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ABSTRACT

This report presents the results of a management study of audio playback equipment operations conducted by the National Library Service, Library of Congress, its associated network of state and local machine lending agencies (MLA), and other parties that play a role in current operations. The objectives were to document current operations, identify problems, and recommend possible solutions that would mitigate or eliminate the identified problems. In addition to audio playback machine operations, this study focused on cassette book machine operations. The background to the study, objectives, constraints imposed on performance, and the methodology used are detailed in section 1. Section 2 contains a summary of current operations; a profile of organizations and functions; and descriptions of automation in current operations. Section 3 identifies findings, and section 4 discusses inventory management and other recommendations. Sections 5, 6, and 7 cover decentralized, regionalized, and centralized repair options. A cost benefit analysis of the three repair option scenarios is discussed in Section 8. Two addendums contain a profile of the typical MLA and a disposal audit. A list of acronyms and abbreviations is also provided. Detailed statistical and narrative information supporting the eight sections is shown in 50 exhibits and 77 appendices. (AEF)

FINAL REPORT
STUDY II, PART 1, PHASE 2

Submitted to:

THE LIBRARY OF CONGRESS
NATIONAL LIBRARY SERVICE FOR THE
BLIND AND PHYSICALLY HANDICAPPED

For:

STUDY II -
STUDY OF AN AUDIO PLAYBACK MACHINE
STORAGE, DISTRIBUTION AND REPAIR SYSTEM

PART 1 -
OPTIONS FOR MACHINE OPERATIONS

Phase 2-
Follow-On

In response to:

CONTRACT NUMBER I70251

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STUDY II, PART 1, PHASE 2

FINAL REPORT

OPTIONS FOR MACHINE OPERATIONS

Contract Number I70251

ManTech Technical Services Corporation

and

Wesley-Kind Associates, Inc.

March 15, 1995

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LIST OF ACRONYMS AND ABBREVIATIONS

ADP	Automated Data Processing
AO	Automation Officer
ARC	Authorized Repair Center
BLS	Bureau of Labor Statistics
BPHICS	Blind and Physically Handicapped Inventory Control System
CBM	Cassette Book Machine
CIDS	USDA Telecommunications Network
CM	Certificate of Mailing
CMLS	Comprehensive Mailing List System
COTR	Contracting Officer's Technical Representative
DMA	Data Management Associates
DRA	Data Research Associates
ECO	Equipment Control Officer
ELFUNS	ELFUNS (General Electric Retirees)
EPA	Environment Protection Agency
EOQ	Economic Order Quantity
FAR	Federal Acquisition Regulations
FTE	Full-Time Equivalent
FY	Fiscal Year
FYE	Fiscal Year Ending
GFE	Government Furnished Equipment
GPO	Government Printing Office
ID	Identification
IOH	Inventory On Hand
IPS	Inches Per Second
LAN	Local Area Network
LOC	Library of Congress
MAPICS	Machine Production Inventory Control System
MB	Megabyte
MER	Monthly Equipment Report
MLA	Machine Lending Agency
MMAR	Monthly Machine Activity Report
MMDR	Monthly Machine Delete Report
MMR	Monthly Machine Report
MMSR	Monthly Machine Shipment Report
MSC	Multistate Center
MSCE	Multistate Center East
MSCW	Multistate Center West
MTBF	Mean Time Between Failures
MTSC	ManTech Technical Services Corporation
NLS	National Library Service
NLSNET	NLS Communications Network
PC	Personal Computer

LIST OF ACRONYMS AND ABBREVIATIONS (cont.)

PCB	Printed Circuit Board
QA	Quality Assurance
QC	Quality Control
RA	Reader Advisor
READS	Reader Enrollment and Delivery System
RFDC	Radio Frequency Data Communication
RL	Regional Library
S/N	Serial Number
SF	Square Feet
SLA	Sublending Agency
SRL	Subregional Library
TBD	To Be Determined
TBM	Talking Book Machine
TMC	Technology Management Corporation
TP	Telephone Pioneers (AT&T Retirees)
USPS	United States Postal Service
WKA	Wesley-Kind Associates
XESS	Book Exchange System Used by Network Libraries

Executive Summary

EXECUTIVE SUMMARY

This report presents the results of a management study of audio playback equipment operations conducted by the National Library Service (NLS), Library of Congress, its associated network of state and local machine lending agencies, and various other parties that play a role in current operations. The objectives of the review were to document current operations, identify problems, and recommend several possible solutions that would either mitigate or totally eliminate the identified problems.

The scope of the effort included all aspects of current operations excluding the following exceptions: equipment design and manufacturing details; the machine audit process; the funding of recommended investments/interventions; and, United States Postal Service (USPS) transportation costs. Additionally, the study's focus was upon cassette book machine (CBM) operations both due to the relative importance of this type of equipment to the overall program, and because of the impending phase-out of talking book machines (TBMs). The background to the study, the objectives of the effort, the constraints imposed upon its performance, and the methodology employed in the study's execution are detailed in Section 1 of the report.

