internal Design				
Functions	Apr '88-Jun '88		80K	
Files	Apr '88-Jul '88		60K	
Test Database	Apr '88-Jul '88		10K	
Design Walkthrough	Jul '88-Aug '88		20K	
Design Document				
Delivery	Aug 10, 1988			
Design Approval	Aug 17, 1988			
Design Subtotal			300K	
Implementation & Coding	Aug '88-Mar '89		200K	150K
Testing and Walkthroughs	Jan '89-Feb '89			40K
Documentation & Turnover	Feb '89-Apr '89			50K
Totals		62K	547K	243K

APPENDIX A - TABLES

Table A.1 BIS FUNCTIONAL DEFINITIONS

Note that experiment and treatment numbers are included in the BIS data base after update. All dates and UIN numbers are system generated.

Function Name: Allocate animal to experiment

Function ID. 1.2.7.6 Cross Reference ID. B.21

Function Definition: Take an animal out of the breeding colony to be used in an experiment

Inputs: destination cage

Outputs: weight, ear clip/UIN pair, BS-012, BS-013, sex, treatment #, rack, side

Requested additions: Multiple sex per cage
Cage mates---up to 5 animals
Litter mate per cage and/or per column
Multiple sex per column, and/or side, and/or per cage
Multiple strain per column, and/or per cage, and/or per side, and/or per rack
Define matrix greater than 6 x 6
Be able to select animal mark or animal ID (5 digit) at random, not always in sequence of N,L,R,B.
Be able to allocate new animals.

Function Name: Assign breeder as feeder

Function ID. 1.2.5.2 Cross Reference ID. B.16

Function Definition: Move animal from breeder cage to feeder cage. Update animal's previous status--may require blocks of animals of one sex to be assigned.

Inputs: breeder cage id, feeder cage id

Outputs: UIN, animal status

Function Name: Assign feeder as breeder

Function ID. 1.2.5.3 Cross Reference ID. B.14

Function Definition: Move an animal from feeder cage to a breeder cage. Update animal's previous status.

Inputs: date, UIN, feeder cage id, breeder cage id

Outputs: UIN, animal status

Function Name: Breed animals

Function ID. 1.2.2 Cross Reference ID.

Function Definition: Place animals in breeding cage. Note pregnancy, birth. Wean litter.

Inputs: date, UIN, cage id, litter data

Outputs: new litter UIN's, breeder UIN's, BS-004, BS-007, BS-008, BS-

Functions Name: Enter Monitor Mode

Function ID. 1.7 Cross Reference ID. NEW

Function Definition: Request to monitor other BIS sessions; check
that user has permission to do this function

Inputs: Userid, request, room #

Outputs: Copy of Screen Displays

Function Name: Establish breeders

Function ID. 1.2.2.1 Cross Reference ID.

Function Definition: Record pair data, cross-reference mate data

Inputs: date, UIN, sex, cage id

Outputs: breeder cage data

Function Name: Identify animal destination

Function ID. 1.2.7.6.2 Cross Reference ID.

Function Definition: Determine to which experiment
room an animal is going

Inputs: experiment data

Outputs: animal requirements, destination

Function Name: Introduce a new strain

Function ID. 1.2.1 Cross Reference ID. B.19

Function Definition: record new animal data (new animal
purchase)

Inputs: date, strain, strain comment source (NEW), generation
number, date of birth, number, sex, cage id

Outputs: new animal UIN's

Function Name: Remove animal for analysis

Function ID. 1.2.7.5 Cross Reference ID. B.8,9,10

Function Definition: Send an animal to pathology,
diagnostics, or chemistry.

Inputs: date, UIN, disposition, issue cage id, cid

Outputs: cid/UIN pair, BS-003

Function Name: Maintain feeders

Function ID. 1.2.3 Cross Reference ID.

Function Definition:

Inputs: cage id, UIN

Outputs: cage id, UIN

Function Name: Maintain the Breeding Colony

Function ID. 1.0 Cross Reference ID.

Function Definition: -top level function-

Inputs: purchased animals, orders(experiments)

Outputs: animals to experiments, surplus animals, reports

Function Name: Move a cage out of the colony

Function ID. 1.2.7.6.5 Cross Reference ID. B.17,18,21

Function Definition: Deliver to experiment room

Inputs: UIN/cid pair, destination

Outputs: animal

Function Name: Move a cage within a room or the colony

Function ID. 1.2.6 Cross Reference ID. NEW

Function Definition: Change the location of a cage,
while maintaining all it's animal
data.

Inputs: date, cage, location, new location

Outputs: cage location

Function Name: Female littered

Function ID. 1.2.2.4 Cross Reference ID. B.13

Function Definition: Record date of littering, number
of animals in the litter

Inputs: date, cage id, number in litter, litter strain,
assign UIN #, block

Outputs: date of birth, BS-005, BS-009

Function Name: Note missing animal

Function ID. 1.2.7.2 Cross Reference ID. B.5

Function Definition:

Inputs: date, missing animal UIN

Outputs:

Function Name: Note pregnancy

Function ID. 1.2.2.3 Cross Reference ID. B.12

Function Definition: Record date on which pregnancy was
observed

Inputs: date, breeder cage data

Outputs: expected date of birth

Function Name: Observe animals

Function ID. 1.2.4 Cross Reference ID. B.3

Function Definition: Note unusual physical feature of
an animal, such as a tumor, or
its phenotype. Animal may be a
litter animal (NEW).

Inputs: date, cage id, UIN, observation, anatomical region

Outputs: BS-002

Function Name: On-line correction

Function ID. 1.5 Cross Reference ID. NEW

Function Definition: Allow animal technician to correct any
miss-entered data that appears on the screen

Inputs: current screen, correction request

Outputs: corrected screen

Function Name: Process cages

Function ID. 1.2 Cross Reference ID.

Function Definition: Perform all data collection needed
to maintain the colony.

Inputs: date, animal data, location data, operator id

Outputs: animals to experiments or analysis, discarded animals,
colony reports

Function Name: Put animal in issue cage

Function ID. 1.2.7.6.1 Cross Reference ID. B.17,18,21

Function Definition: Begin issue to experiment function.

Inputs: date, UIN, issue cage id, animal requirement

Outputs: UIN/issue cage

Function Name: Transfer animals out of breeding colony

Function ID. 1.2.7 Cross Reference ID. B.17,18

Function Definition: Function category including
removal, assignment, issuing for
survey

Inputs: date, UIN, reason for transfer, cid, disposition

Outputs: UIN's, BS-001

Function Name: Remove dead animal

Function ID. 1.2.7.3 Cross Reference ID. B.15

Function Definition:

Inputs: date, UIN, cage id, cid

Outputs: cid/UIN pair

Function Name: Sign off the system

Function ID. 1.3 Cross Reference ID.

Function Definition:

Inputs:

Outputs:

Function Name: Sign on to the system

Function ID. 1.1 Cross Reference ID. II

Function Definition: Verify operator id, password, and location

Inputs: date, operator id, password, room number

Outputs: access to system

Function Name: Transfer to a new breeder cage

Function ID. 1.2.2.2 Cross Reference ID. B.15

Function Definition: Remove a breeder from a breeder cage and place
it in another breeder cage with litter, if one
is present.

Inputs: date, cage id, breeder UIN, new cage id

Outputs: breeder UIN, cage id

Function Name: Verify mark

Function ID. 1.2.7.6.4 Cross Reference ID. B.21

Function Definition: Determine that animal has mark
according to experiment/order

Inputs: UIN, required mark/toe clip/ear punch/tag (NEW)

Outputs: UIN/clip pair

Function Name: Wean animals

Function ID. 1.2.2.5 Cross Reference ID. B.20,18

Function Definition: Remove animals from parents cage

Inputs: date, wean age, date of birth, sex, cage

Outputs: weaned animal UIN's, BS-006

Function Name: Weigh animals--individual

Function ID. 1.2.7.6.3 Cross Reference ID. B.21

Function Definition: Weigh animals in issue cage

Inputs: date, UIN/issue cage, weight

Outputs: weighed cage

Function Name: Weigh animals--group

Function ID. 1.2.4.1 Cross Reference ID. NEW

Function Definition: Weigh animals not in issue cage

Inputs: date, cage id, UIN, weight

Outputs: animal weight

Requested New Functions:

- o Manual entry of BIS data
- o Print copy of screen as log of activity; print log book sheets
- o Error Correction

Table A.2 BIS DATA ELEMENT, FUNCTION NUMBER, and DEFINITIONS.

<u>Data Name</u>	<u>Function</u>	<u>Definition</u>
animal	1.2	
UIN		unique identification number
strain code		
generation		
litter sequence		
sex		male, female, both, unsexed
birth date		
ear clip		none, left, right, both
sire UIN		
sire strain		
dam UIN		
dam strain code		
animal status	1.2.5	breeder, feeder, litter, issue
cage	1.2	
cage type		breeder, feeder, issue
number		
rack		
room		
CAN	1.2.7	common account number
CID	1.2.7	carcass identifier
date	all	
disposition	1.2.7	pathology, diagnostics, chemistry
experiment number	1.2.5.6	(cross-reference to order)
exp.room number		
exp.rack number		
cage number range		
treatment		
dose date		
issue reason		experiment, feeder, other
litter	1.2.2.4	
litter strain code		
litter UIN		
count		number of animals in a litter
father strain		
father UIN		
mother strain		
mother UIN		
date of birth		
# of males, # of females, litter sequence		
mark		ear clip, ear punch, toe clip
mate strain code		(output)
mate UIN		(output)
new animal/litter	1.2.1	
strain code		
strain comment (source)		
sex/count		
litter/count		

generation
date of birth
reference number
observation 1.2.4
mother lactating NEW
phenotype by strain NEW
tumor
anatomical feature
anatomical region
pregnant;littered
operator id 1.1.1.2 animal technician number
order animals needed for an experiment
previous status (output)
reason for removal 1.2.5.1
room number 1.1
starting UIN litter UIN
valid op.id's 1.1 valid operator identifiers
wean age 1.2 age at which a strain is weaned
weight 1.2.7.6.3 weight of animal(s) in a cage
work assignments 1.2 tasks for animal technicians

Table A.3 BIS Reports

Report Number: BS-001

Report Name: ASSIGNMENTS (1.2.5, 1.2.7)

Report Frequency: Daily

<u>Data Items</u>	<u>Header</u>	<u>Summary</u>
rec.no.	room	total male breeders set up
operator	strain	total female breeders set up
status	date	total male feeders setup
UIN/count	time	total female feeders set up
sex/mark		total unsexed feeders set up
generation		total males issued
source		total females issued
destination		total unsexed issued
assignment		total males allocated
CAN		total females allocated
experiment number		
mate UIN		
reference number		

Report Number: BS-002

Report Name: OBSERVATIONS (1.2.4)

Report Frequency: Daily

<u>Data Items</u>	<u>Header</u>	<u>Summary</u>
rec.no.	room	total littered
operator	strain	total pregnant
status	date	total alopecia
UIN/count	time	total dyspnea
sex/mark		total tissue mass
source		total soft feces
observation/weight		total rough hair
litter-UIN		total brown
litter-generation		total swelling
		total new born

Report Number: BS-003

Report Name: REMOVALS (1.2.5.1)

Report Frequency: Daily

<u>Data Items</u>	<u>Header</u>	<u>Summary</u>
rec.no.	room	total males culled
operator	strain	total females culled
status	date	total unsexed culled
UIN/count	time	total males surplusd
sex/mark		total females surplusd
source		total unsexed surplusd
type-removal		total males retired
carcass id		total females retired
		total males found dead
		total females found dead
		total unsexed found dead
		total missing
		total males to pathology
		total females to pathology
		total unsexed to pathology
		total males to diagnostics
		total females to diagnostics
		total unsexed to diagnostics
		total males to chemistry
		total females to chemistry
		total unsexed to chemistry

Report Number: BS-004

Report Name: FEMALE AND MALE BREEDER CARDS (1.2.2)

Report Frequency: As Needed

Data Items

UIN
mated date
strain
generation
from cages number
birthdate
room number
cage number,check digit
rec.no.
date litter born (female)
number in litter (female)
number weaned (female)
remarks;m/f/dead (female)

Report Number: BS-005

Report Name: ANIMAL BIRTH FROM DATE MM/DD/YY to MM/DD/YY
(1.2.2.4)

Report Frequency: AS NEEDED

<u>Data Items</u>	<u>Header</u>	<u>Summary</u>
birth date	room	total born; strain/room
wean date	strain	total born this date
establish date		
room	time	
cage		
sire strain		
sire UIN		
dam strain		
dam UIN		
litter strain		
litter UIN		
litter number		
generation		
litter size		

Report Number: BS-005A

Report Name: ANIMAL BIRTH RECAP (1.2.2.4)

Report Frequency: AS NEEDED

<u>Data Items</u>	<u>Header</u>	<u>Summary</u>
strain code	date	
total litters	time	
total born	period covered	
average litter size		
projected weaned 90%		
projected weaned 95%		

Report Number: BS-006

Report Name: ANIMALS WEANED FROM MM/DD/YY TO MM/DD/YY (1.2.2.5)
Report Frequency: AS NEEDED

<u>Data Items</u>	<u>Header</u>	<u>Summary</u>
wean date		total pairs; strain/room
birth date	time	total litters
room	period of	total dead
cage	report	total culled
sire strain		total surplus
sire UIN		total survey
dam strain		total issue
dam UIN		total breeder/feeder
litter strain		
litter UIN		
litter size		
dead		
culled		
surplused		
survey		
issue		
breeder/feeder		
generation		

Report Number: BS-007

Report Name: BREEDER ASSIGNMENTS FROM MM/DD/YY TO MM/DD/YY
(1.2.2)
Report Frequency: AS NEEDED

<u>Data Items</u>	<u>Header</u>	<u>Summary</u>
establish date		total breeders/room
room	time	total assigned today
cage	reporting	total assigned this
	period	period by strain
sire birth date		total assigned this
		period
sire strain		
sire UIN		
sire from cage		
sire from room		
dam birth date		
dam strain		
dam UIN		
dam from cage		
dam from room		

Requested Modification or Addition: hybrid cages reported by
hybrid strain code, not female code

Report Number: BS-008

Report Name: ACTIVE BREEDER (1.2.2)

Report Frequency: AS NEEDED

<u>Data Items</u>	<u>Header</u>	<u>Summary</u>
room	date	total active pairs
male strain	time	in room
male UIN		
female strain		
female UIN		
cage		
generation		
date established		

Report Number: BS-009

Report Name: AVERAGE LITTER SIZE FROM MM/DD/YY to MM/DD/YY
(1.2.2.4)

Report Frequency: AS NEEDED

<u>Data Items</u>	<u>Header</u>	<u>Summary</u>
strain	time	
litter number	date	
number born	period covered	
number litters		
average size		

Report Number: BS-010

Report Name: UNPRODUCTIVE BREEDER PAIRS (1.2.2)

Report Frequency: AS NEEDED

<u>Data Items</u>	<u>Header</u>	<u>Summary</u>
room	date	total pairs/strain
cage	time	total pairs/room
sire strain		
sire UIN		total pairs/strain
dam strain		total pairs/room
dam UIN		
establish date		
establish days		
last litter date		
last litter days		
last litter number		
next to last date		

Report Number: BS-011

Report Name: RETIREMENT CANDIDATES (1.2.2)

Report Frequency: AS NEEDED

<u>Data Items</u>	<u>Header</u>	<u>Summary</u>
room	date	total/strain
cage	time	total
strain		
UIN		total/strain
sex		total
date established		
days as breeder		
birthdate		
age		

Report Number: BS-012

Report Name: DAILY ALLOCATION (1.2.7.6)

Report Frequency: DAILY

<u>Data Items</u>	<u>Header</u>	<u>Summary</u>
cage	experiment	total males allocated
UIN	room	total females allocated
ear clip	rack	total allocated
sex	date	
treatment number	time	
destination	alloc.date	
assignment		
CAN		
experiment number		
mate UIN		
reference number		

Report Number: BS-013

Report Name: ALLOCATIONS RECAP (1.2.7.6)

Report Frequency: DAILY

<u>Data Items</u>	<u>Header</u>	<u>Summary</u>
rec.no.	room	total males allocated
operator	strain	total females allocated
status	date	
UIN/count	time	
generation		
destination		
assignment		
CAN		
experiment number		
mate UIN		
reference number		

Report Number: BS-014

Report Name: Not Available

Report Frequency:

Report Number: BS-015

Report Name: SYSTEM EDIT SUMMARY

Report Frequency: AS NEEDED

<u>Data Items</u>	<u>Header</u>	<u>Summary</u>
assignments	time	transactions processed
observations	date	with errors
removals		requested deleted
allocations		passing edit
deletions		errors encountered
		internal transactions
		to database

Report Number: BS-016

Report Name: SYSTEM DATABASE UPDATE SUMMARY

Report Frequency:

Report Number: BS-017

Report Name: SYSTEM DRIVER SUMMARY

Report Frequency:

Report Number: BS-018

Report Name: FEMALE BREEDER HISTORY

Report Frequency:

<u>Data Items</u>	<u>Header</u>	<u>Summary</u>
litter UIN	time	totals by sex
birth date	date	totals by disposition
size	UIN	
number	date of birth	
animal UIN	room/cage	
sex	male UIN	
culled	total weaned	
surplused		
missing		
dead		
breeder		
feeder		
issue		
survey		

Report Number: BS-019

Report Name: Not Available
Report Frequency:

Report Number: BS-020

Report Name: ACTIVE FEMALE BREEDER DESCENDANT REPORT
Report Frequency:

Report Number: BS-021

Report Name: BREEDER ALLOCATION WEIGHTS
Report Frequency:

Report Number: BS-022

Report Name: Not Available

Report Number: BS-023

Report Name: PRODUCTIVITY INDEX (1.2.2)
Report Frequency: AS NEEDED

<u>Data Items</u>	<u>Header</u>	<u>Summary</u>
strain	time	
average weekly weaned	date	
standard deviation	period covered	
total breeders		
total weaned		

Report Number: BS-024

Report Name: Not Available
Report Frequency:

Report Number: BS-025

Report Name: CAGE CHECK REPORT
Report Frequency:

Report Number: BS-026

Report Name: ISSUE PUNCH CARD REPORT
Report Frequency:

Report Number: BS-027

Report Name: ROOM CARD PUNCH FORMAT REPORT
Report Frequency:

Requested Reports:

Report Name: Animals in Feeder status with time of projected mating

Report Name: Transfer/issue cages with animals in them by strain

TABLE A.4 NCTR PROJECT INLIFE FUNCTIONAL DEFINITIONS

Following is a list of the major functions in the existing INLIFE system. The Cross Reference ID lists the page in the INLIFE Data Collection System User's Guide, DRIMS Doct. #4141-INL-1.0, where the function is defined.

Most of these major functions have a number of inputs and outputs. The numbers in parenthesis () for the inputs and outputs serve to tie a given input with its resulting output.

Function Name: Logon ID #
Cross Reference ID. 3.1
Function Definition: Allow user to get from the VAX operating system to the INLIFE Data Collection System.

Inputs: (1) VMS operator name, CR,
Outputs: (1) validation of operator name, error message,

Function Name: Main Menu, Identification Information ID #
Cross Reference ID. 3.1
Function Definition: This is the main identification menu for INLIFE, a user is allowed to do interactive data collection, change the experiment/test, or logoff INLIFE.

Inputs: (1) "6",
(2) "1",
(3) "7",
(4) new experiment/test number
(5) PF 2,

Outputs: (1) closes all files, closes the transaction files, logged off the VAX system,
(2) sequences to the interactive data collection function,
(3) prompt for new experiment/test,
(4) previous experiment/test files are closed, opens experiment/test files of new experiment, validates new experiment/test number,) prompt for function desired in new experiment,
(5) field help test, screen help text,

Function Name: Interactive Data Collection ID #
Cross Reference ID. 4.2
Function Definition: Allows data collection for a specific equipment. System determines that the experiment/test is valid. The terminal, keyboard, and barcode are validated to ensure they are for the correct type of equipment.