Section 2 of the report contains a narrative discussion and statistical profile of current audio playback equipment operations. These profiles were developed based upon several extensive series of site visits to various entities that play a role in current operations in order to determine what services are being provided to patrons of the program, what workload in being processed by the various functions required in operations, what resources are utilized, what procedures are followed in the production of the services, what costs are incurred, and what problems are being encountered. This section of the report addresses in detail the various roles played by the NLS, USPS, Regional Libraries/Machine Lending Agencies (MLAs), Sublending Agencies (SLAs), Equipment Manufacturers, Commercial Equipment Repairers, Volunteer Repairers, the inventory control system (BPHICS) contractor, Multistate Centers, other contractors and vendors, and patrons in overall operations, and also contains a separate discussion of automation in current audio playback equipment operations.

Section 3 of the report contains a discussion and presentation of significant findings, their relative importance to the project's objectives, and their relevance to three fundamental repair option recommendations developed and presented in later portions of the report. These major findings are summarized below.

- Equipment is not uniformly available to patrons of the national free library program due to regional variations in agency fiscal resources, agency levels of emphasis, agency or volunteer repair capacity, and/or agency or volunteer repair quality. There simultaneously exist pockets of machine shortages accompanied by patron waiting lists, while other areas appear to have more working machines than they require;
- Too many machines are in the repair pipeline (approximately 32,000 versus an ideal target of approximately 10,000), signaling problems in current repair capacity;
- The quality of CBM repairs are unsatisfactory, with an average reject rate of approximately 43%, signaling major problems in current repair quality;

- The current new production allocation scheme is fundamentally problematic because it is entirely based upon merit rather than need, is static rather than dynamic, uses a readership allocation basis that introduces error, and does not consider age of agency inventory;
- Triage is not applied at all lending agencies, and results in 20,000-to-30,000 machines going into formal electro-mechanical repair that should rather be turned around within an agency the same day examined;
- The diagnostic and repair procedures, equipment, and personnel skills employed by repair groups vary considerably (including the use of different repair codes), and result in marked variations in repair quality, and indirectly, repair capacity (i.e. repeat repairs);
- Communication and coordination with the repair groups is generally poor, and the network is more diffuse and diverse than previously thought. As of mid-February, 1995, 288 independent repair groups have been identified, with a significant number being one-person operations;
- The warranty repair program has several problems including its cost, which is too high, and delays in processing warranty machines;
- The CBM cases are hard to clean;
- The NLS parts operation lacks an automated inventory control system, which is necessary to maximize distribution efficiency, facilitate procurement forecasting needs, and aid in other types of management analyses, does not use barcoding, and is also conducted in relatively expensive facility space;
- Although security of equipment in some MLAs is a problem, the real problem re. equipment security/attrition is with patrons, especially institutions;
- The variety of agency ADP systems in current use results in information communication and compatibility problems;
- Delivery and return of equipment by the USPS sometimes takes too long, with MLAs generally not using bar-coding of zip-codes and pre-sorting of mailed output;
- Machine disposal operations have several problems including non-removal of batteries in disposed machines, scrapping of machines still eligible for warranty, and use of good packaging supplies for disposal shipments;
- The BPHICS system and the Monthly Machine Report (MMR) differ by 9% (63,000 machines) for the common models tracked, and the MMR tracks an additional 37,000 machines that BPHICS does not; and,
- Non-reporting and late reporting of MMR data continues to be a problem, but has recently improved.

Section 4 presents recommendations that, fundamentally, do not vary with the three repair options developed and presented in Sections 5, 6, and 7. The first portion of Section 4 presents recommendations pertaining to inventory management and custody control of equipment, while the second portion presents various other recommendations. The primary recommendations with regard to inventory control are as follows:

- Audio playback machines are long-lived rather than expendable assets, and must be tracked and accounted for by lending agencies;

- The MMR should be revamped to become the Machine Inventory Management System (MIMS). MIMS would encompass agency inventory status reporting to the national level, and would produce management reports pertaining to repair backlogs, inventory aging profiles, working inventory levels, and production planning requirements. It would rely, to the maximum extent possible, upon the telecommunication of data from agencies to the NLS.
- The BPHICS system should be revamped to become the Custody Accounting System (CAS). CAS would encompass agency inventory custody reporting to the national level and would include activity reporting, but should both reduce by a moderate degree the quantity of exception reporting reconciliation the network agencies must process, and provide NLS with certain management information to better manage operations.

The primary recommendations with regard to other aspects of operations are:

- Implement triage at all lending agencies;
- Implement an automated inventory control system for the parts operation conducted by the NLS, move the operation to lower cost facility space, use prepackaging of certain line items, and bar-code parts bins to expedite distribution;
- Change the warranty repair program to reduce cost and expedite the processing of repairs;
- Eliminate the redundant submission of both warranty repair forms and repair data to the NLS if it is not to be used;
- Improve the ease with which the standard CBM can be cleaned;
- Label all machines with lending agency-specific, easy-to-read, identification;
- Perform an audit of the machine disposal process, centralize all disposals, improve the disposal shipping process in several respects, verify the serial numbers of disposed machines, and eliminate the practice of agencies physically retaining machines after accounting for disposals;
- Change the new production allocation process by making it needs-based rather than merit-based, make it dynamic rather than static, use aging of agency inventories in the process of equilibrating inventories, and use an estimate of two readers per institution rather than four or six...if readership is still to be used as a basis;
- Promulgate a machine identification bar coding standard to the network in terms of convention (3/9), type (S/N), and location on the machine (handle-end);
- Improve on-time agency reporting to 100%;
- Implement bar-coding of both addressee and return USPS zip-codes in shipping labels, and presort mail to expedite deliveries if relevant.