- Inputs: (1) experiment/test, location (room), terminal ID, keyboard ID, barcode ID,
(2) GOLD Q,
(3) CR,
(4) "4",
(5) "2",
(6) PF 2,
- Outputs: (1) session number, validation of information entered, associates this identification information with all data collected in this session,
(2) deletes all data entered, confirmation message, a "Y" response to the confirmation message will execute the action, a "N" response to the confirmation message will cancel the action,
(3) sequence to the first scheduled action, sequences to the procedure definition screen,
(4) sequence to the balance calibration screen,
(5) sequence to the procedure definition screen,
(6) field help text, screen help text,

Function Name: Procedure Definition Screen ID #

Cross Reference ID. 4.5

Function Definition: This screen allows the user to review action schedules (both protocol and user-defined) and to define new action schedules. The protocol-defined action schedule relates actions to specific cages on specific days of the experiment. The user-defined action schedule defines one set of actions for all cages processed during the time it is in effect. The screen displays: SCREEN ID, SYSTEM DATE, SYSTEM TIME, CURRENT CAGE, and EXPERIMENT TEST.

- Inputs: (1) "1",
(2) "2",
(3) "3", action codes,
(4) "4",
(5) "5",
(6) GOLD M,
(7) GOLD 4,
(8) PF 2,
- Outputs: (1) prompt for input for the first action of a user-defined action schedule, warning message if there is no user-defined action schedule,
(2) prompt for input for the first action of a study definition schedule, warning message if there is no study defined action schedule,
(3) prompted to enter desired action codes, validation of action codes, reorder actions, sequence to the schedule definition screen,

- (4) display the actions as defined in the action schedule currently being followed, error message if no current schedule defined,
- (5) display the actions as defined in the study definition system, error message if there is no protocol schedule in existence,
- (6) sequence to the main menu screen,
- (7) sequence to the balance calibration screen,
- (8) field help test, screen help test,

Function Name: Schedule Definition Screen ID #

Cross Reference ID. 4.7

Function Definition: This screen displays the codes and text from the Action for Test file. It also allows the user to define a current action schedule (user-defined). The actions can be selected and the order of actions can be changed. Actions will be rearranged by INLIFE into cage actions first, animal actions second, and independent actions last. If weights are to be taken, the required actions and sequence must be followed.

Inputs: (1) select desired actions, select desired action order, CR,
 (2) GOLD C,
 (3) GOLD Q,
 (4) PF 2,

Outputs: (1) validation of action codes entered, check for duplicate codes, error messages, sequence to procedure definition screen,
 (2) deletes all data entered on this screen, starts data entry again on this screen,
 (3) deletes all data entered on this screen, returns to the procedure definition screen,
 (4) field help text, screen help text,

Function Name: Balance Calibration Screen ID #

Cross Reference ID. 4.9

Function Definition: Identification and calibration of the balance must occur prior to the first weighing action of this session. If the balance has not been calibrated in this session, INLIFE will automatically sequence to this screen. The user must enter the balance ID using the barcode reader or the numeric keypad.

Inputs: (1) balance ID, CR,
 (2) place required weights on balance, key in weight reading, CR, allow balance to transmit weight reading to screen,

- (3) GOLD Q,
 - (4) PF 2,
- Outputs:
- (1) validation of balance ID, calibration weights,
 - (2) validation of weight readings,
 - (3) sequence away from balance calibration screen if calibration is not required, can not sequence away of calibration is required,
 - (4) field help text, screen help text,

Function Name: Identification Correction Screen ID #

Cross Reference ID. 4.10

Function Definition: The Identification Correction Screen comes up showing current values for: operator ID, Terminal ID, Barcode ID, and Keyboard ID. The use can sequence between fields and change them as needed. All new IDs are validated as originally entered. If any ID is changed, the current session is closed and a new session entered.

- Inputs:
- (1) operator ID, terminal ID, barcode reader ID, keyboard ID, "TAB", "F12", CR,
 - (2) GOLD Q, "Y", "N",
 - (3) PF 2,
- Outputs:
- (1) current operator ID, current terminal ID, current barcode reader ID, current keyboard ID, validation of new IDs, close current session, open new session, required transactions, error messages, return to the function the user came from,
 - (2) confirmation message that all changes will be canceled, a "Y" response to the confirmation message will sequence to the function the user came from with no changes, a "N" response to the confirmation message will remain in the identification correction screen,
 - (3) field help text, screen help text.

Function Name: Cage Menu Screen

ID #

Cross Reference ID. 4.11

Function Definition: This allows the user to select the cage to be processed and to select additional actions to be processed. INLIFE sequences to this screen before proceeding to any cage or animal action.

- Inputs:**
- (1) cage ID, unscheduled actions CR,
 - (2) GOLD 6,
 - (3) GOLD M, "Y", "N",
 - (4) GOLD R,
 - (5) GOLD 2,
 - (6) GOLD 3,
 - (7) GOLD 4,
 - (8) GOLD 9,
 - (9) GOLD T,
 - (10) "6",
 - (11) GOLD 7,
 - (12) "1" in response to warning that cage selected has already been observed in this processing cycle
 - (13) "2" in response to warning that the cage selected has already been observed in this processing cycle, additional actions,
 - (14) PF 2,
- Outputs:**
- (1) validation of cage number, sequence to the first scheduled action for cage, unscheduled actions will be validated, error message,
 - (2) sequence to the observation summary screen,
 - (3) confirmation message that any scheduled actions will not be prompted, sequence to the main menu, a "Y" response to the confirmation message will execute the action, a "N" response to the confirmation message will not execute the action,
 - (4) deletes any data entered on this screen, sequences to the cage field to restart data collection,
 - (5) sequence to the procedure definition screen,
 - (6) sequence to the identification correction screen,
 - (7) sequence to the balance calibration screen,
 - (8) normal completion of this screen, sequence to the first independent action, sequence to the procedure definition screen,
 - (9) sequence to the select unscheduled actions screen,
 - (10) sequence to the observation summary screen,
 - (11) leave repeating field before completing all occurrences,
 - (12) prompt for another cage,
 - (13) prompt for additional actions, validate the additional actions, prompt to execute the additional actions,
 - (14) field help text, screen help text,

Function Name: Process Container Weights

ID #

Cross Reference ID. 4.18

Function Definition: The user is prompted to weigh: Old Feeder, Old Bottle, New Cage, New Feeder, and New Bottle. Screen ID, System Date, System Time, Experiment/Test, and Cage are displayed. INLIFE prompts for the necessary weights, calculates individual weights from the cumulative weight of the new items, and validates that the weights are within the appropriate range.

- Inputs:**
- (1) weights, CR,
 - (2) "5"
 - (3) GOLD N,
 - (4) GOLD O,
 - (5) GOLD R, "Y", "N",
 - (6) "1" in response to weight out of range warning,
 - (7) "2" in response to weight out of range warning,
 - (8) "3" in response to weight out of range warning,
 - (9) PF 2,
- Outputs:**
- (1) prompt for old feeder, prompt for old bottle, prompt for new cage, prompt for new feeder, prompt for new bottle, error messages, required transactions, sequence to next action,
 - (2) saves data entered on this field, sets override flag for remaining scheduled actions, sequence to the cage menu screen,
 - (3) deletes data collected on screen, restarts screen to re-enter the data,
 - (4) sets override flag for the data normally collected, sequence to the next scheduled action,
 - (5) deletes all data entered for this cage, confirmation message, a "Y" response to the confirmation message will execute the action, a "N" response to the confirmation message will not execute the action, sequence to the cage menu screen,
 - (6) sets the validation out of range flag in the transaction,
 - (7) deletes the weight entered and allow the reentry of the weight,
 - (8) sequence to the replace/recalibrate balance screen,
 - (9) field text help, screen text help,

Function Name: Cage Observations and Notes

ID #

Cross Reference ID. 4.22

Function Definition: The Cage Observation Screen displays: Screen ID, System Date, System Time, Experiment/Test, and Cage. The user enters codes for cage conditions. At least one code and as many as five codes can be entered. Condition codes are validated. Up to four lines of text can be entered as notes.

Inputs:

- (1) cage condition codes, notes, CR,
- (2) "5",
- (3) GOLD N,
- (4) GOLD O,
- (5) GOLD R, "Y", "N",
- (6) GOLD 7,
- (7) PF 2,

Outputs:

- (1) validation of cage condition codes, error messages, required transactions,
- (2) saves data already entered on cage observation screen, sets override flag for remaining cage and animal actions, sequence to the cage menu screen,
- (3) deletes all data on the screen, sequence to first input position on screen to start data collection again,
- (4) deletes any data collected on the screen, sets override flag for the data usually collected, sequence to the next scheduled action for this cage,
- (5) confirmation message, deletes all data collected for this cage, a "Y" response to confirmation message will execute action, a "N" response will cancel the action, sequence to the cage menu screen,
- (6) leave repeating field before completing all occurrences,
- (7) field text help, screen text help,

Function Name: Select Animal Process

ID #

Cross Reference ID. 4.25

Function Definition: The user is allowed to select animals to be processed and to select any unscheduled actions to be performed for the animal. The Select Animal Screen displays: Screen ID, System Date, System Time, Experiment/Test, and Cage. The IDs for the animals assigned to that cage are displayed along with information about whether the animal has actions scheduled for this day. The user must select an

animal using the SELECT ANIMAL field. This must be a valid entry and must be performed before going to any other fields. The user can add up to six additional actions for the animal selected in addition to the actions which were already scheduled. These additional actions are validated by the system.

- Inputs:
- (1) animal ID, up to six additional action codes for this animal, CR, "1",
 - (2) GOLD 3,
 - (3) GOLD 6,
 - (4) GOLD A,
 - (5) GOLD M, "Y", "N",
 - (6) GOLD N,
 - (7) GOLD R, "Y", "N",
 - (8) GOLD T,
 - (9) GOLD 4,
 - (10) GOLD 7,
 - (11) GOLD 8,
 - (12) GOLD 9, "Y", "N",
 - (13) PF 2,
- Outputs:
- (1) validation of animal ID, validation of additional action codes, error messages, required transactions, sequence to the next scheduled action for the selected animal, a "1" in response to an error message that the selected animal has already been processed will allow the selection of another animal,
 - (2) sequences to the identification correction screen,
 - (3) sequences to the observation summary screen, display of observations for current session, current cage, and current animal,
 - (4) deletes all data collected in current session on any animals in this cage, starts collecting data on this cage again,
 - (5) all data on this cage of animals will be deleted, sequences to main menu screen, confirmation message, a "Y" response to confirmation will execute option, a "N" response to confirmation will cancel the option,
 - (6) data on the screen will be deleted, sequences to the first data field on the screen to restart data collection,
 - (7) sequences to the cage menu screen, all data on current cage and animals will be lost, confirmation message, a "Y" response to confirmation message will exercise the option, (8) a "N" response to the confirmation message will cancel the option,
 - (8) sequences to the select unscheduled actions

animal assigned to the cage. The current status (Present or Absent) are also presented.

- Inputs: (1) reason for correction, CR,
(2) "Y"
(3) "N"
(4) GOLD Q,
(5) PF 2,
- Outputs: (1) accepts correction reason, confirmation message,
(2) agree with confirmation message,
(3) disagree with confirmation message,
(4) sequences to the select animal field without changing any data
(5) field help text, screen help text,

Function Name: Animal Weight Process

ID #

Cross Reference ID. 4.37

Function Definition: This process allows the user to enter animal weights. INLIFE displays: Screen ID, System Date, System Time, Experiment/Test, and current Cage. The user can enter the weights from the keyboard or automatically from the balance. INLIFE uses the cumulative weight approach so that the new cage, water bottle, feed, and any other animals must already be on the balance. The animal weight is validated against expected. Both the weight from the balance and the animal weight are displayed. Animal weights are validated against the minimum and maximum weight ranges for that day of the experiment. The percentage deviation between the current animal weight and the previous animal weight are also calculated and compared against the percentage deviation in the study definition.

- Inputs: (1) animal onto balance, CR,
(2) "1",
(3) GOLD 6,
(4) GOLD A,
(5) GOLD N,
(6) GOLD O,
(7) GOLD R, "Y", "N",
(8) When Animal out of weight range "1",
(9) When Animal out of weight range "2",
(10) When Animal out of weight range "3",
(11) PF 2,
- Outputs: (1) cumulative weight, animal weight, error

- messages, required transactions, sequence to the next action for current animal,
- (2) saves data on this animal, sets override flag for remaining actions on this animal, required transactions,
 - (3) sequence to observation summary screen,
 - (4) deletes all data collected in the processing cycle about all animals in this cage, begin processing the animals again,
 - (5) delete all data collected on this screen, start processing the screen again,
 - (6) deletes all data collected on the screen, sets an override flag for the data to be collected, sequences to next scheduled action for this cage,
 - (7) sequences to the cage menu screen, discards all data collected in this processing cycle on this cage and animal data, confirmation message, executes option in response to "Y", does not execute the option in response to "N",
 - (8) accept an out of weight reading, sets override flag in transaction,
 - (9) weight reading is deleted, sequence to weight field for reentry,
 - (10) sequence to the balance calibration screen,
 - (11) field help text, screen help text,

Function Name: Clinical Observation Process

ID #

Cross Reference ID. 4.44

Function Definition: This option will allow the user to enter up to eight observations describing abnormalities in the current animal or to indicate that the animal is normal. The Screen ID, System Date, System Time, Experiment/Test, Cage Number and Animal Number are displayed. At least one observation or the Override Flag must be entered. INLIFE prompts for the observation code, site, size and color. If the site, size or color are required for a particular observation or experiment, INLIFE will prompt for them. The same observation code can be entered again to designate a different site, size or color. Duplicate observations are not allowed. All observation codes are validated and a short text description appears. Text for the current observation is highlighted.

- Inputs:
- (1) observations regarding animal, text notes describing observation, CR,
 - (2) "1",

- (3) GOLD N,
 - (4) GOLD A,
 - (5) GOLD O,
 - (6) GOLD P,
 - (7) "6",
 - (8) GOLD C,
 - (9) GOLD L,
 - (10) GOLD T,
 - (11) GOLD R, "Y", "N",
 - (12) GOLD 7,
 - (13) GOLD 9,
 - (14) PF 2,
- Outputs:
- (1) validation of codes, error messages, required transactions, sequence to the next s c h e d u l e d actions,
 - (2) saves data already entered for this animal, s e t s override flag for remaining actions scheduled for this animal, sequences to the select animal screen,
 - (3) delete data collected on this screen, start this screen again,
 - (4) deletes all data collected in current processing cycle about animals in this cage, begin processing animals in this cage again,
 - (5) deletes all data on this screen, sets override flag for data to be collected, sequence to next scheduled action for this animal,
 - (6) sequences to the observation preceding this one, allow change or deletion of the highlighted observation,
 - (7) sequences to the observation summary screen,
 - (8) sequences to the color/size table screen,
 - (9) sequences to the site code table screen,
 - (10) sequences to the observation table screen,
 - (11) deletes all cage and animal data collected, confirmation message, deletes in response to "Y", returns to cage menu screen in response to "Y", cancel delete in response to "N",
 - (12) escape from repeating field before all occurrences complete,
 - (13) normal completion of function, required transactions, return to cage menu screen,
 - (14) field help text, screen help text,

Function Name: Clinical Observation Table Screen ID #

Cross Reference ID. 4.49

Function Definition: This set of two screens displays the valid observation code and text which can be entered for a particular study. Entry of these fields is performed exactly as in the Clinical Observation Screens. Notes can not be entered on this screen.

Once you sequence to a Table Screen from the Clinical Observations Screen, the system will not return to the Clinical Observations Screen until the observations are completed.

- Inputs: (1) observation code, CR,
(2) GOLD C,
(3) GOLD L,
(4) GOLD N,
(5) GOLD P,
(6) GOLD S,
(7) GOLD 9,
(8) GOLD F,
(9) PF 2,
- Outputs: (1) validation of observation codes, error messages, required transactions, sequence to position for next code,
(2) sequence to color/size table screen,
(3) sequence to the site table screen,
(4) deletes all data collected, sequence to the clinical observation screen,
(5) sequences to the clinical observation screen, sequences to the observation previous to this one,
(6) sequences to the second clinical observation table screen,
(7) normal completion of function, required transactions, sequence to the clinical observation screen,
(8) sequences to the first clinical observation table screen,
(9) field help text, screen help text,

Function Name: Site Table Screen

ID #

Cross Reference ID. 4.52

Function Definition: This screens displays the valid site code and text which can be entered for a particular study. Entry of these fields is performed exactly as in the Clinical Observation Screens. Notes can not be entered on this screen. Once you sequence to a Table Screen from the Clinical Observations Screen, the system will not return to the Clinical Observations Screen until the observations are completed.

- Inputs: (1) site codes, CR,
(2) GOLD C,
(3) GOLD N,
(4) GOLD P,
(5) GOLD T,

- (6) GOLD 9,
 - (7) PF 2,
- Outputs:
- (1) validation of site codes, error messages, required transactions, sequences to the next site code position,
 - (2) sequence to the color/size table screen,
 - (3) deletes all data entered, sequence to the clinical observation screen,
 - (4) sequences to the clinical observations screen, sequences to the observation immediately preceding this one,
 - (5) sequences to the observation table screen,
 - (6) normal completion for this function, required transactions, sequence to the clinical observation screen,
 - (7) field help text, screen help text,

Function Name: Size/Color Table Screen ID #

Cross Reference ID. 4.54

Function Definition: This screen displays the valid observation code and text which can be entered for a particular study. Entry of these fields is performed exactly as in the Clinical Observation Screens. Notes can not be entered on this screen. Once you sequence to a Table Screen from the Clinical Observations Screen, the system will not return to the Clinical Observations Screen until the observations are completed.

- Inputs:
- (1) size/color codes, CR,
 - (2) GOLD L,
 - (3) GOLD N,
 - (4) GOLD P,
 - (5) GOLD T,
 - (6) GOLD 9,
 - (7) PF 2,
- Outputs:
- (1) validation of size/color codes, required transactions, error messages,
 - (2) sequence to the Site Code Table Screen,
 - (3) deletes data, sequences to the Clinical Observation Screen,
 - (4) sequences to the Clinical Observation screen, sequences to the previous observation on that screen,
 - (5) sequences to the Observation Table Screen,
 - (6) normal completion of this transaction, required transactions, sequence to the Clinical Observation Screen
 - (7) field help text, screen help text,

Function Name: Observation Summary Screen

ID #

Cross Reference ID. 4.56

Function Definition: The screen displays the data currently being collected for the current cage. The user sequences to this screen from the Cage Menu Screen, Select Animal Screen, Animal Weight Screen, or the Clinical Observations Screen. The screen is a display only screen and displays the data that has been collected on the current cage and its animals.

- Inputs:** (1) CR,
(2) PF 2,
- Outputs:** (1) sequence to the observations on the next animal in the cage, sequence to the function from which this screen was called,
(2) field help text, screen help text,

Function Name: Feed Check Screen

ID #

Cross Reference ID. 4.57

Function Definition: This screen allows the user to indicate that a rack has been checked for food remaining. Cage numbers are manually entered or barcoded. INLIFE prompts for a cage number from the rack and a Feed Check Transaction is automatically generated. When the user enters a cage number, a Food Remaining Transaction is automatically entered for that cage. (IT IS NOT CLEAR WHAT IS TO BE DONE IF THERE IS NO FOOD REMAINING)

- Inputs:** (1) cage number,
(2) GOLD M,
(3) GOLD 2,
(4) GOLD 9,
(5) PF 2,
- Outputs:** (1) food remaining transaction, sequences to be ready for next cage number,
(2) sequences to Main Menu Screen,
(3) sequences to the Procedure Definition Screen,
(4) normal completion for this function, required transactions, sequence to next scheduled action, sequence to the Procedure Definition Screen
(5) field help text, screen help text,

Function Name: Death Check Screen

ID #

Cross Reference ID. 4.58

Function Definition: The screen allows the user to check a rack for dead or moribund animals. INLIFE prompts for a cage number from the rack. This automatically generates a Death Check Transaction. If the user enters a cage number from the same rack, INLIFE sequences to the Remove Animal Screen and allows the user to remove an animal. If the user enters a cage number from a different rack, INLIFE enters a Death Check Transaction for that rack.