Section 5 presents the decentralized repair option operational scenario. This scenario is based upon the premise that the relationship with volunteer repairers is not hierarchical and traditional, and that the only effective manner in which repair quality and capacity can be improved is through education and persuasion. It is recommended that, lending agency contracts and responsibilities notwithstanding, the NLS must take a much more active role in the training, coordination, and monitoring of volunteer repair operations throughout the network. A National Repair Coordination Center must be created and staffed whose mission will be to train and monitor repair operations via continuous site visits, provide them with parts and equipment as necessary, and coordinate with repairers and agencies as necessary for load-leveling of repairs as required. This scenario assumes maximum utilization of the existing repair network. This option is the second most expensive to implement, the second most likely to achieve repair capacity objectives, and the least likely to achieve repair quality objectives.

Section 6 presents the regionalized repair option operational scenario. This scenario is essentially identical to that for the decentralized scenario except in the following two respects: 1) only relatively large volunteer groups will be used and fostered, with approximately 20-to-25 groups in total nationally; and, 2) repair groups would become reporting agencies in this scheme. This option is the least expensive of the three considered, the second most likely to achieve repair quality objectives, and the least likely to achieve repair capacity objectives.

Section 7 presents the centralized repair option operational scenario. Detailed resource requirements, workload estimates, and operating procedures are presented for a single free-standing, modern, first-class repair and distribution operation that would utilize paid staff to process all repairs required nationally, with the exception of warranty repairs. This central operation would also handle all equipment-related functions now managed by the MSCs, the parts operation now managed by the NLS, and the disposal operations now housed at the Library's logistics facility in Landover, Maryland. The operation would employ a variety of modern features such as mobile shelving, bar-coding and automated battery charging equipment. This option is the most expensive to implement, but the most likely to be successful in achieving both repair capacity and quality objectives.

Section 8 presents cost/benefit analyses of the three repair option scenarios and recommendations regarding their implementation. The costs of implementing the decentralized, regionalized, and centralized repair scenarios over a 10-year period are estimated at $12.3 million, $2.6 million, and $23.7 million, respectively. The savings associated with implementing these three scenarios are $5.7 million, $6.5 million, and $15.1 million, respectively. The decentralized option is found to have a net cost of $6.6 million and the centralized option a net cost of $8.6 million. The regionalized option yields a net savings of $3.9 million.

The appendices to the report contain detailed statistical and narrative information supporting the eight sections in the body of the report.

Addendum A presents a detailed profile of recommended operating procedures and forecasted activity at the MLA level in future operations. The best organizational, managerial, and operational practices of all the MLAs observed in the site visits conducted for the study are incorporated into the recommended mode of operation. Although fiscal resources and/or other constraints may preclude implementation of some or all of these recommendations, the profile is nevertheless established as a conceptual future operation.

Addendum B presents the recommended audit of machine disposal operations currently conducted in Landover, Maryland. The primary purpose of the audit is to determine the quantity of machines that can be salvaged from the disposal stream, and secondarily to determine both how well agencies are making the repair-scrap decision, and the age-repairability character of the machines. The statistical parameters for the test design are presented, and it is concluded that if approximately 10% or more of the machines are found to be salvageable, then universal central disposal and screening of machines should be implemented.

Section 1
Introduction

Section 1

INTRODUCTION

This section of the report presents an introduction to Study II, Part 1 (as modified) of the audio playback equipment project. The background and objectives of this effort are initially presented, followed by a discussion of the scope of the study, the methodology used in its execution, and the format of this document.

1.1 BACKGROUND

The National Library Service for the Blind and Physically Handicapped (NLS), Library of Congress, administers a free national library program for persons who are unable to read standard printed materials due to physical and/or visual impairments. In cooperation with authors and publishers of books and magazines, NLS is granted permission to mass-produce copyrighted works. NLS works with a network of state, local, and private libraries and agencies, which provides the necessary resources for the storage and distribution of the NLS materials, and provides a direct interface with the patrons of the service. Books and magazines in braille, recorded disc, and recorded cassette format, as well as specially designed playback machines and accessories, are delivered to eligible patrons by postage-free mail, and returned to network libraries and agencies in the same manner.

The free national library program consists of three major components, each with its associated responsibilities, costs, and revenue sources. NLS, funded by Congress, secures copyright permission from authors and publishers; contracts with commercial and not-for-profit firms for the mass production of braille and recorded books and magazines, playback machines, machine accessories, and repair parts; and administers the program. The United States Postal Service (USPS), funded directly by Congress for this program, provides transport of program materials among network facilities, patrons, NLS, and points of book and machine manufacture and repair. The network, consisting of state, local, and private libraries and agencies, and funded by various combinations of federal, state, local, and private sources, provides the personnel, facilities, and other resources necessary to provide NLS materials to patrons. The combined expenditure for the entire program is approximately $120,000,000 annually, with the three major components bearing approximately equal portions of the total costs.

1.1.1 Network

There were five basic types of organizations participating in the network during federal fiscal year 1993. Fifty-six (56) Regional Libraries (RL) provide a comprehensive range of services, including services in addition to distributing NLS sponsored materials. Eighty-six (86) Subregional Libraries (SRL) provide book circulation services to a specified part of a regional library's territory, and 71 of these 86 subregional libraries also provide playback machine services. Four (4) independent Machine Lending Agencies (MLA), in conjunction with the RLs, control and distribute NLS playback machines and accessories to patrons in a specified service area. Three-hundred one (301) Sublending Agencies (SLA), 71 of which are also SRLs and two of which are also RLs, provide audio playback machine loan services to a specified part of an RL's or MLA's service territory. Two (2) Multistate Centers (MSC), which are NLS agencies, distribute program materials and backup supplies and equipment to network libraries and agencies, as well as braille and recorded books from special and backup collections directly to patrons.

1.1.2 Previous Study

In 1989 and 1990, NLS contracted with Technology Management Corporation (TMC), a subsidiary of ManTech International and currently a division of ManTech Technical Services Corporation (MTSC), to perform a two-phase study of network operations. In the first phase of the previous study, TMC gathered information from a selected sample of network agencies, and network statistics compiled by NLS, and calculated both annual costs and a 15-year cost projection for NLS sponsored activities provided to patrons by the network. TMC found that the approximate costs of network operations for federal fiscal year 1989 (FY89) were $3,154,000 for braille book services, $7,724,000 for playback machine services, and $30,181,000 for recorded book services, for a total of $41,059,000 for all three services combined. In addition to the costs incurred directly by network agencies, NLS directly incurred approximately $805,000 in costs for its three (currently two) multistate center operations of which $173,000 was for braille book services, $92,000 was for machine services, $387,000 was for recorded book services, and $153,000 was for publication and back-up supply services.

In the second phase of the previous study, TMC developed two alternative centralized service models, one for the provision of braille book storage and distribution services, and the other for the provision of audio playback machine storage, distribution, and repair. Both alternative models proposed that service be provided from two national centers, and each model was compared to existing service patterns at the time, i.e., 39 braille libraries and 57 machine lending agencies. As a result of these previous studies, NLS determined that it was probably both feasible and economical to centralize braille book services and decided that an implementation study be undertaken. However, in the case of audio playback equipment storage, distribution and repair, NLS determined that it *might* be feasible to centralize these operations but that more detailed analyses would be required before a firm conclusion could be reached.

1.2 OBJECTIVES OF STUDY II, PART 1

On September 21 and 22, 1993, a meeting was held with the project Advisory Committee (consisting of representatives from network libraries, major consumer groups, and library organizations) to discuss and refine the objectives of the first phase of the audio playback equipment project, and to enumerate all of the important factors, concerns, and constraints to be considered in its undertaking. Based upon the results of this meeting, the objectives of the effort were changed from those specified by the NLS in the original solicitation. These changes are discussed below.

1.2.1 Original Objectives

The original objective of Study II, Part 1 was to develop centralized models of two or three options of audio playback equipment storage, distribution and repair operations addressing resource requirements of all types, including automation, facilities, equipment, personnel, and other requirements, and their associated costs. It also was to develop the most appropriate operating procedures to be employed within any centralized operations. The analysis was furthermore to address operational goals and patron and network concerns about centralization as enumerated in the original solicitation, and as posed by the study Advisory Committee. Additionally, the analysis was to take into account results (not necessarily conclusions) from the previous feasibility studies, any applicable U.S. Government standards and requirements for automation and telecommunications, and any applicable existing or planned NLS systems. Finally, the analysis also was to address any impacts on agencies other than the centers themselves which would result from centralization implementation, and to make recommendations on the most effective and efficient arrangement of the proposed machine centers vis-à-vis the existing MSCs.

1.2.2 Modified Objectives

The original objectives of the project were modified as a result of the September, 1993 Advisory Committee meeting. Specifically, the study was **not** to take an *a priori* slant towards centralization of audio playback equipment operations. Rather, a comprehensive management study of current operations was commissioned with the objectives of improving the efficiency and effectiveness of services offered to patrons. Primary objectives of both the NLS and the network are the improvement of the accuracy and timeliness of reporting and accountability of the equipment, improvement in the repair process, and an increase in the availability of machines for patrons of the network. To this end, ManTech was tasked by the NLS and the Advisory Committee to:

- Collect information on current operations,
- Document current operations,
- Enumerate significant findings, and
- Formulate and present recommendations for improvement.