- Inputs:**
- (1) cage number from rack "i",
 - (2) another cage number from rack "i",
 - (3) cage number from rack "i+1",
 - (4) GOLD M,
 - (5) GOLD P,
 - (6) GOLD 9,
 - (7) PF 2,
- Outputs:**
- (1) start death check for rack "i", required transactions,
 - (2) sequence to Remove Animal Screen, required transactions,
 - (3) start death check for rack "i+1", required transactions,
 - (4) sequence to the Main Menu Screen,
 - (5) sequence to the Procedure Definition Screen,
 - (6) normal completion for this function, required transactions, sequence to next scheduled action, sequence to the Procedure Definition Screen
 - (7) field help text, screen help text,

Function Name: Cage Relocation Screen

ID #

Cross Reference ID. 4.59

Function Definition: This screen allows the user to move a cage from one location to another. The destination building/room/rack must be valid for this test. The destination position must not already be occupied by another cage.

- Inputs:**
- (1) destination building, destination room, destination rack, CR,
 - (2) GOLD M,
 - (3) GOLD N,
 - (4) GOLD Q,
 - (5) GOLD P,
 - (6) GOLD 9,
 - (7) PF 2,
- Outputs:**
- (1) validation step, error messages, required

- transactions, position cursor for another relocation,
- (2) sequence to the Main Menu Screen,
 - (3) delete data and restart screen,
 - (4) delete data and return to function from which Cage Relocation was called,
 - (5) sequences to the Procedure Definition Screen,
 - (6) normal end of this function, required transactions, sequence to the next scheduled action
 - (7) field help test, screen help text,

Function Name: Remove Animal Screen

ID #

Cross Reference ID. 4.61

Function Definition:

This screen allows the user to remove animals from the experiment, assigning a carcass ID, Reason for Removal, and if applicable, a disposition. The user can reach this screen as a result of: (1) the schedule of action for the day, (2) selecting GOLD 8 on the Select Animal Screen, or (3) from the death Check Screen. What is displayed, and what the required entries are depend on how the user reached this screen.

If the user arrived as a result of a scheduled action, he or she must remain until GOLD 9 is selected. None of the data fields will be completed. The user must complete: CAGE NUMBER, ANIMAL ID, CARCASS ID, and REASON FOR REMOVAL. All fields must have valid entries. If the user arrived as a result of selecting GOLD 8 on the Select Animal Screen, he or she will return to the Select Animal Screen as soon as this function is completed for the animal chosen on that screen. In this case, the CAGE NUMBER and ANIMAL ID fields will be completed by INLIFE. The user must complete the CARCASS ID and REASON FOR REMOVAL fields.

If the user arrived from the Death Check Screen, he or she will return to the Death Check Screen as soon as this function is completed. INLIFE will have completed the CAGE NUMBER FIELD. The user must complete the ANIMAL ID, CARCASS ID, and REASON FOR REMOVAL fields.

All entries will be checked and invalid entries will generate an error message. Any errors must be corrected.

While in the Remove Animal function, the user is prompted to enter data for any actions defined as removal actions in the Study Definition files for the experiment. These actions can include weighing, and observing animals.

In addition if the last animal is being removed from a cage, the WEIGH OLD BOTTLE and WEIGH OLD FEEDER selection option will display at the bottom of the screen.

If an action is to be selected from the bottom of the screen, it should be selected before INLIFE prompts for the scheduled removal action. Only one action can be selected from the bottom of the screen. There will not be an opportunity to do additional removal actions once the scheduled removal actions are begun.

- Inputs: (1) Cage Number, Animal ID, Carcass ID, Reason for Removal, CR,
(2) GOLD Q,
(3) GOLD 4,
(4) GOLD N,
(5) GOLD 7,
(6) GOLD 9,
(7) PF 2,
- Outputs: (1) validation of entries, error messages, required transactions, sequence to Select Animal Screen, sequence to Remove Animal Screen, sequence to Death Check Screen,
(2) data is not saved, sequence to Select Animal Screen, sequence to Remove Animal Screen, sequence to Death Check Screen,
(3) sequence to the disposition table,
(4) delete data entered and restart screen,
(5) escape repeating field,
(6) normal completion for the screen, next scheduled action, Procedure Definition Screen, required transactions
(7) field help text, screen help text,

Function Name: Reason for Removal Screen

ID #

Cross Reference ID. 4.64

Function Definition: This screen displays the Reasons for Removal codes and associated text that are valid for the study. The only to sequence to this field is by entering GOLD 5 from the REASONS FOR REMOVAL field on the Remove Animal Screen. The EXPERIMENT/TEST, CAGE, ANIMAL, SYSTEM DATE, and SYSTEM TIME are displayed. The user must enter the REASON FOR REMOVAL field. This reason is validated and if valid, a transaction is written. The user is then sequenced to the DISPOSITIONS field of the Remove Animal Screen.

- Inputs:** (1) reason for removal code, CR,
(2) GOLD Q
(3) PF 2,
- Outputs:** (1) validate code, required transactions, sequence to the Remove Animal Screen, error messages
(2) does not save data, sequence to Remove Animal Screen
(3) field help text, screen help text,

Function Name: Select Dispositions Screen

ID #

Cross Reference ID. 4.65

Function Definition: This screen displays the disposition codes that are valid for this study. The only way to sequence to this field is by entering a GOLD 4 from the DISPOSITIONS field on the Remove Animal Screen. The only input field on this screen are the SELECT DISPOSITIONS field. Up to five dispositions can be entered. The dispositions are validated, a transaction is written, and the user is returned to the SEQ FLAG field of the Remove Animal Screen.

- Inputs:** (1) up to 5 dispositions, CR,
(2) GOLD Q
(3) PF 2
- Outputs:** (1) validated dispositions, required transactions, error messages, sequence to Remove Animal Screen,
(2) sequence to Remove Animal Screen
(3) field help text, screen help text,