1.2.3 Constraints Imposed

Two fundamental constraints were imposed by the project Advisory Committee upon the formulation of any recommendations by the ManTech/WKA study team. First, RLs and MLAs throughout the network must be allowed to physically possess sufficiently sized inventories of equipment and distribute such equipment within their service regions to patrons of the free national library program on both a walk-in and mail-order basis. Second, RLs and MLAs throughout the network must, to the maximum extent possible, be the only point of patron contact in the system.

1.3 SCOPE OF STUDY

Listed below are basic tenets regarding the analyses performed and the development of recommendations during the course of Study II, Part 1 (as modified) of the audio playback equipment project.

1.3.1 Overall Scope

All functions relating to audio playback equipment operations beginning with the distribution and allocation of new equipment production through the disposal of used equipment were within the scope of the project effort. Some functional areas received more attention and scrutiny than others based both upon specific direction from the NLS and/or upon the apparent relative importance of particular functions in the overall scheme of operations. All types of organizations, i.e. the NLS, MLAs, contractors, etc. were studied.

1.3.2 Equipment Design and Manufacturing

Equipment design, procurement, and manufacturing functions, while not explicitly "out of scope", were not in the mainstream of the study, per NLS direction. Findings and recommendations pertaining to these functions are not addressed in this report except to the extent that they impact other functions which are in the mainstream of the study.

1.3.3 Machine Audit Process

Both per NLS direction and given the practical reality of the situation, the machine audit process is not addressed in this report. The audit process is out of NLS and network agency control, and is not addressed for this reason alone. Furthermore, certain efforts to "score better" in the audit process, given the manner in which the audit is currently conducted would in fact, in ManTech's opinion, be detrimental to overall service (e.g. rapid write-off of unlocatable assigned inventory versus efforts to retrieve Government Furnished Equipment (GFE)).

1.3.4 Funding

The method(s) by wl h any recommendations would be incrementally funded, if implemented to any extent, is outside the scope of the study and is not addressed in this report. This pertains to both aggregate funding requirements for any implementations and to the manner in which any such incremental costs would be shared by the NLS and the network.

1.3.5 Transportation/Postage Costs

The costs of transporting equipment, supplies, spare parts, and any other materials relevant to audio playback equipment operations, performed by the USPS, are outside the scope of the study and are not addressed in this report. Any incremental impacts on the USPS resulting from the implementation of any recommendations presented are not addressed in the analyses for this reason.

1.3.6 CBM Emphasis

Per NLS direction and based upon the practical reality of current operations and envisioned future operations, the emphasis of the study focused upon providing Cassette Book Machine (CBM) services to patrons of the free library program. Although Talking Book Machines (TBMs) and equipment accessories are also elements of the program, the CBM is the "workhorse" of the equipment side of the program and is, by far, the most important single area of concern from the perspective of both the NLS and the network. Furthermore, the NLS is seriously considering phasing out both talking books and magazines on disc. For this reason, the report's primary focus is upon functions that impact CBM operations. However, as a result of the March, 1994 Advisory Committee meeting concerning the Study II, Part 1, Phase 1 draft report, the scope of the effort was broadened to include a description of major TBM activities since these operations will continue for several more years.

1.4 METHODOLOGY EMPLOYED

The methodology for the conduct of Study II, Part 1 (as modified) consisted of essentially seven steps, which are summarized below.

1.4.1 Review Prior Study Reports

Prior to the performance of the initial (autumn 1993) site visits, and both prior and subsequent to the September, 1993 Advisory Committee meeting, the previous study reports on machine operations were reviewed by the study team members. These reports were reviewed both from the standpoint of refamiliarization with the efforts and results of the prior studies, and for identifying weaknesses or other areas that deserved additional scrutiny/revisiting as part of the current effort.

1.4.2 Attend First Advisory Committee Meeting

In September, 1993, the first Advisory Committee meeting for Study II was held with the Advisory Committee in Washington, D.C., and the results of that meeting have already been described in Subsection 1.2 of this report. The various concerns, constraints, and modified objectives resulting from this meeting are addressed in this report with the exception of those that are outside the scope of the study, per NLS, and which are enumerated in Subsection 1.3 of this report.

1.4.3 Conduct Site Visits

NLS, network, and commercial contractor sites were selected by NLS for site visits by the study team in order to develop an understanding of all applicable functions which constitute the whole of audio playback equipment operations. The sites selected and visited, the dates of the visits, and the geographic locations of the sites are shown in Appendix 1-1. In addition to these site visits, 20 sites were visited as part of the quality of repair analysis (these sites are listed in Problem Statement 6 in Section 3 of the report).

During the course of the site visits, the functions which constitute machine operations were observed first-hand, staff participating in relevant functions were interviewed, and both statistical data and non-statistical documentation pertaining to these functions were collected. The primary objectives of this data collection effort were to: 1) determine exactly what audio playback equipment services are currently being offered to patrons of the free national library program; 2) determine what resources are currently being employed to provide the subject services; 3) determine what operating procedures are currently being employed to provide the subject services, with an emphasis upon problems that are encountered; and, 4) collect data which would facilitate both the development of a profile of current operations, and analyses of current operations.

1.4.4 Document Current Operations

With all site visits completed, the study team then compiled all information collected in order to fully describe current operations in terms of both narrative descriptions of functions and statistical profiles of workload and production for those same functions. These descriptions and profiles then served as the bases for evaluation of the present system.

1.4.5 Perform Analyses and Identify Problems

With a narrative and statistical profile of current operations documented, analyses were performed to scrutinize various functions and to identify any associated problems. In other instances, analyses were not required to identify and define problems, as they are clearly evident to NLS, network agencies, and/or commercial contractors. Potential solutions to some of the identified problems were formulated in this step, but not as final recommendations.

1.4.6 Formulate Recommendations

The last step involved in this phase of the project was to formulate recommendations for future operations that would eliminate or attenuate the problems identified (either current problems or problems forecasted to occur in the future). Some recommendations were directed at network level functions, some were directed at NLS level functions, and some were directed at commercial contractor level functions.

1.4.7 Delivery of Draft Report and Subsequent Activities

A draft report was prepared and delivered to NLS on March 1, 1994. At the March, 1994 Advisory Committee meeting convened to discuss the draft report there were differences in opinion among Advisory Committee members as to some of the basic assumptions and non-quantified findings contained in the document. Additionally, an expanded range of alternative recommendations was desired by the committee.

It was thus agreed that the scope of the original effort should be expanded and that additional data be gathered and analyzed. Consequently, the following activities have occurred since the March, 1994 advisory committee meeting:

- o Four additional sites were visited:
  - Texas Regional Library,
  - North Carolina Regional Library,
  - Kentucky Regional Library, and
  - MSCW.
- o Efforts to quantify machine operations were made in the areas of:
  - Machine repairs,
  - Non-warranty machine defects,
  - Volunteer labor value,
  - Volunteer labor capacity, and

- Machine economic repair threshold.

- o The area of machine inventory management and reporting has been extensively revisited from the "no constraints" perspective.
- o The description of the central repair scenario was enhanced.
- o Two new repair options were developed:
  - Decentralized, and
  - Regionalized.
- o Section 3 of the March, 1994 report was reformatted to be more problem-oriented.
- o Cost/benefit analyses were prepared to contrast the three repair options.
- o A directory of volunteer repair sites was prepared, profiling these groups' operations.
- o An audit of the machines being shipped to Landover for disposal was designed.
- o The report was edited and rewritten to reflect the above work.

1.5 FORMAT OF REPORT

The overall format of the Study II, Part 1 report was essentially determined by ManTech, with an outline submitted to NLS for comments and suggestions, and with the comments subsequently integrated into the report. The report is structured as described below.

- Section 1 contains an introduction to the report, including the background to the current study and phase, the objectives of the effort, the methodology used in its execution, and its scope and format.
- Section 2 contains a narrative discussion and statistical profile of current audio playback equipment operations.
- Section 3 contains a discussion and presentation of significant findings, their relative importance to the project's objectives, and their relevance to the repair options developed.
- Section 4 presents recommendations that, fundamentally, do not vary with the three repair options developed.
- Section 5 presents the decentralized repair option operational scenario.
- Section 6 presents the regionalized repair option operational scenario.

- Section 7 presents the centralized repair option operational scenario.

- Section 8 presents cost/benefit analyses of the three repair option scenarios and recommendations regarding their implementation.

- Appendices contain detailed statistical and narrative information supporting the eight sections in the body of the report.

- Addendum A presents a detailed profile of recommended operating procedures and forecasted activity at the MLA level in future operations.

- Addendum B presents the recommended audit of machine disposal operations conducted in Landover, Maryland.

Section 2
Current Operations

Section 2

CURRENT OPERATIONS

This section of the report presents a narrative discussion and statistical profile of current audio playback equipment operations of the national free library program beginning with a high level summary, followed by a detailed presentation of all relevant organizations and the functions performed by each, and concludes with a focus upon automation and the ADP systems employed within current operations. This section of the report is essentially the same as that presented in the March, 1994 draft report, but edited with updated statistics, where available, and with narrative descriptions, where applicable.

2.1 SUMMARY OF CURRENT OPERATIONS

The audio playback equipment operations of the national free library program consist of a large number of organizations performing diverse functions that interact with one another in various ways. The NLS is the nucleus of the program and coordinates and manages, directly and indirectly, the many components of current operations. It develops specifications and production requirements for new equipment, contracts with commercial firms for the production of the equipment and monitors production, determines how equipment is to be allocated among network MLAs, and instructs the manufacturer regarding the distribution of such production. The national inventory of equipment is tracked by a centralized contractor-operated database system, and the NLS assists and monitors the contractor in the performance of this function.