FIGURE B.2

BIS Level 1 Data Flow Diagram from Maintain Breeding Colony 1.0

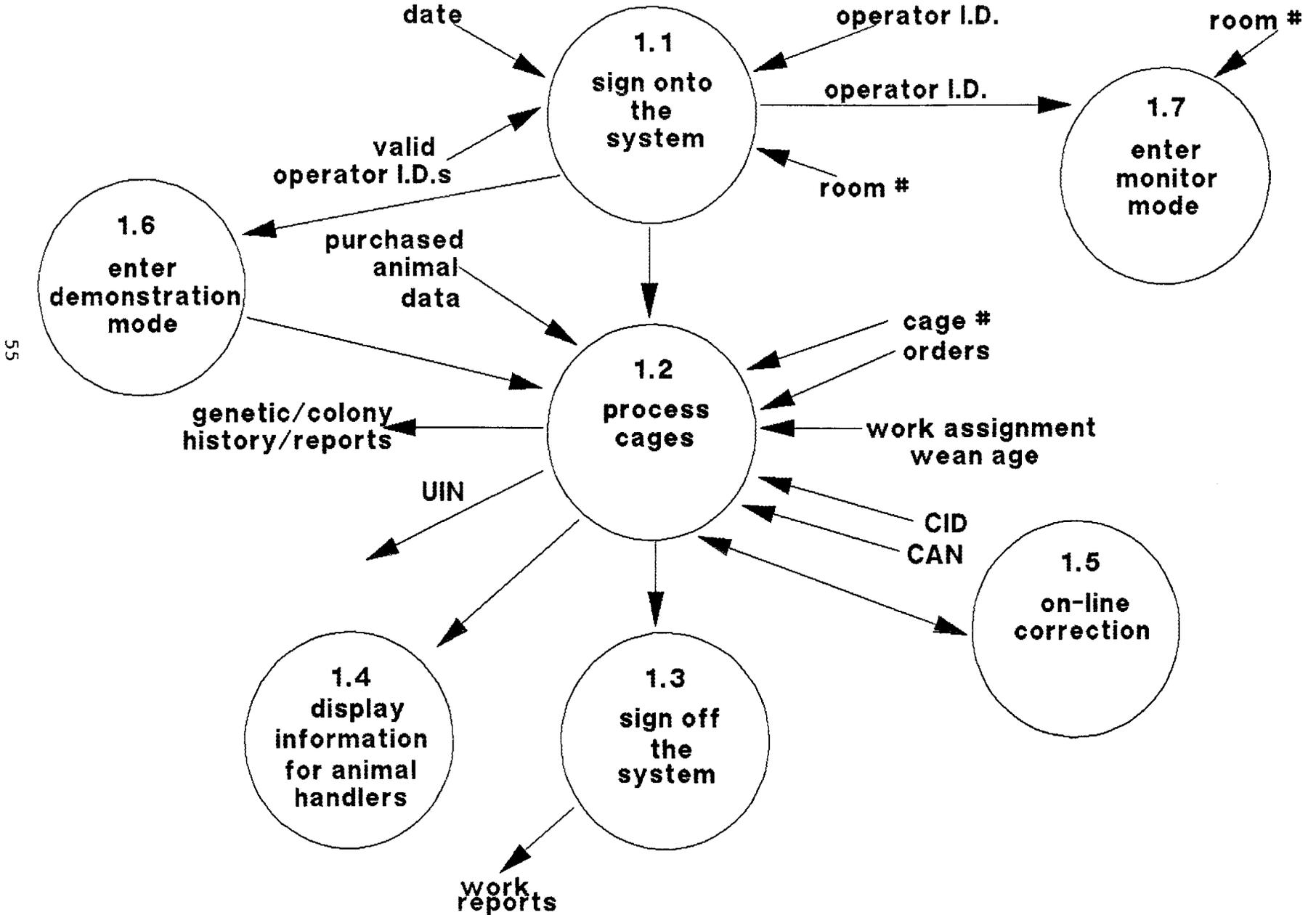


FIGURE B.3

BIS Level 2 Data Flow Diagram from Process Cages 1.2

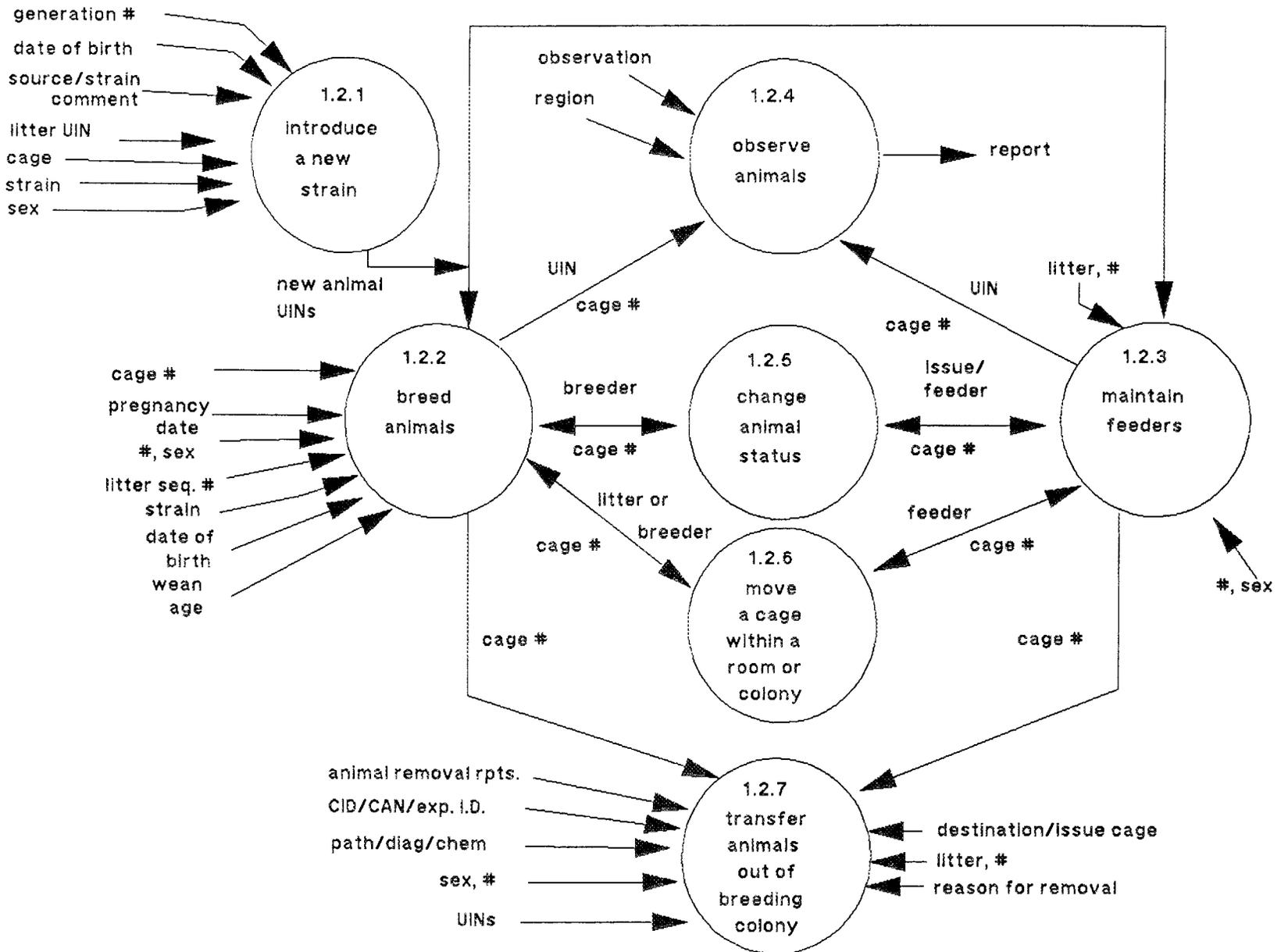


FIGURE B.4

BIS Level 3 Data Flow Diagram from Breed Animals 1.2.2

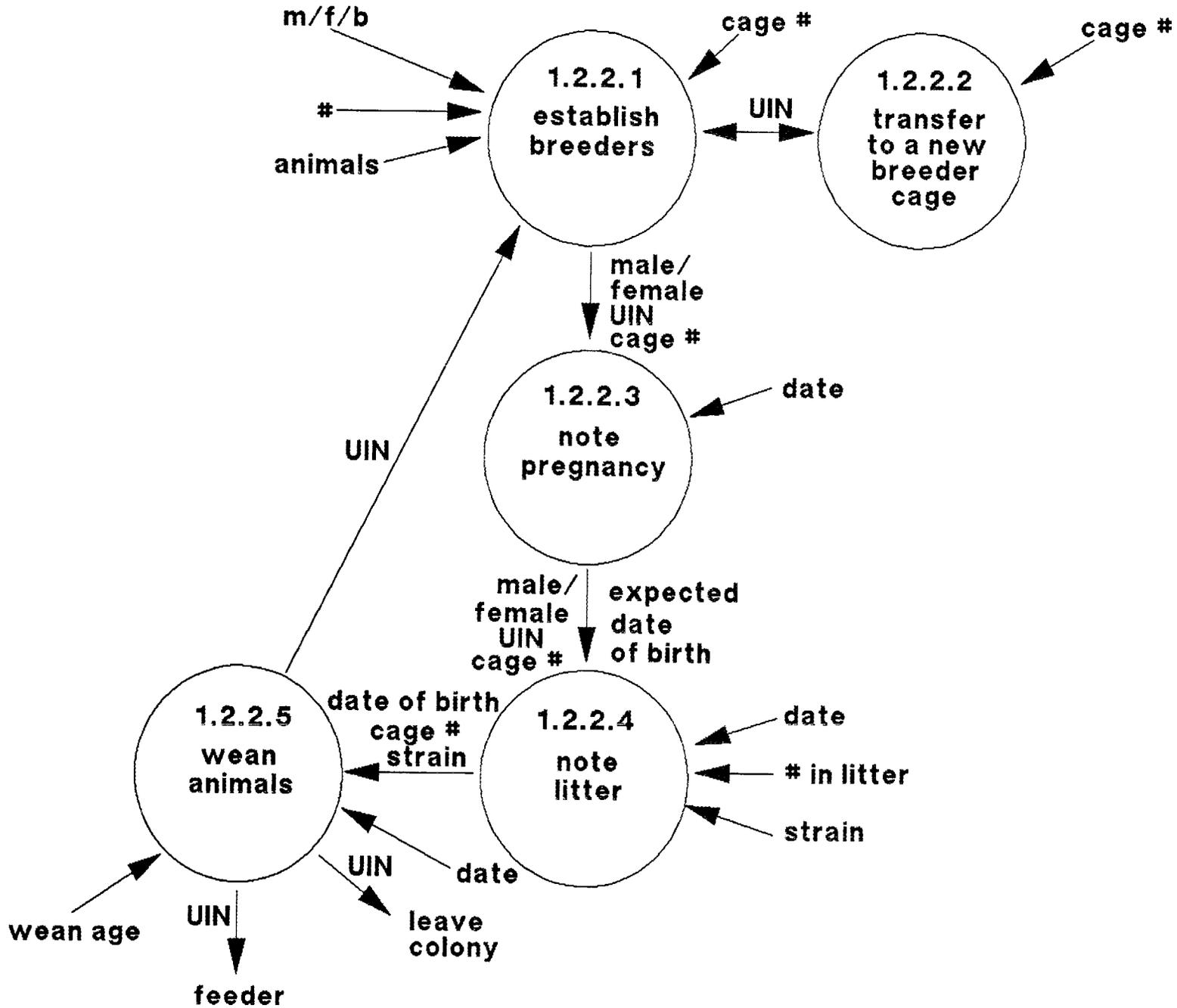


FIGURE B.5

BIS Level 3 Data Flow Diagram from Change Animal Status 1.2.5

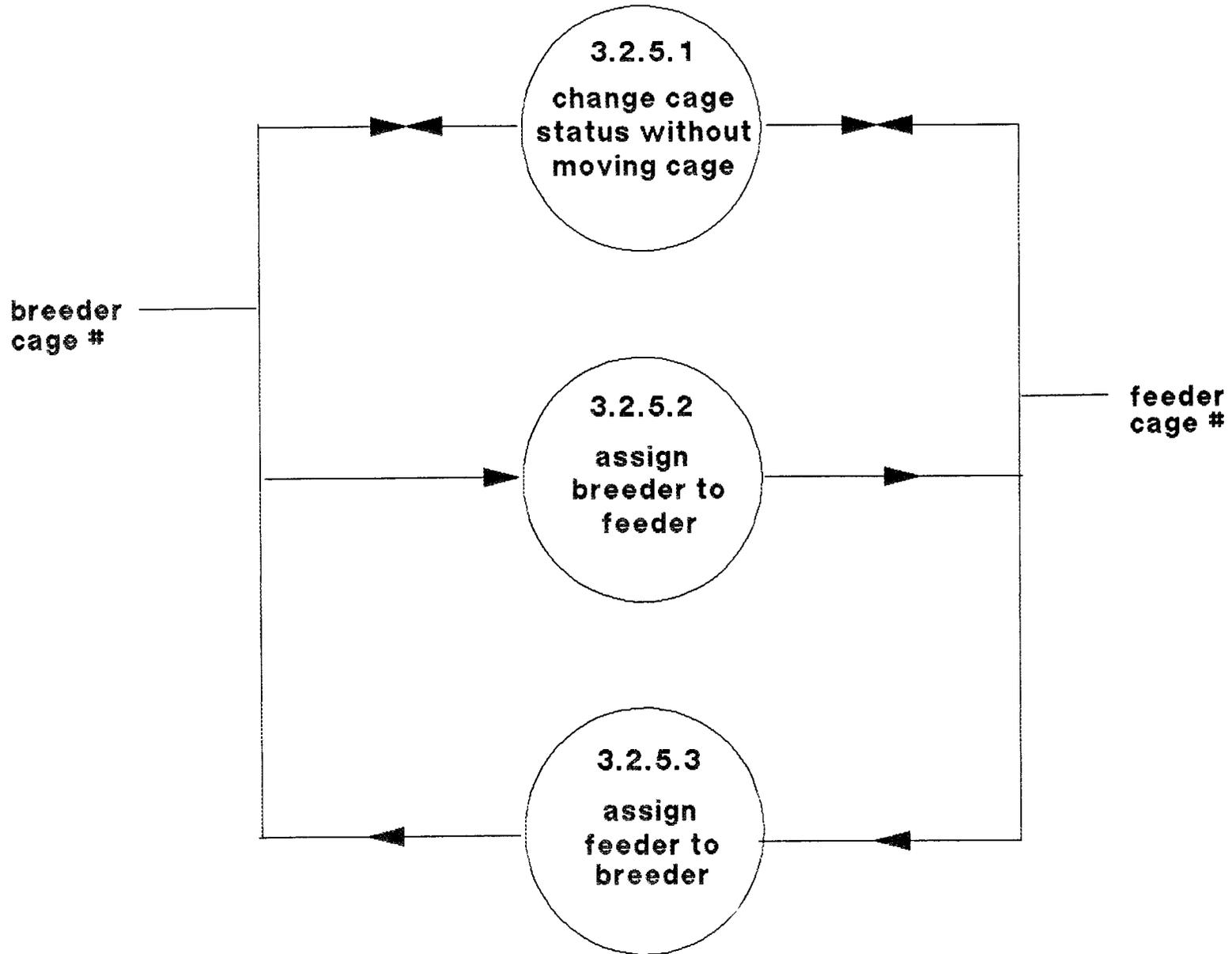
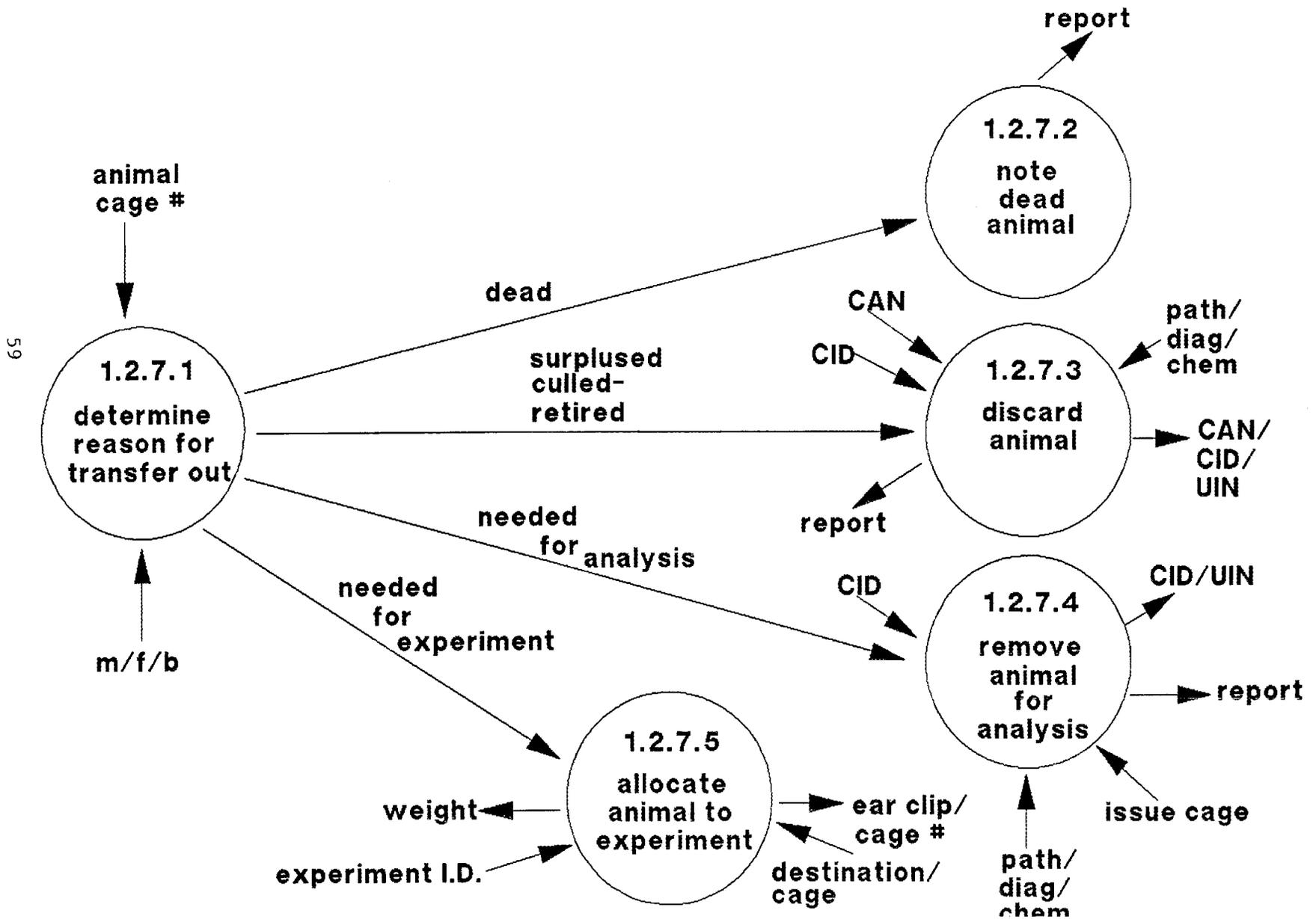


FIGURE B.6

BIS Level 3 Data Flow Diagram from Transfer Animals 1.2.7



59

FIGURE B.8
INLIFE Level 0 Data Flow Diagram

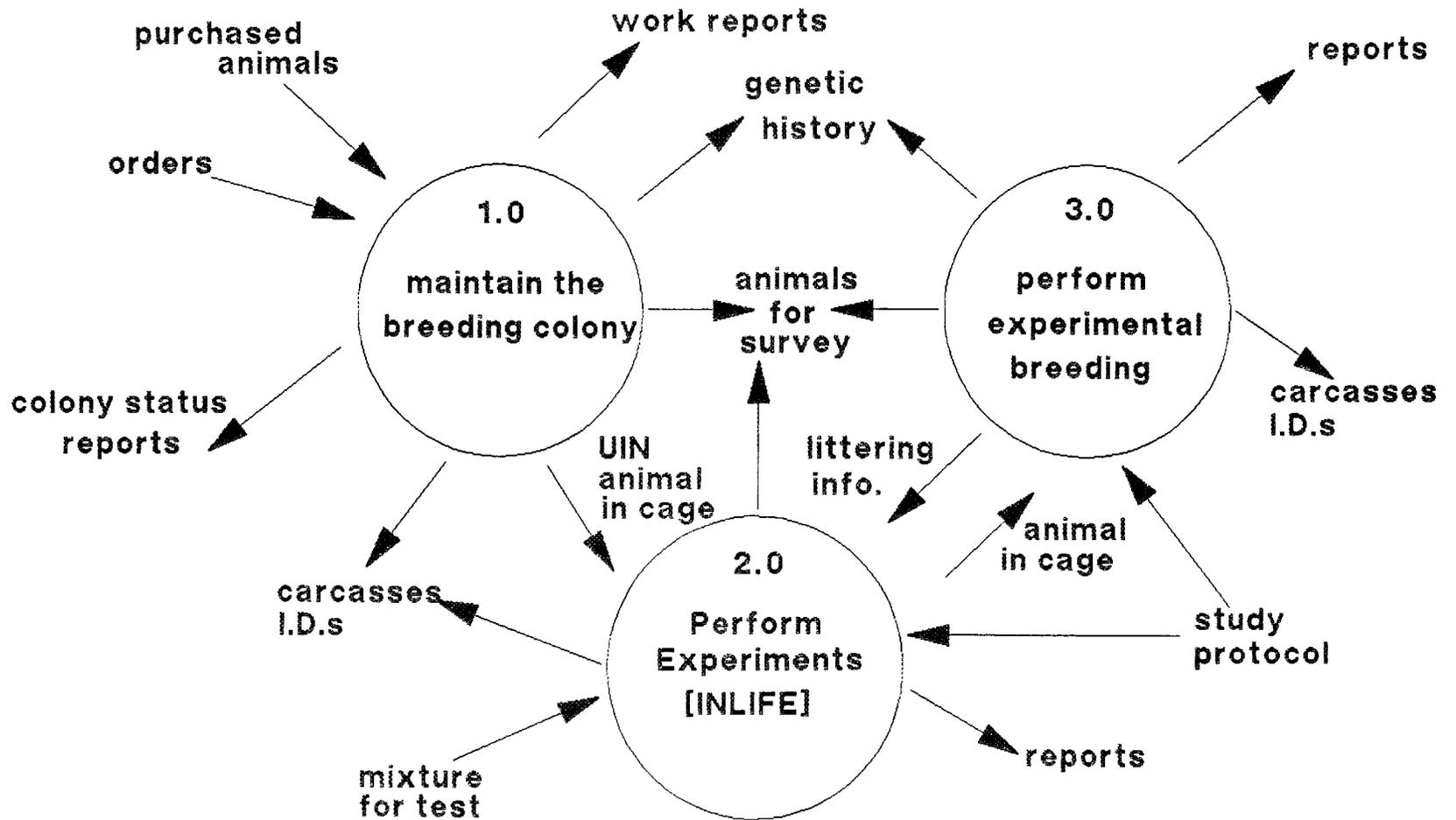


FIGURE.B.10

INLIFE Level 2 Data Flow Diagram from Procedure Definition 2.7

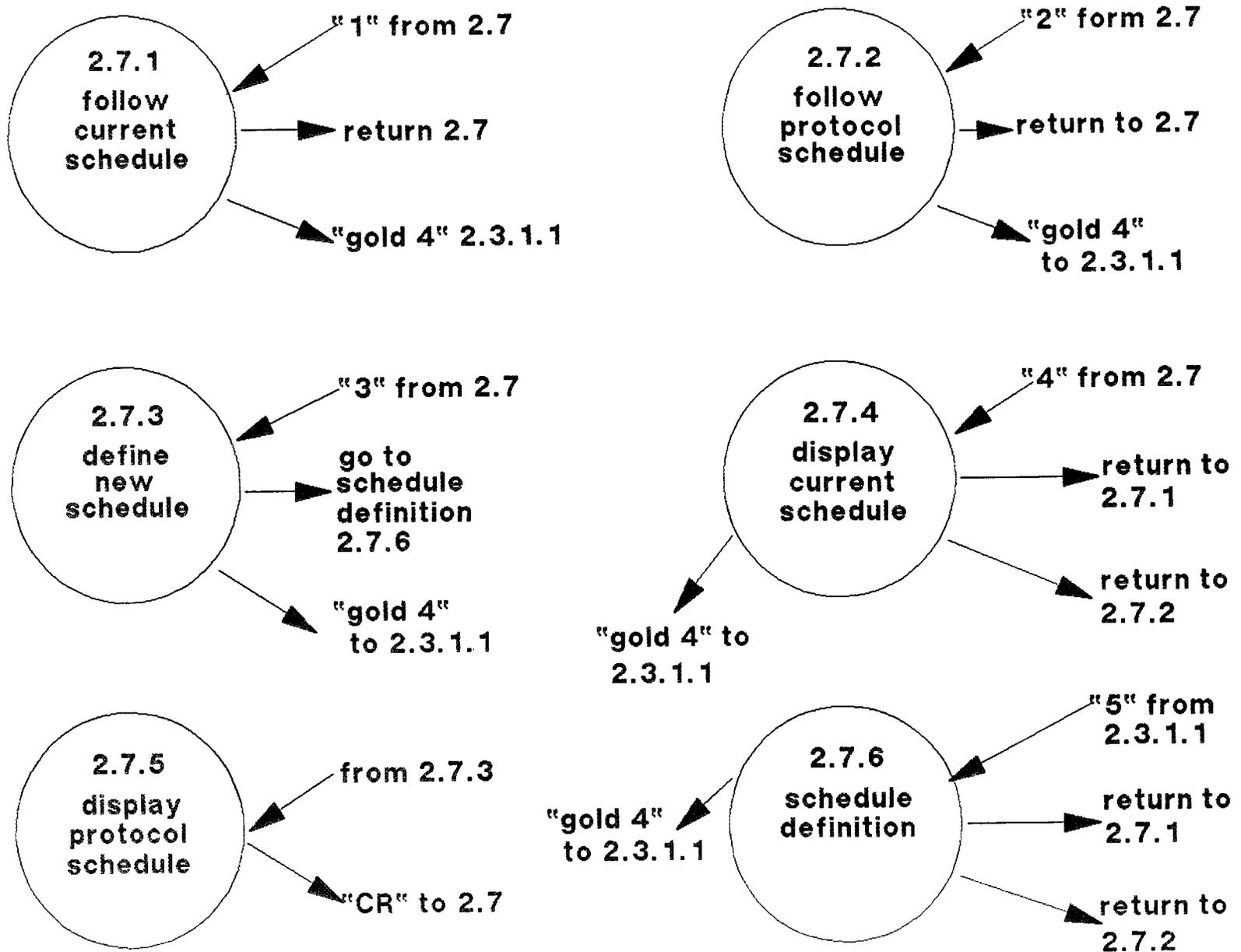


FIGURE B.11
INLIFE Level 2 Data Flow Diagram
from Interactive Data Collection 2.3

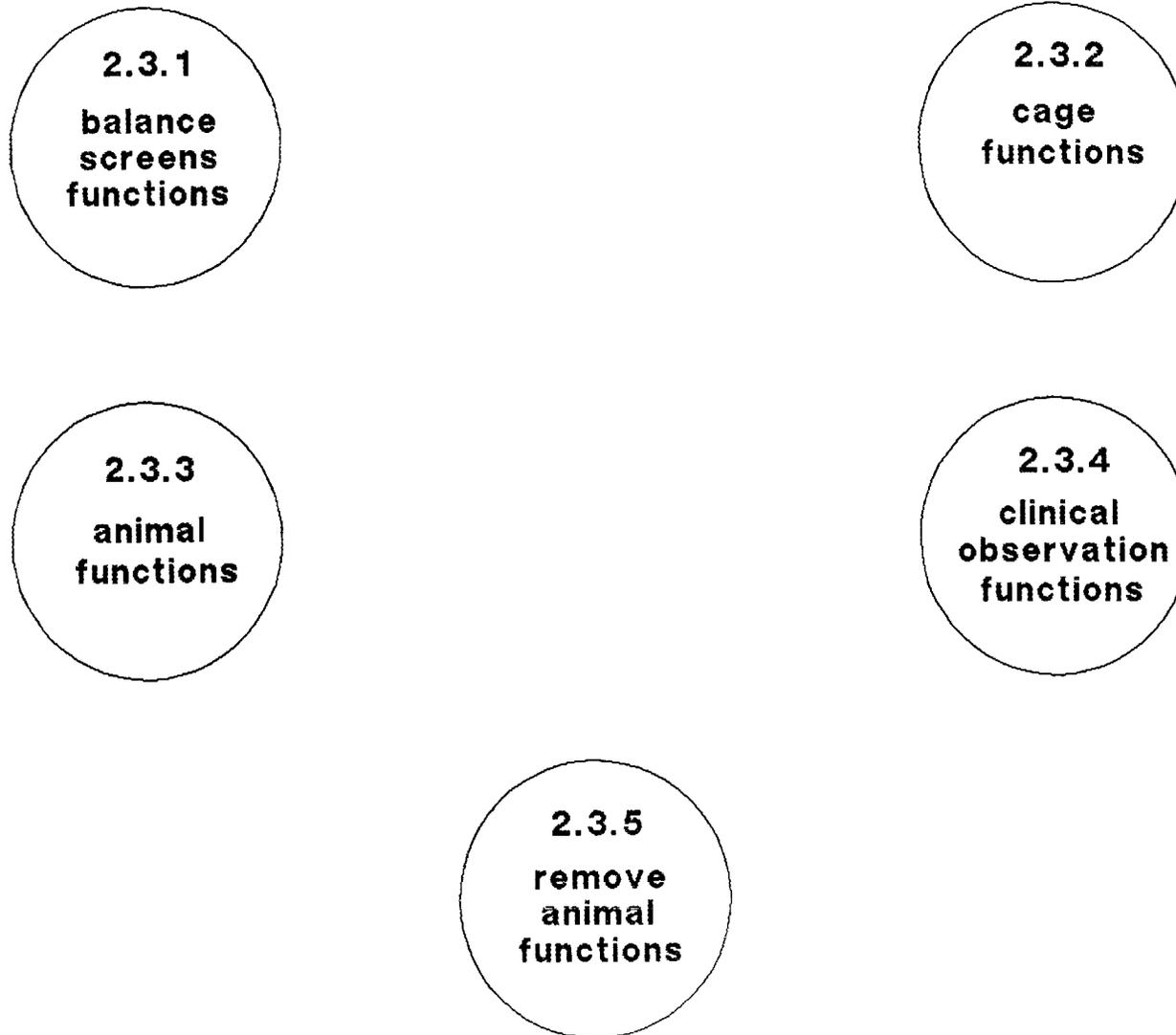


FIGURE B.12
INLIFE Level 3 Data Flow Diagram
from Balance, Screens, Functions 2.3.1

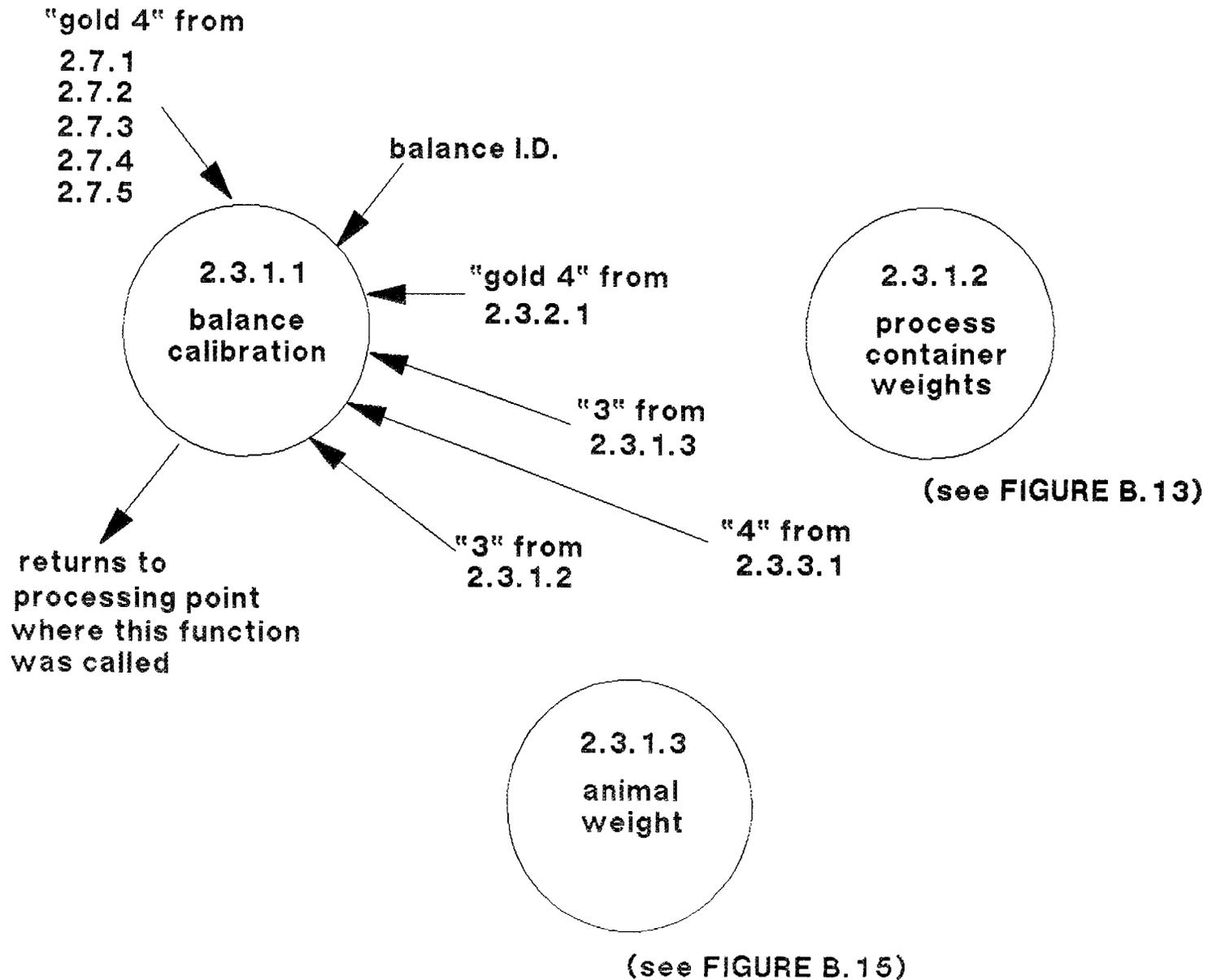


FIGURE B.13
 INLIFE Level 3 Data Flow Diagram from
 Balance, Screens, Functions 2.3.1