The NLS determines the needs for equipment repair parts and equipment-related supplies on a national basis, contracts with firms for the provision of these items, and stores and distributes the majority of parts (not supplies) from the NLS itself. Procedures to be followed by network agencies and repairers regarding equipment inventory control and repair are developed by the NLS and promulgated to all agencies and repairers. The NLS determines the needs for warranty coverage of equipment and the needs for NLS-funded commercial repairs, and contracts with firms for the provision of these services. The disposal of some of the equipment in the network is directly handled by the NLS, research and development of equipment is conducted by the NLS, and the direct coordination of special efforts by volunteer groups is performed by the NLS. Finally, the NLS procures the services and monitors the performance of other contractors that provide essential support to current operations, which include the operation of Multistate Centers, the support of the READS system, the support of the CMLS system, the support of the NLSNET, and the disposal of spent batteries.

The United States Postal Service transports all items required for the program among the various entities that play a role in current operations; the only notable exception being bulk shipment of supplies to MSCs from suppliers. Items are transported and processed as free-matter, which is handled in the bulk-mail system of the USPS with parcel post priority. The USPS is also the official agent of the NLS regarding the initial receipt of new production from manufacturers.

Machine Lending Agencies (MLAs), and the Regional Libraries (RLs) with which they cooperate (in the four service regions wherein the MLA and RL are not the same agency), register patrons with the free library program and have virtually all direct interface with patrons. They create, maintain and delete patron records from their systems (most of which are automated), select equipment for patrons and train them in the use of such equipment, and address any problems patrons have with equipment. MLAs receive and place orders for patrons, and issue equipment to patrons on a first-time and replacement basis. These agencies also perform all distribution functions at the local level, including receipt and issue of new and returned equipment, and maintain control of inventory for which they are responsible. MLAs are responsible for the repair of equipment in their custody and execute this function via the use of in-house staff, and, primarily, volunteers. Finally, the MLAs must dispose of unrepairable equipment, and report various inventory status and activity transactions to the NLS as necessary.

Sublending Agencies are used by some MLAs as adjunct service points, and these operations focus on the provision of service to patrons in a portion of an MLA's service area, with many specializing in walk-in service. Many of the same functions performed by MLAs are performed by SLAs. SLAs do not interact directly with the NLS regarding equipment operations, but rather receive equipment from, and report inventory and activity information to, their MLAs.

Equipment manufacturers, of which there is currently one (another is being brought "on-line" in the very near future), manufacture and distribute equipment to the network per NLS direction. The current manufacturer also performs warranty repairs on standard Cassette Book Machines (CBMs) and non-warranty repairs on several special types of equipment, and additionally is the largest supplier of repair parts to the NLS. Finally, activity for all of the above functions is reported to the NLS.

Commercial repairers, of which there is currently one (exclusive of the non-warranty repairs performed by the manufacturer mentioned above), perform repairs on non-warranty CBMs per NLS direction. The NLS provides all repair parts to the firm, which then repairs defective equipment and returns the repaired units to the same MLAs that submitted them.

Volunteer repairers directly support network MLA/SLA operations by receiving defective equipment, repairing it, and returning it for use by the agencies supported. All parts are provided by the NLS directly, or indirectly via the MLAs/SLAs. A few select repair groups work directly for the NLS in the repair of specialized equipment and/or the reclamation of certain equipment components.

A systems contractor operates a centralized, national equipment inventory control system (BPHICS) for the NLS, which involves the receipt, input and processing of data provided by network agencies and MSCs to maintain a custody database of inventory on a periodic basis. This system produces management reports for the NLS, and activity exception reports for network agencies, to assist in the control of national inventory.

Multistate Centers are operations under contract to the NLS that receive, store and distribute playback equipment, equipment related supplies, and some repair parts directly to network agencies and repair groups. They are monitored and directed by the NLS, and regularly report their activity and inventory status to the NLS.

Several other firms not previously mentioned provide necessary services and goods within the framework of current operations. These functions include ADP systems support for MLA and NLS ADP systems, provision of repair parts, provision of supplies, and disposal of batteries.