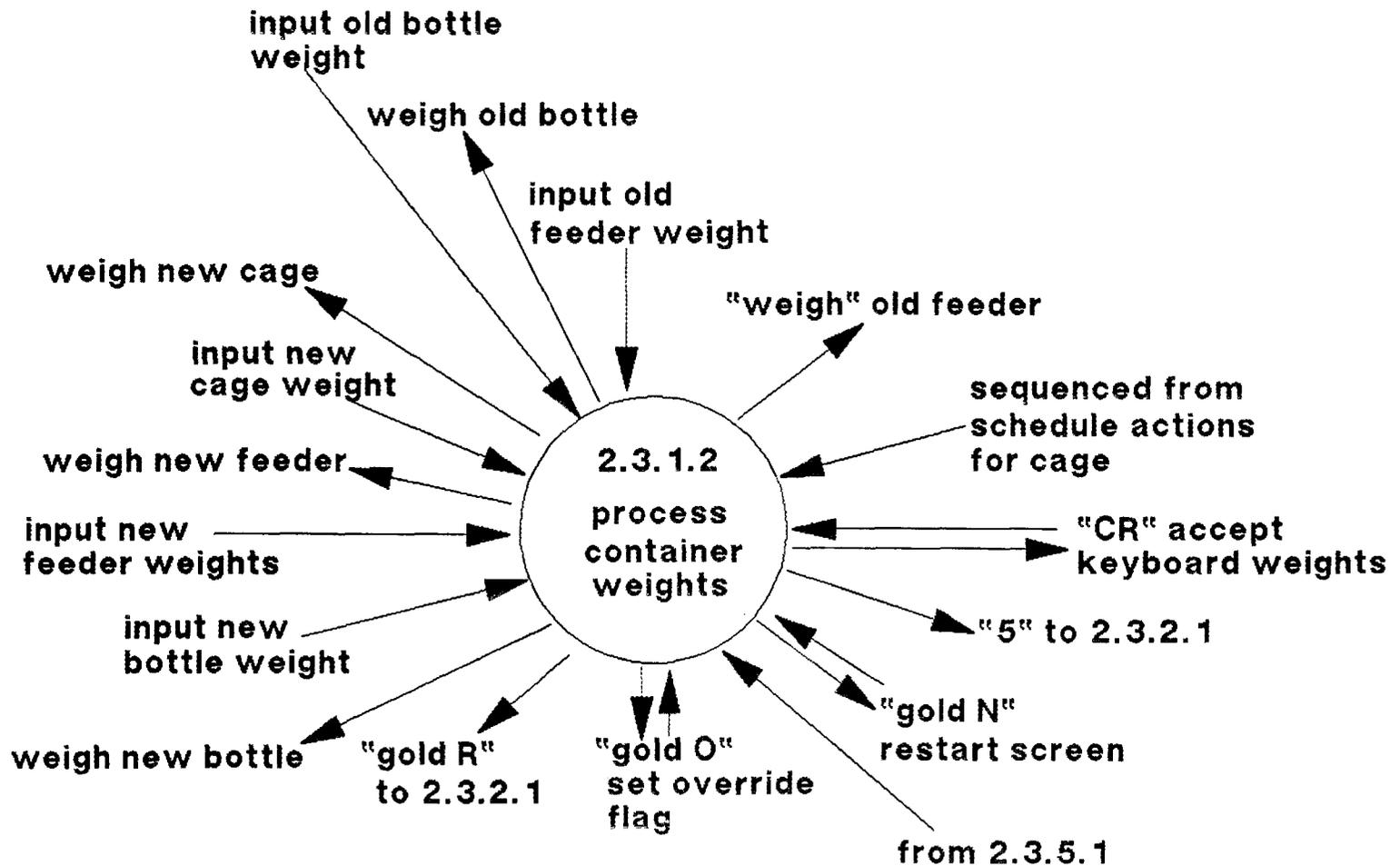
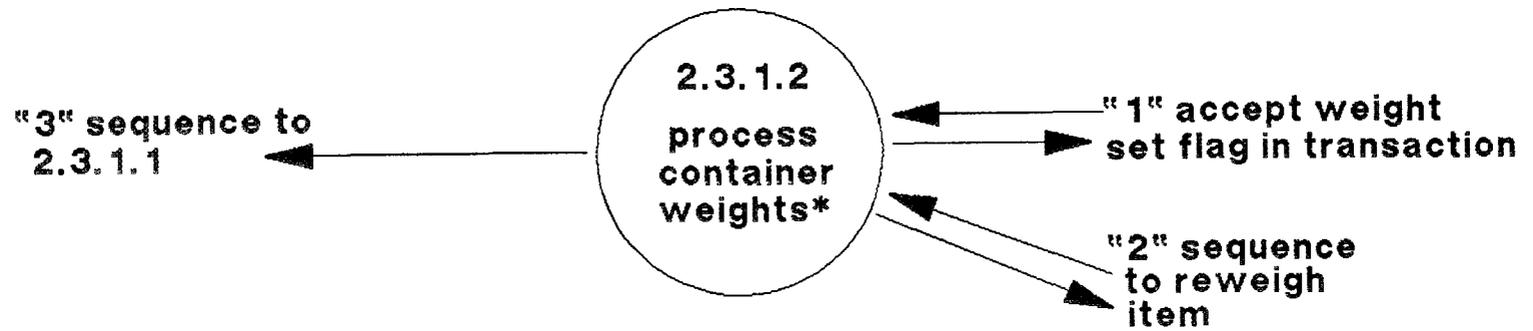


FIGURE B.14
INLIFE Level 3 Data Flow Diagram
from 2.3.1 Balance, Screens, Functions



* Error message displays if weight does not pass validation

FIGURE B.15
INLIFE Level 3 Data Flow Diagram for Animal Weights
from Balance, Screens, Functions, 2.3.1

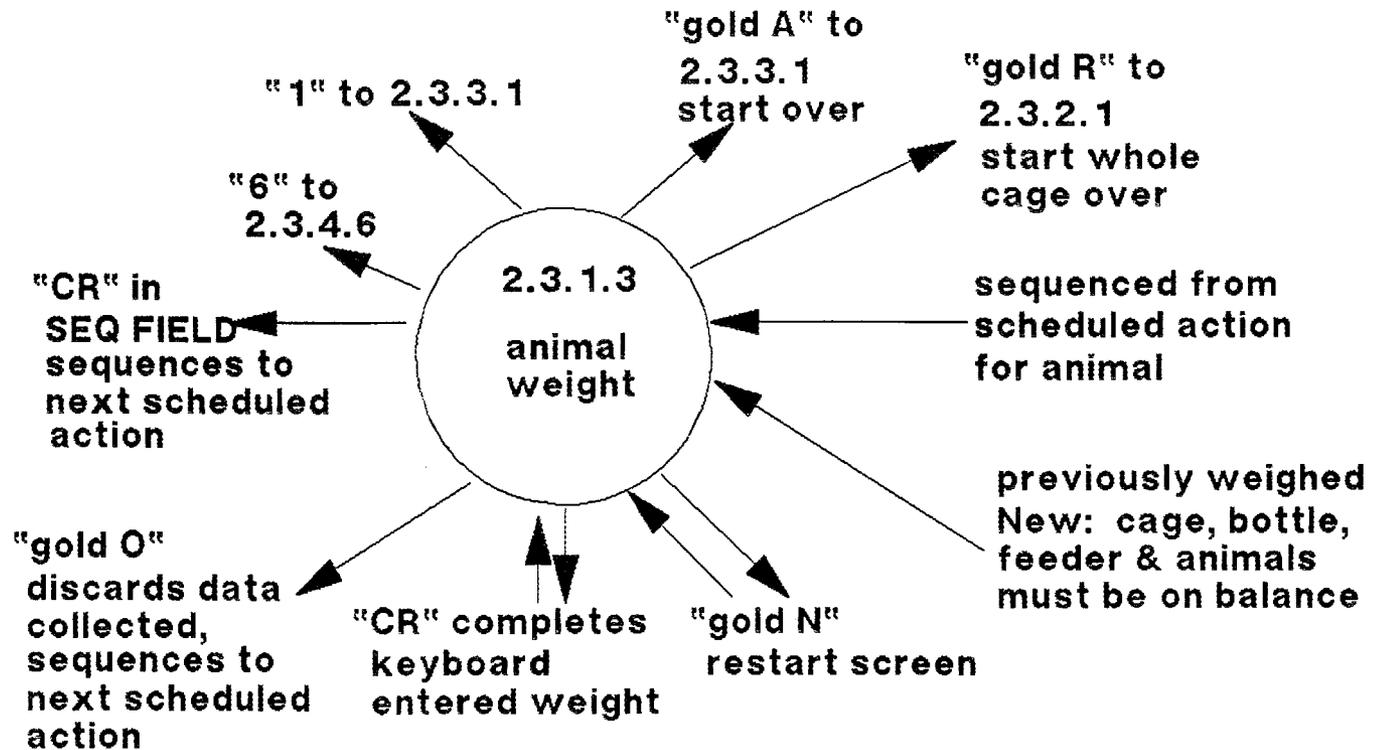
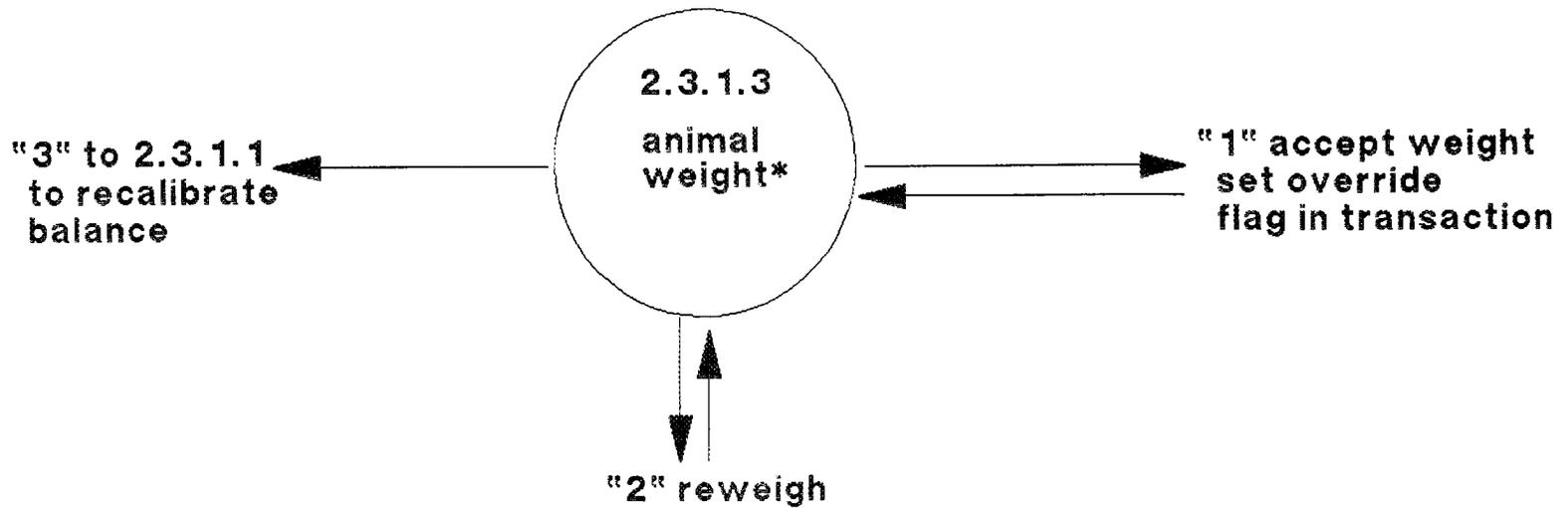
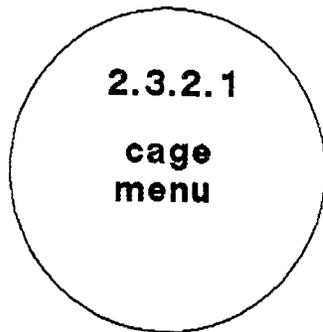


FIGURE B.16
INLIFE Level 3 Data Flow Diagram
from Balance, Screens, Functions, 2.3.1



* If animal weight is outside validation range

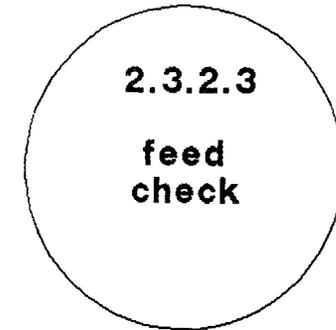
FIGURE B.17
INLIFE Level 3 Data Flow Diagram
from Cage Functions, 2.3.2



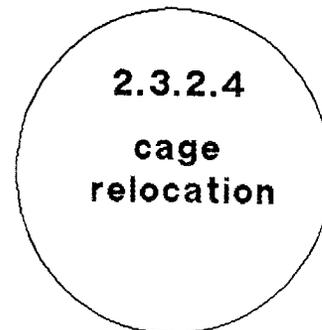
(see FIGURE B.18)



(see FIGURE B.20)



(see FIGURE B.21)



(see FIGURE B.22)

FIGURE B.18
INLIFE Level 3 Data Flow Diagram
for Cage Menu from Cage Functions 2.3.2

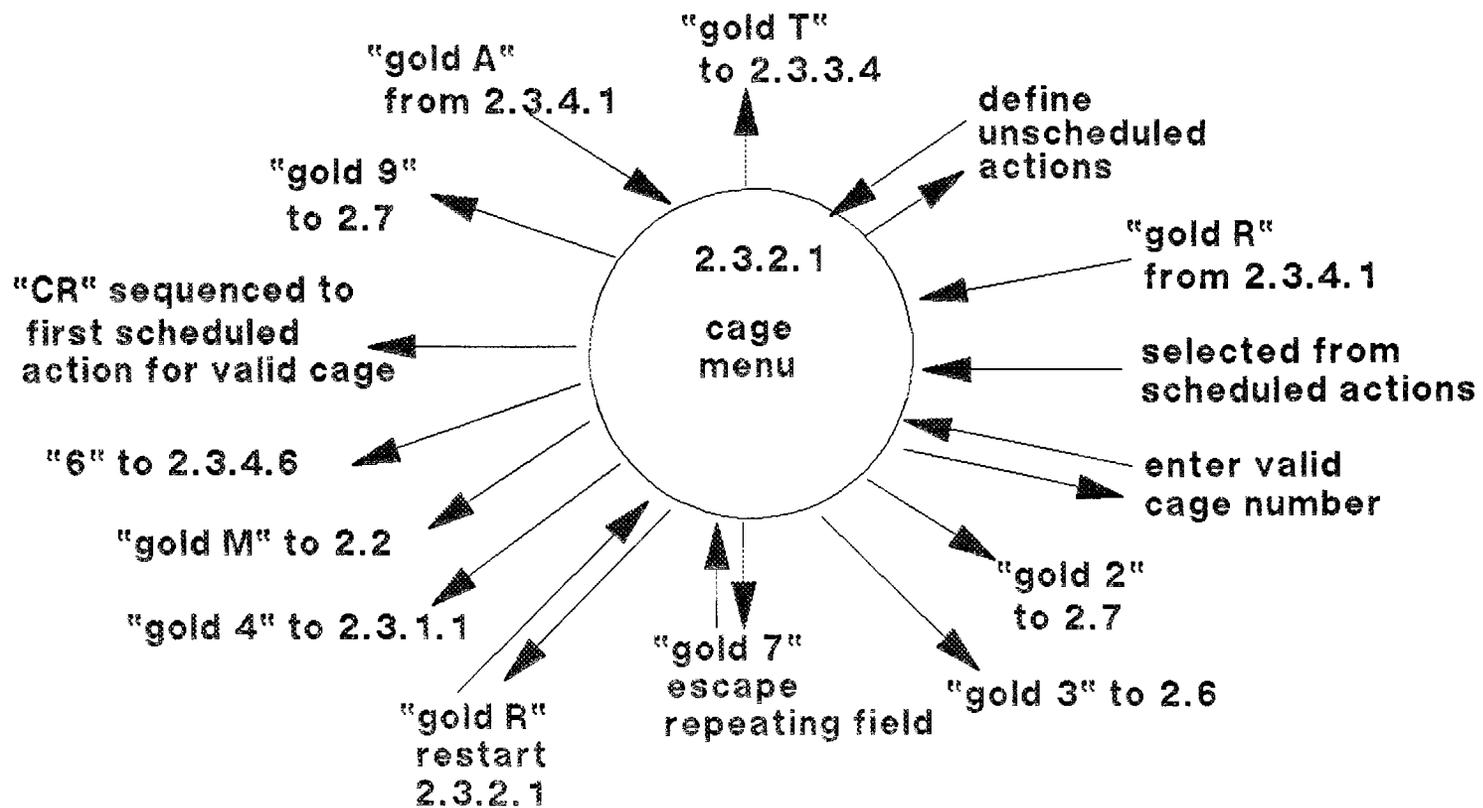
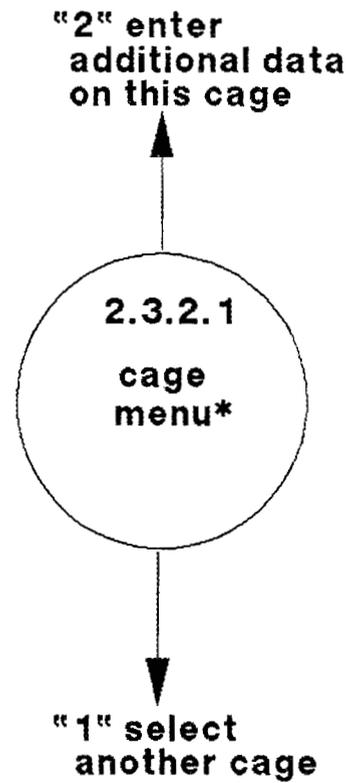


FIGURE B.18
INLIFE Level 3 Data Flow Diagram
for Select Another Cage from Cage Functions 2.3.2



* If the cage selected has already been observed during this data collection session

FIGURE B.20
INLIFE Level 3 Data Flow Diagram
for Cage Observation from Cage Functions 2.3.2

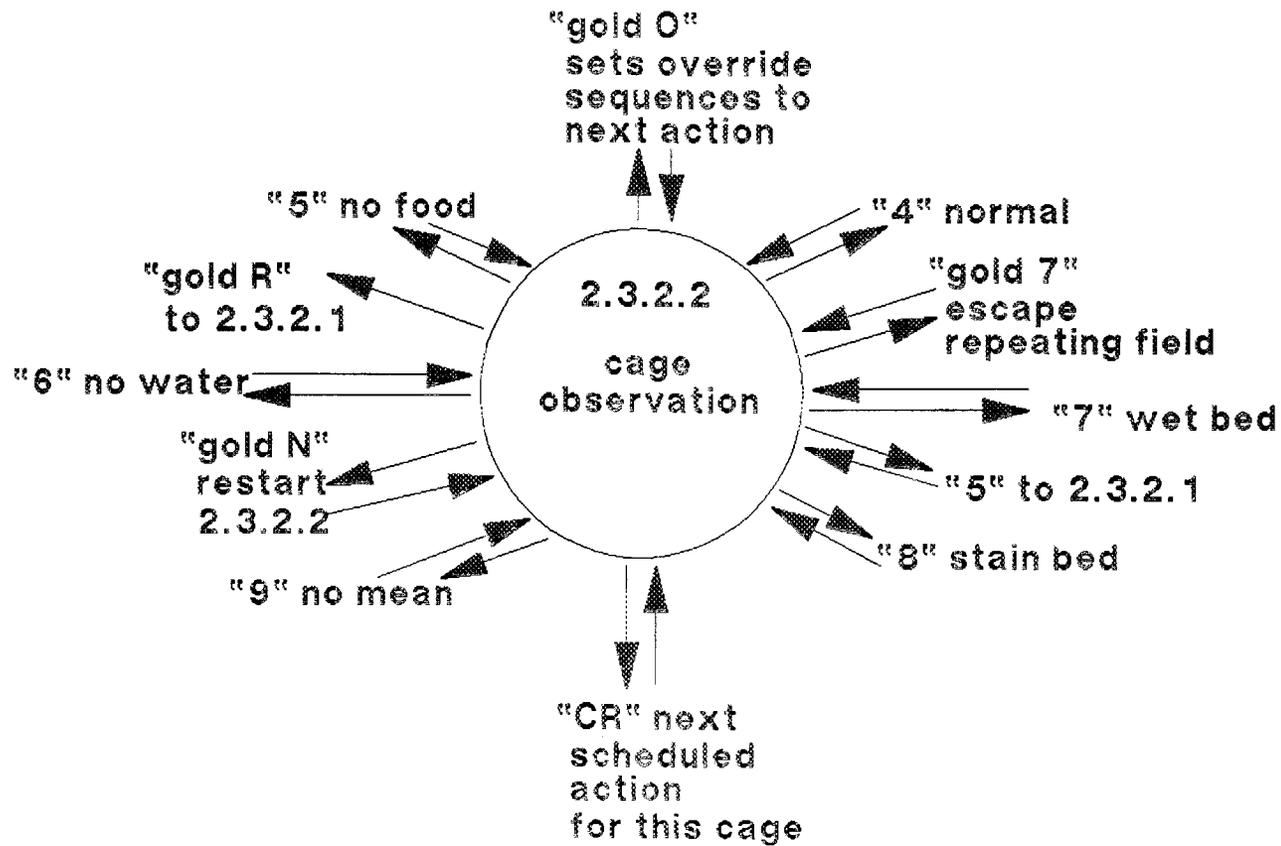


FIGURE B.2 1
INLIFE Level 3 Data Flow Diagram
for Feed Check from Cage Functions 2.3.2

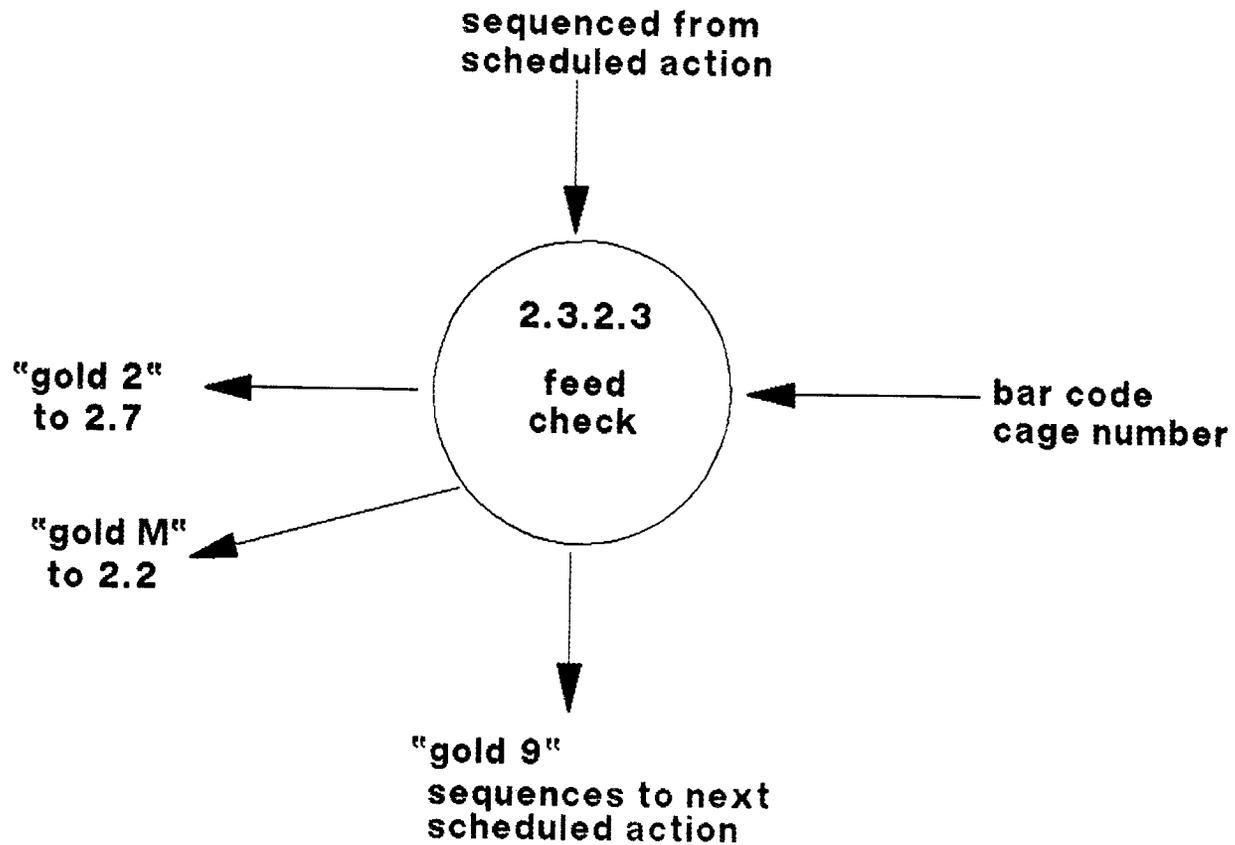


FIGURE B.22
INLIFE Level 3 Data Flow Diagram
for Cage Relocation from Cage Functions 2.3.2

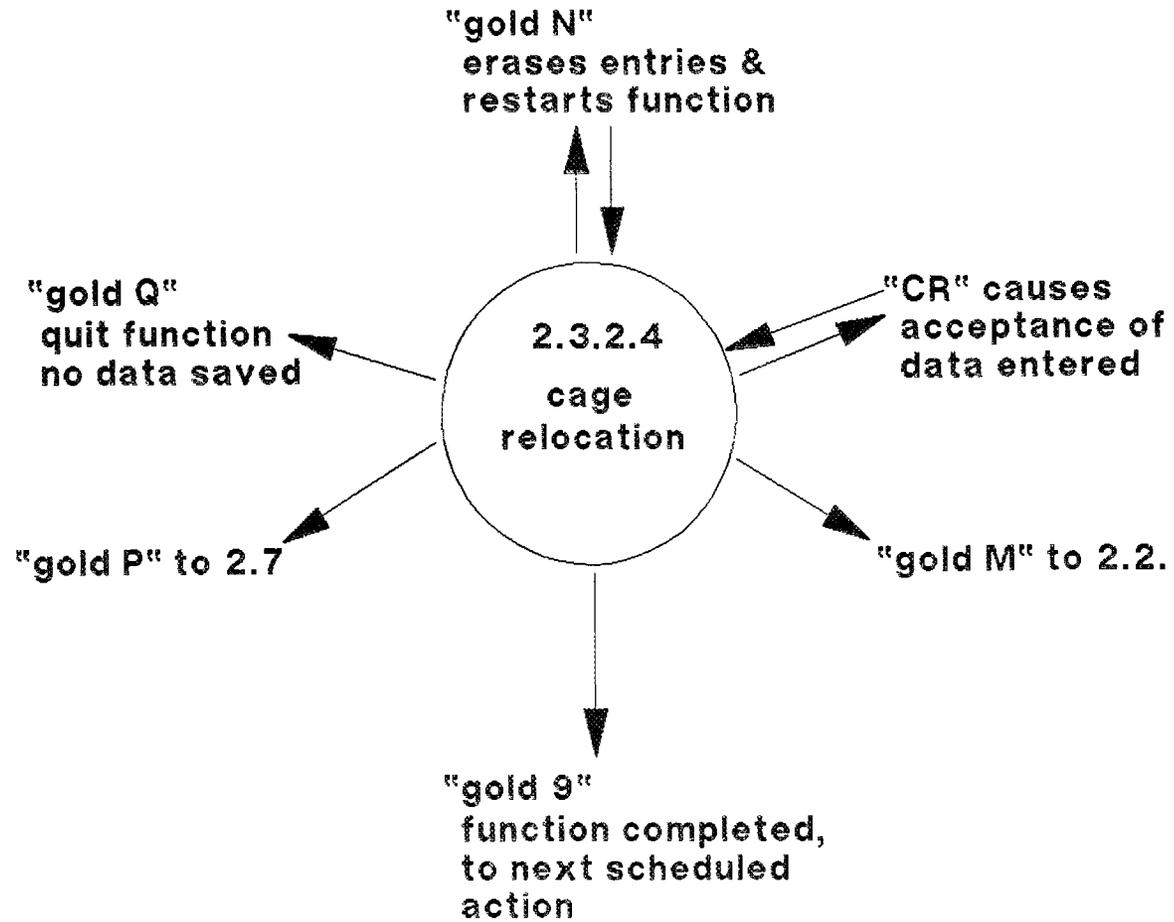


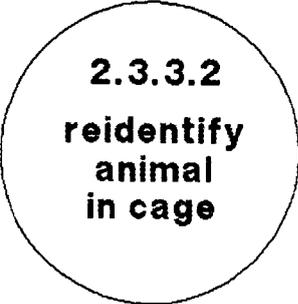
FIGURE B.23
INLIFE Level 3 Data Flow Diagram
for Animal Functions from 2.3.3



(see FIGURE B.24)



(see FIGURE B.26)



(see FIGURE B.27)



(see FIGURE B.28)

FIGURE B.24
INLIFE Level 3 Data Flow Diagram
for Select Animals from 2.3.3 Animal Functions

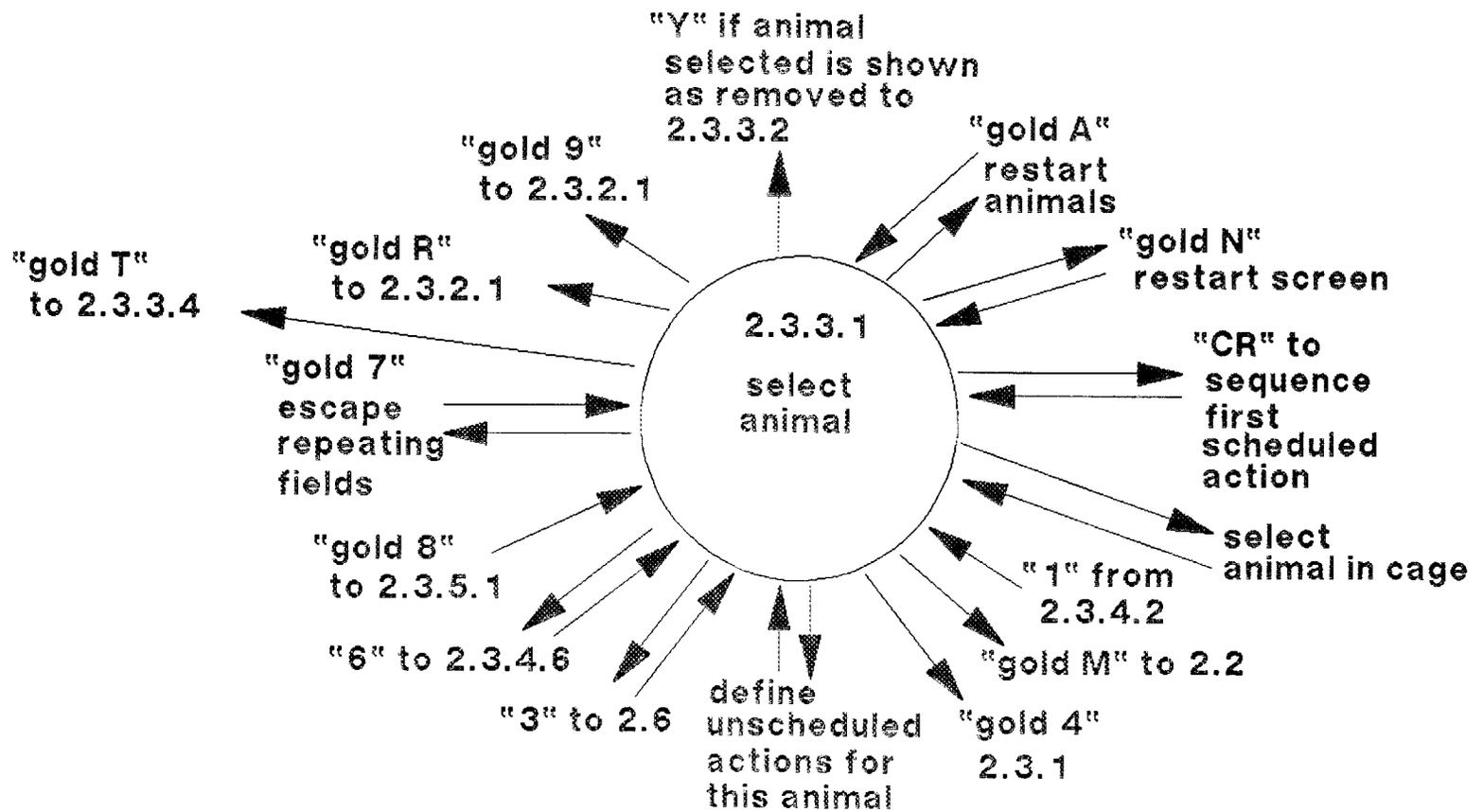
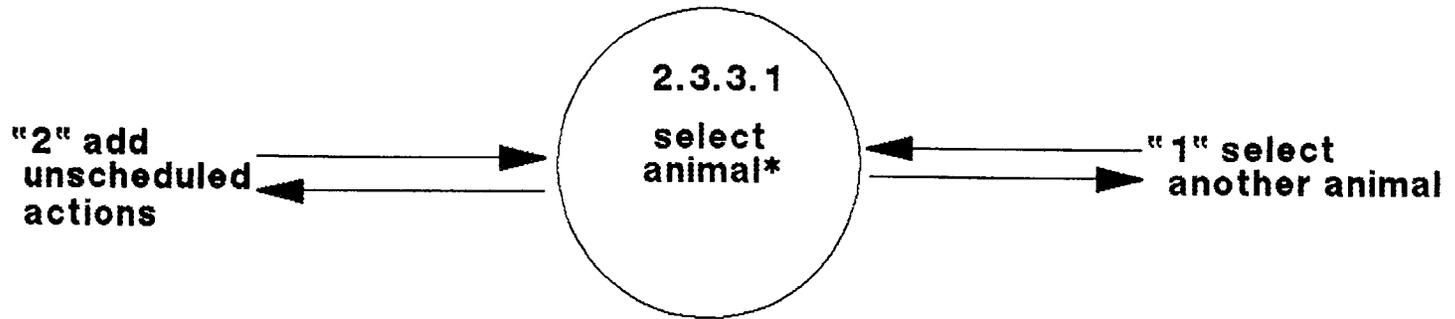


FIGURE B.25

INLIFE Level 3 Data Flow Diagram for Select Animals
from 2.3.3 Animal Functions



* These options occur if animal selected has
already been processed during this cycle

FIGURE B.26
INLIFE Level 3 Data Flow Diagram
for Unscheduled Actions from 2.3 Animal Functions

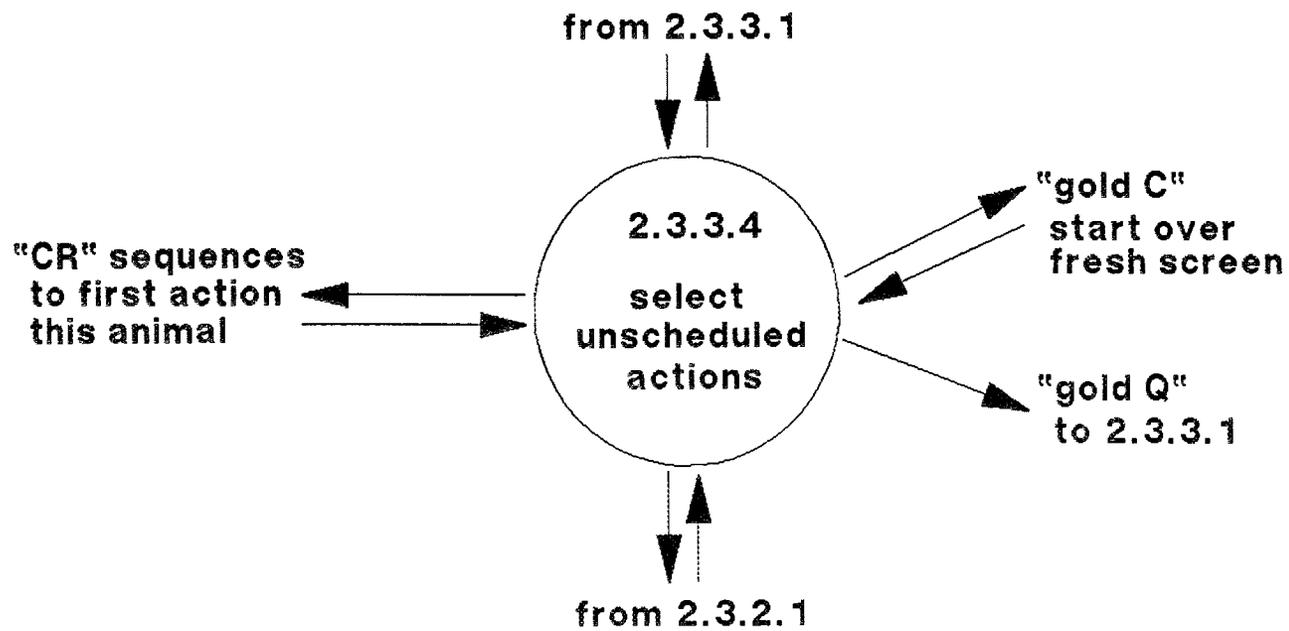


FIGURE B.27
INLIFE Level 3 Data Flow Diagram
for Animal Identification from 2.3 Animal Functions

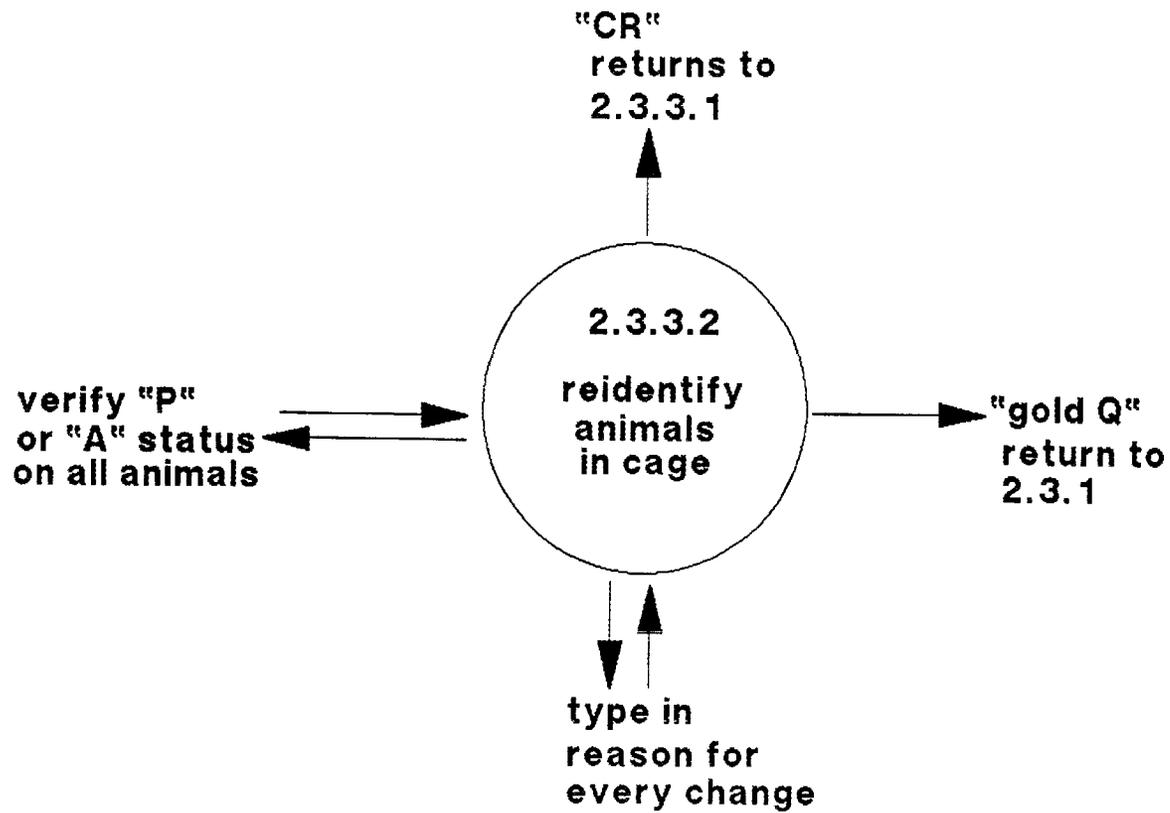


FIGURE B.28
INLIFE Level 3 Data Flow Diagram
for Animal Status from 2.3 Animal Functions

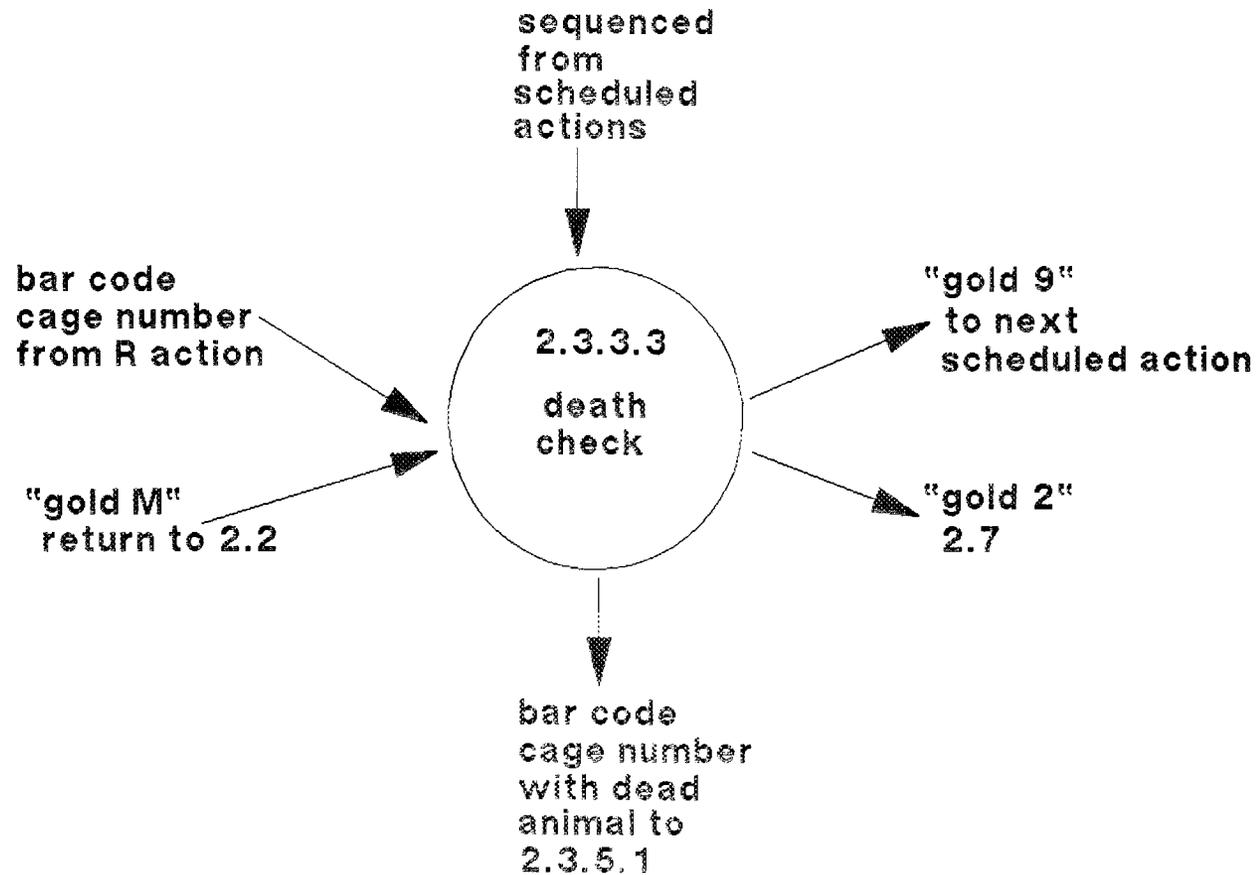


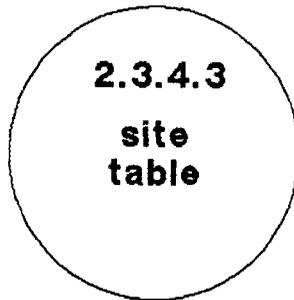
FIGURE B.29
INLIFE Level 3 Data Flow Diagram
for Clinical Observation Functions from 2.3.4 Clinical Observations



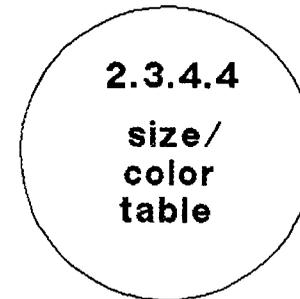
(see FIGURE 2.8.1)



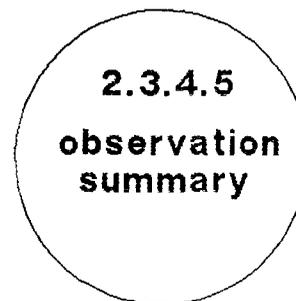
(see FIGURE 2.8.3)



(see FIGURE 2.8.4)



(see FIGURE 2.8.2)



(see FIGURE 2.8.5)

FIGURE B.30
INLIFE Level 3 Data Flow Diagram
for Clinical Observations from 2.3.4 Clinical Observations

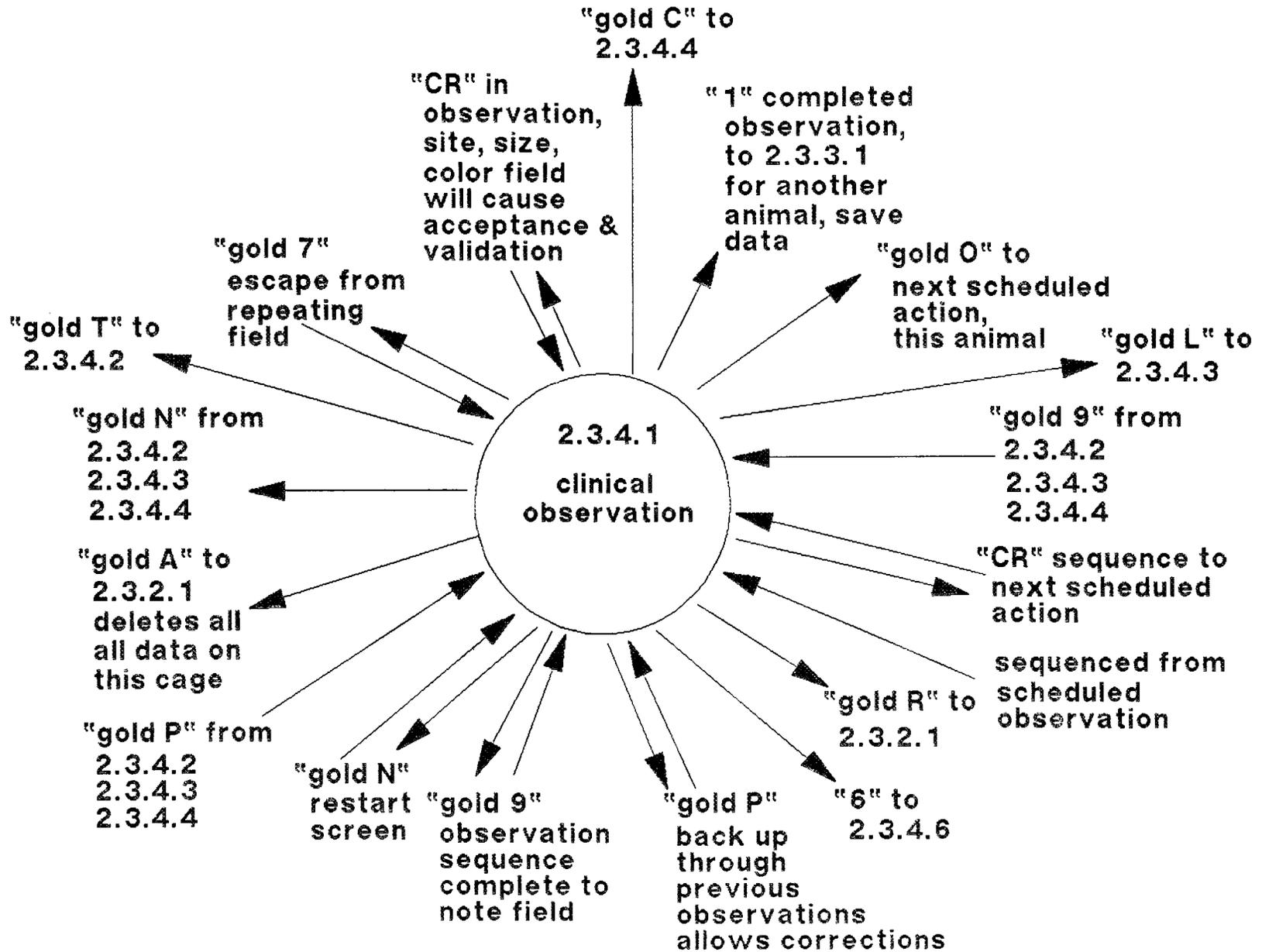


FIGURE B.3 1
INLIFE Level 3 Data Flow Diagram
for Size/Color Table from 2.3.4 Clinical Observation

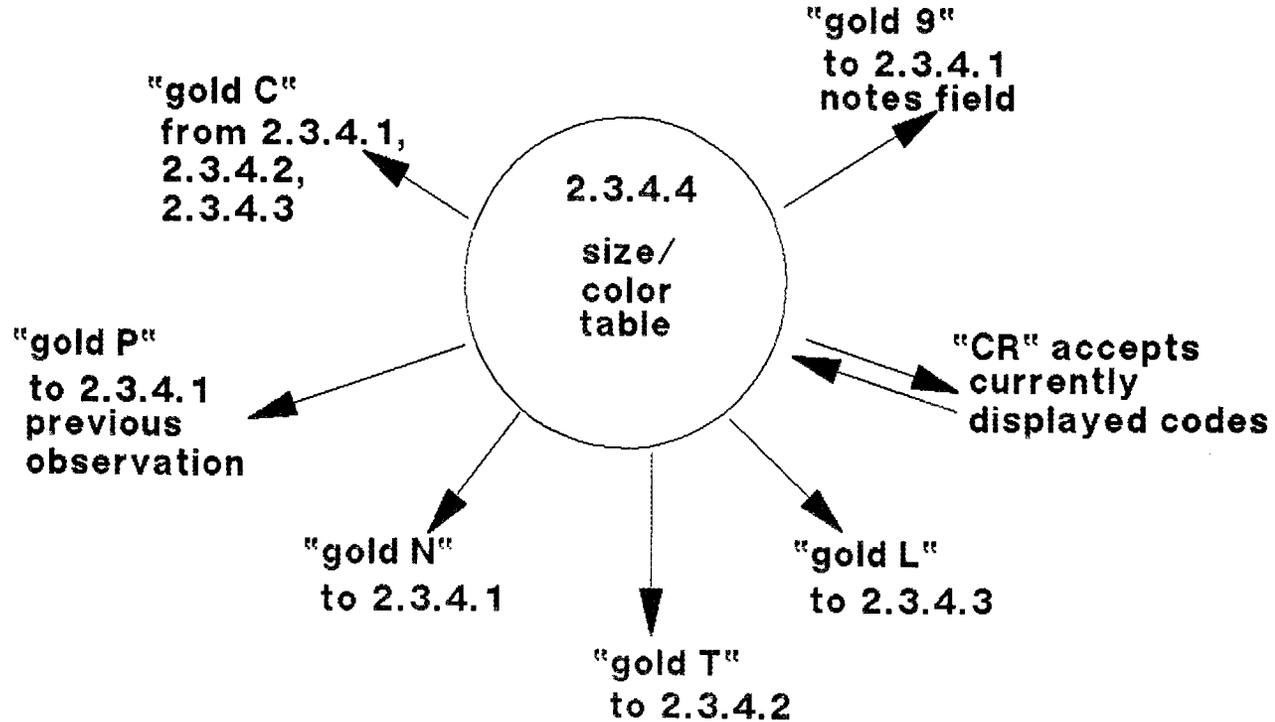


FIGURE B.32
INLIFE Level 3 Data Flow Diagram
for Clinical Observation Table from 2.3.4 Clinical Observations

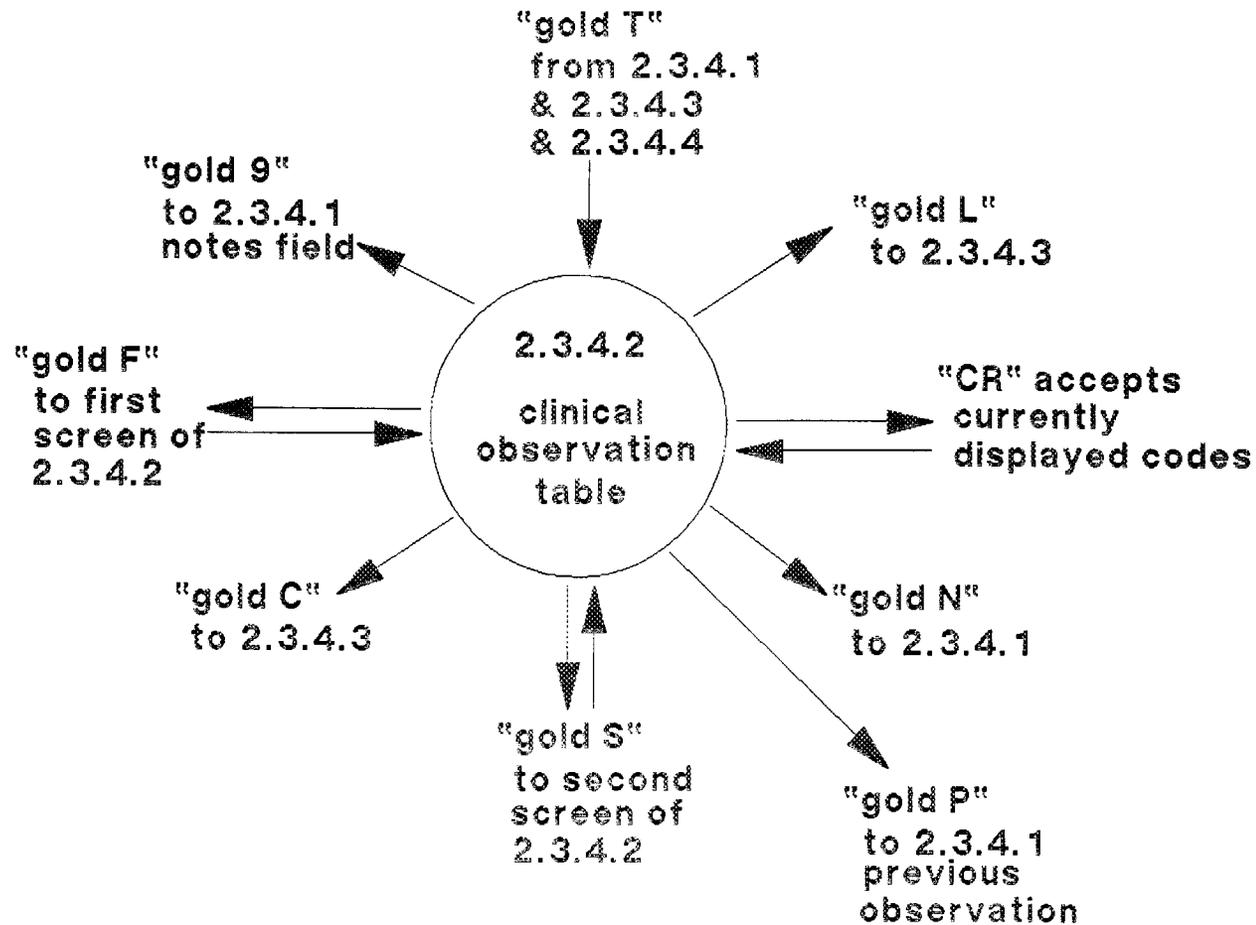


FIGURE B.33
INLIFE Level 3 Data Flow Diagram
for Site Table from 2.3.4 Clinical Observations

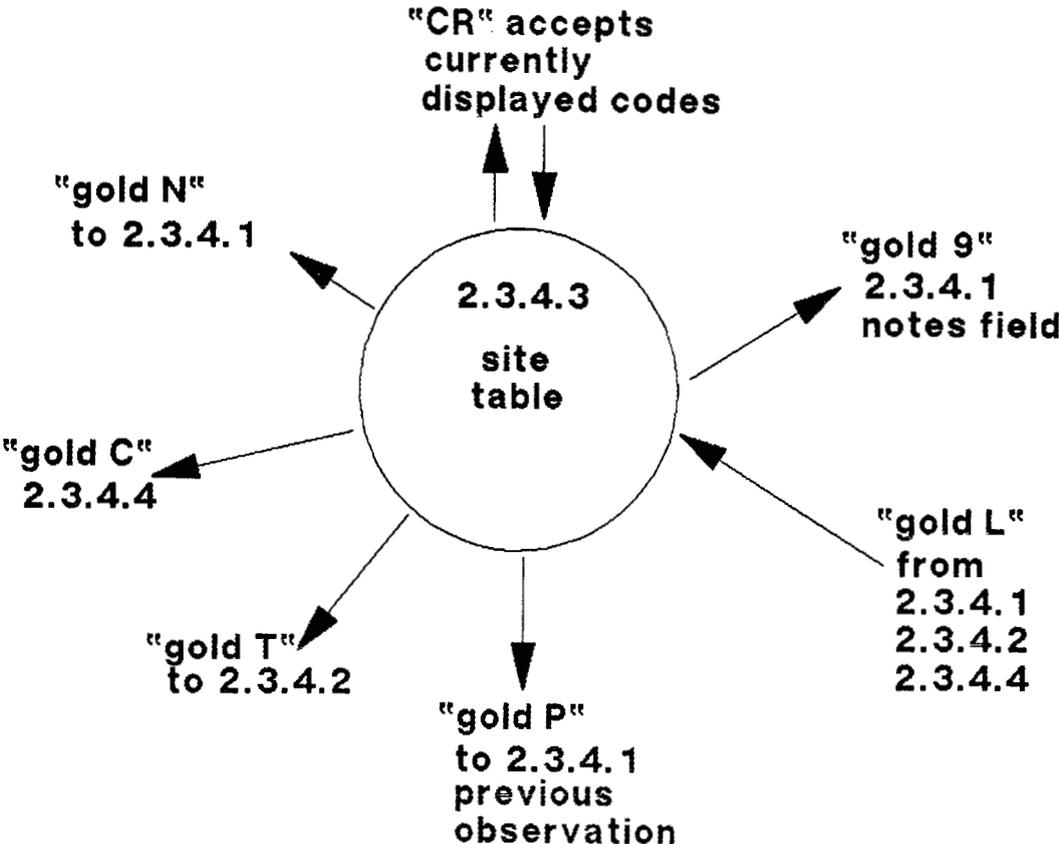
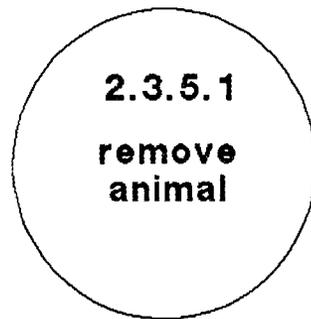


FIGURE B.34
INLIFE Level 3 Data Flow Diagram
for Observation Summary from 2.3.4 Clinical Observations



FIGURE B.35
INLIFE Level 3 Data Flow Diagram
for Remove Animal Functions from 2.3.5 Remove Animals



(see FIGURE B.36)



(see FIGURE B.37)



(see FIGURE B.38)

FIGURE B.36
 INLIFE Level 3 Data Flow Diagram
 for Remove Animals from 2.3.5 Remove Animal Functions

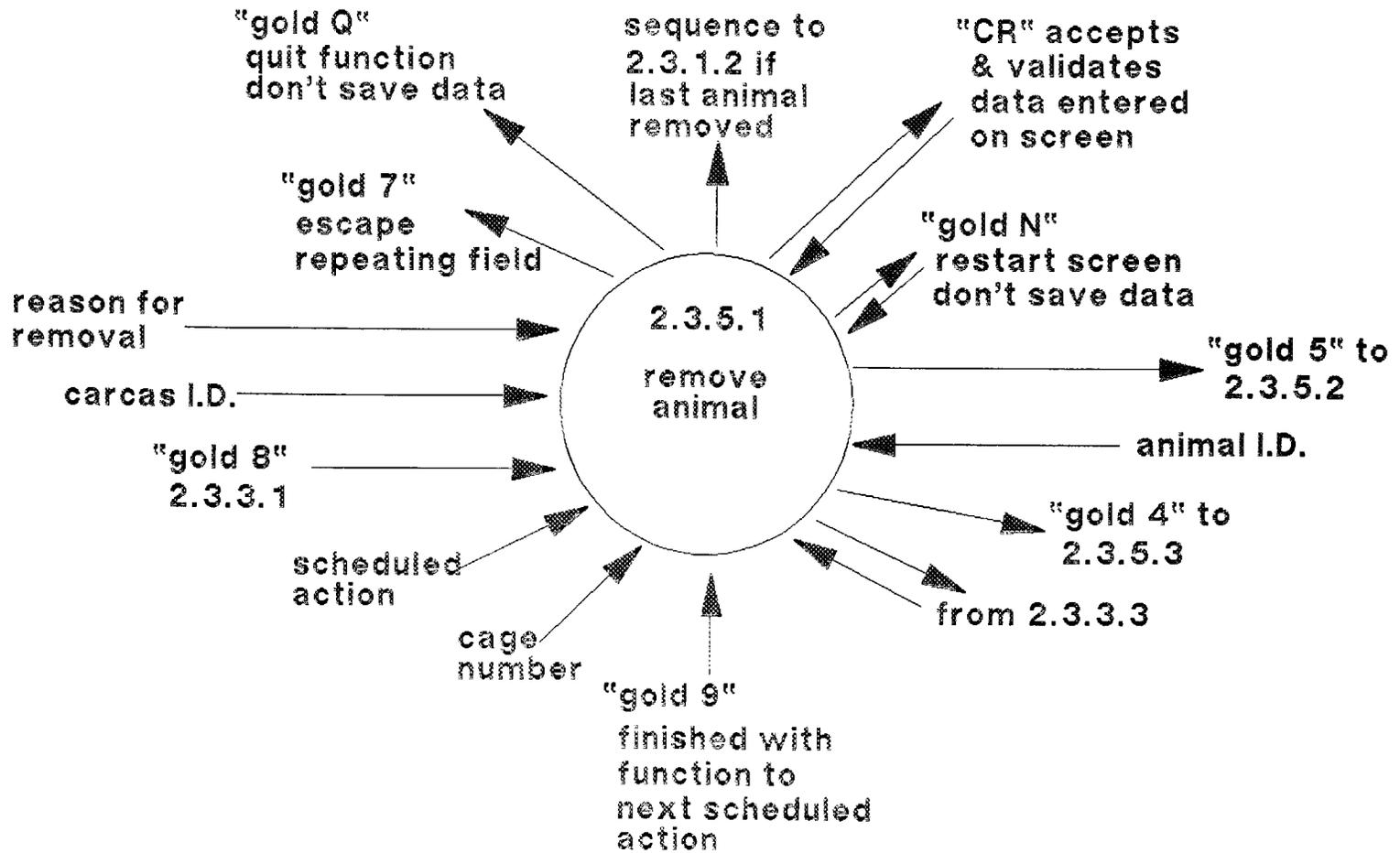


FIGURE B.37
INLIFE Level 3 Data Flow Diagram
for Reason for Removal from 2.3.5 Remove Animal Functions

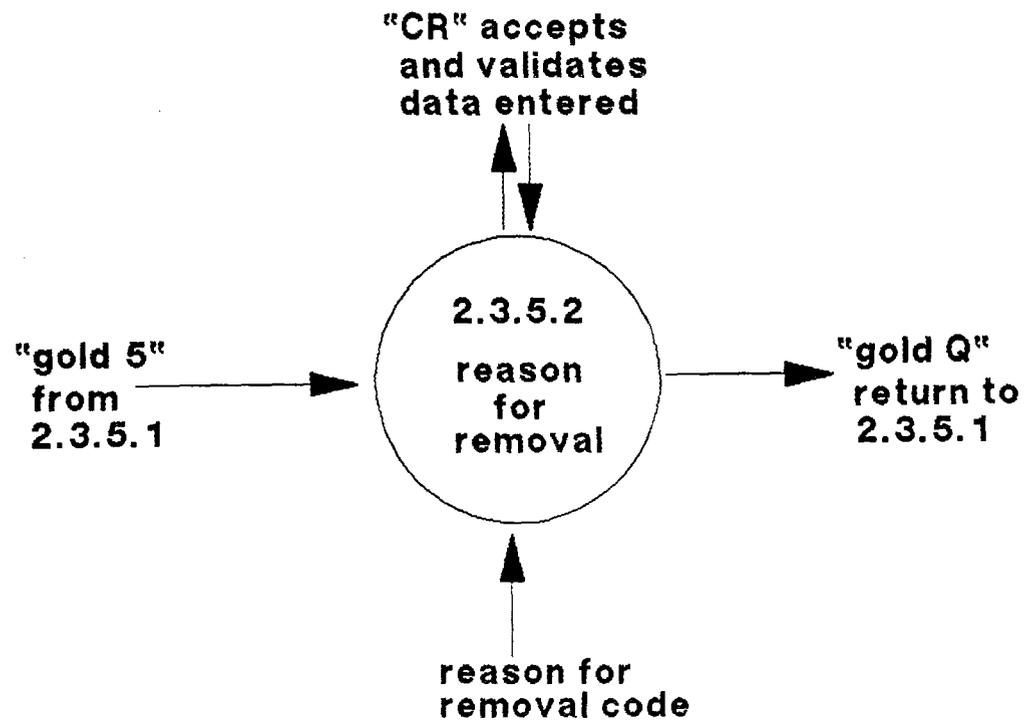


FIGURE B.38
INLIFE Level 3 Data Flow Diagram
for Disposition from 2.3.5 Remove Animal Functions

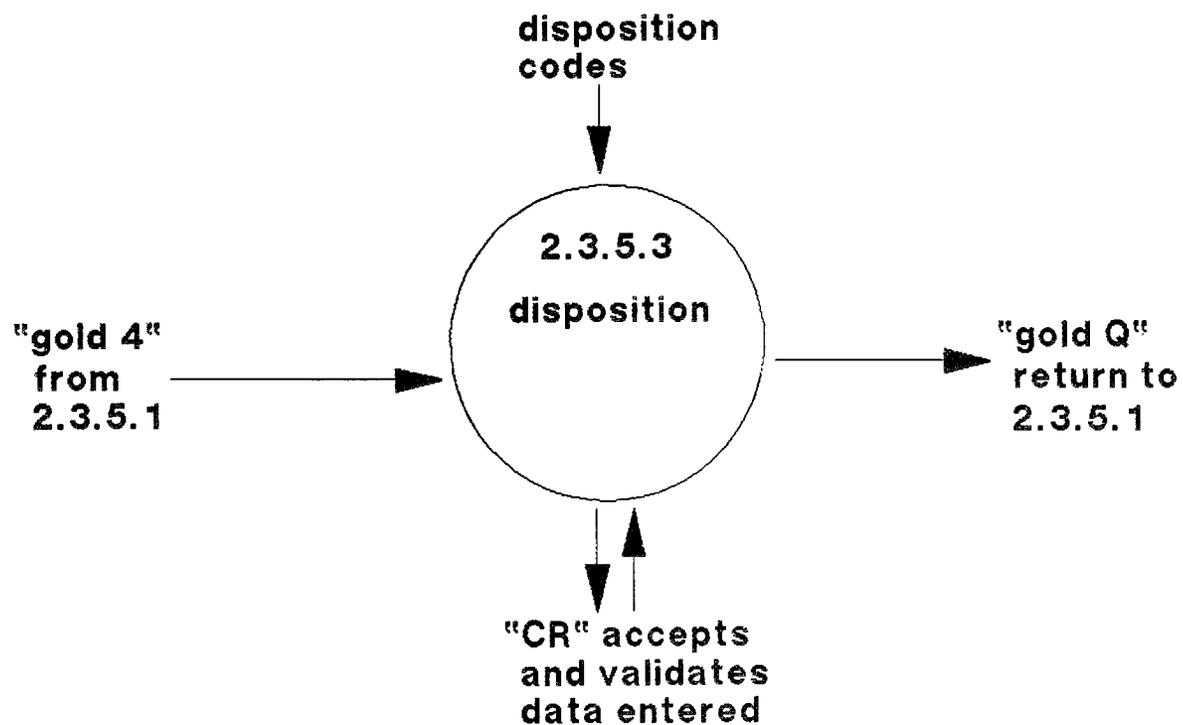


FIGURE B.38

Multigeneration Support Data Flow Diagram from 1.2.7
Transfer Animals Out of Breeding

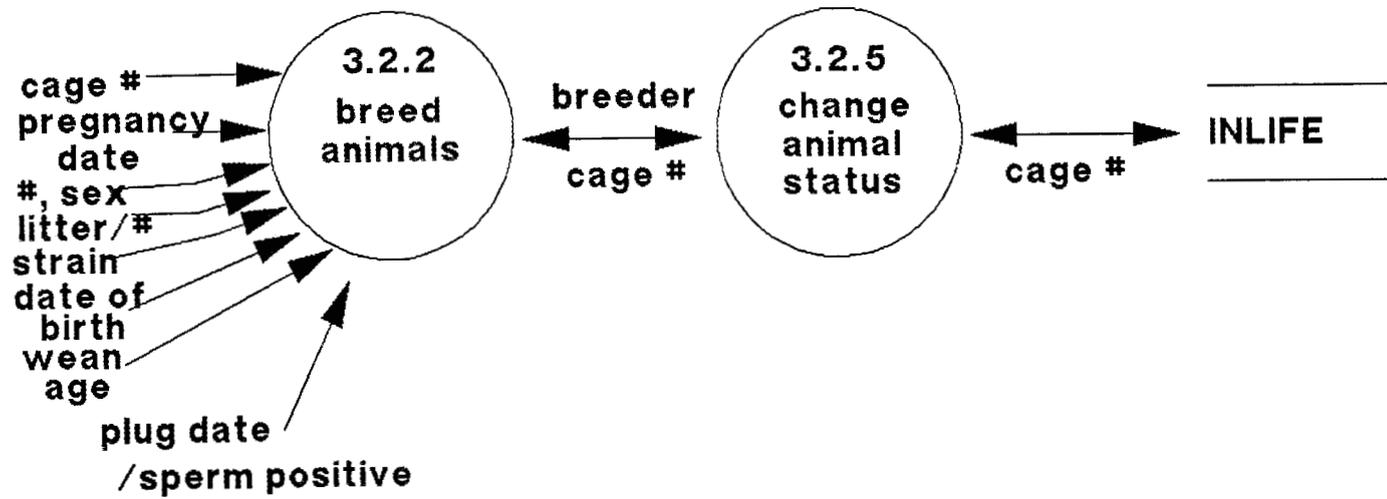


FIGURE B.40

Multigeneration Support Data Flow from Breed Animals 3.2.2

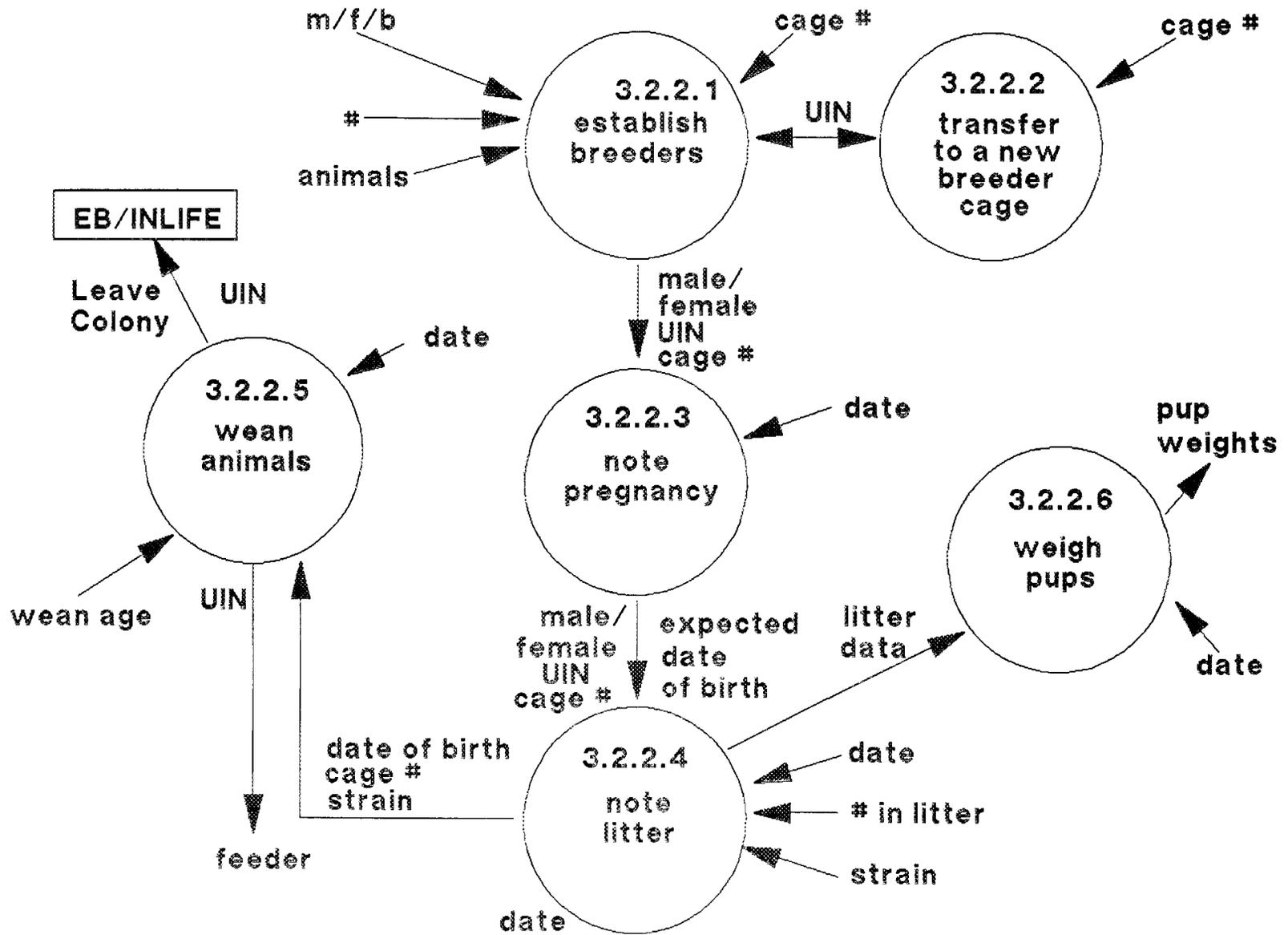
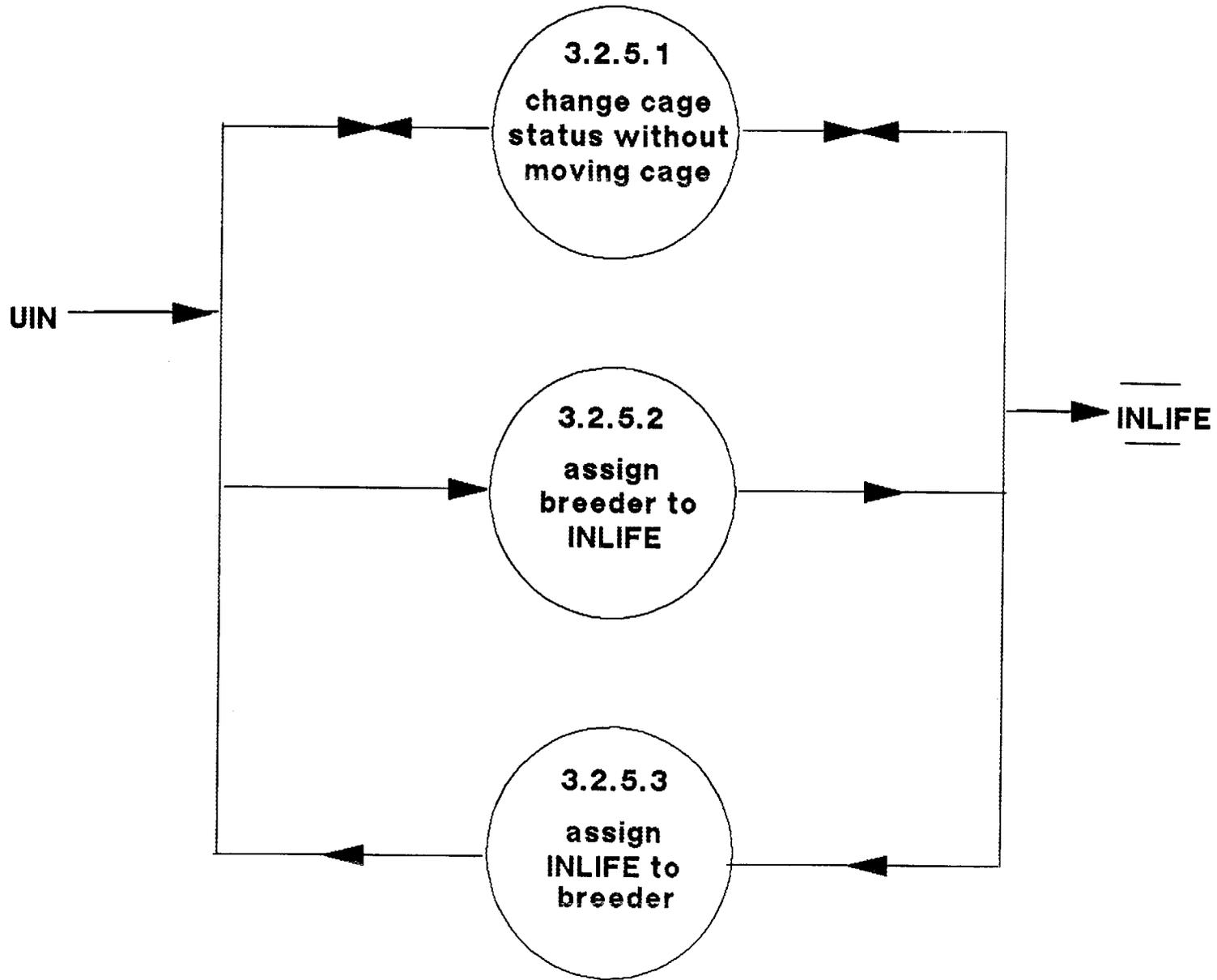


FIGURE B.4 1

Multigeneration Data Flow from Change Animal Status 3.2.5



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