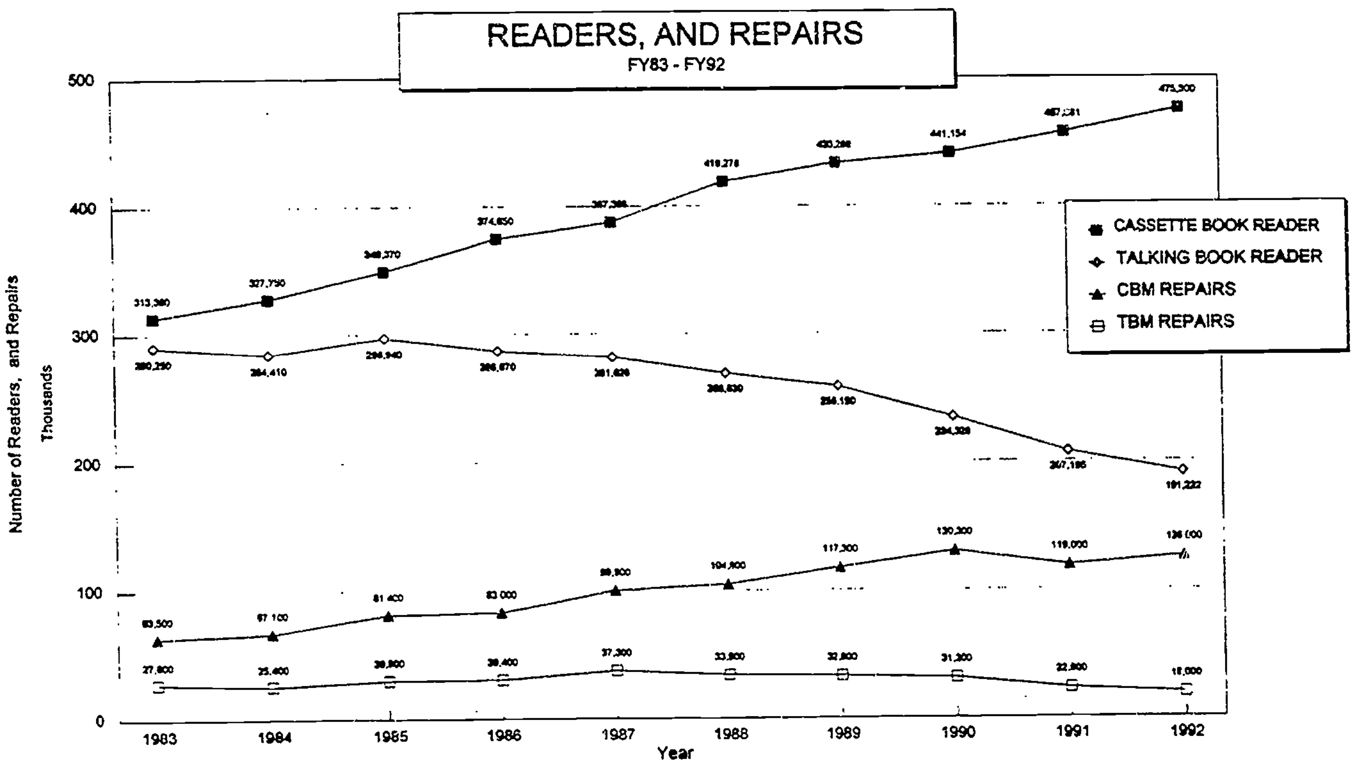
Finally, patrons of the service themselves have three responsibilities to the program. These responsibilities include proper operation of the equipment with which they have been furnished, return of equipment when defective and return of all equipment if they leave the service for any reason, and responding to inquiries made by their serving MLA/SLA and NLS auditors.

Exhibit 2-1 presents the readership and machine repairs of the free national library program for 10 years as reported by network agencies. Machine inventories cannot be shown in this exhibit because data is only available from 1989 to the present.

2.2 ORGANIZATIONS AND FUNCTIONS

This subsection of the report presents a detailed discussion of the various organizations and their associated functional responsibilities which in entirety constitute the whole of audio playback equipment operations of the free national library program. An in-depth focus upon issues specifically associated with the use of ADP systems within current operations is contained in Subsection 2.3 of this report; however, the physical components of these functions are presented in this subsection as well.

Exhibit 2-1



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2.2.1 National Library Service

The National Library Service (NLS) for the Blind and Physically Handicapped, Library of Congress, is the nucleus of the free national library program which, as previously mentioned, includes the provision of audio playback equipment services. The major functional responsibilities of the NLS with respect to the audio equipment portion of the program are addressed below, with those areas in the mainstream of the project receiving more emphasis than those on the periphery of the study.

2.2.1.1 Manage and Coordinate Overall Program

The most fundamental and overarching function of the NLS is the overall management of the free national library program, including both the coordination of all the necessary functions performed for the audio equipment portion of the program, and coordination with the organizations that perform them. The NLS interacts in various ways with equipment manufacturers, supply and parts vendors, network agencies, commercial and volunteer repairers, systems contractors, MSCs, and patrons. The NLS obtains congressional funding for its own operations, which is in the order of $40 million annually (total budget) and deploys those fiscal resources toward the provision of various services. The provision of NLS services is performed both with in-house staff and contractor support in the performance of various functions, which are detailed below for any that are relevant to audio playback equipment operations.

2.2.1.2 Contract, Procure, and Control Equipment Production

The following major types of audio playback equipment are currently in use by the free national library program:

- Talking Book Machines (TBM), Standard, model A-1, A-80, etc., are phonographs capable of playing rigid and flexible discs at 8-1/3, 16-2/3, and 33-

1/3 rpm, and are not equipped with batteries. Of these models, only the A-1 has a variable speed control and a tone arm with special location and damage minimization features.

- Talking Book Machine, Overseas, model B-79, is identical to the standard TBMs except that it contains a rechargeable battery, has variable speed control, and can use 110-120 or 220-240 volt current; it is loaned only to eligible patrons living in foreign countries.

- Cassette Book Machine (CBM), Standard, models C-1, C-79, C-78, etc., are portable playback-only cassette machines that can play two and four-track cassettes at 15/16 and 1-7/8 ips, have a rechargeable battery, and variable speed control.

- Cassette Book Machine, Overseas, model C-1A, is identical to the standard CBM except that it can operate and recharge its battery using 220-240 volt current; it is loaned only to eligible patrons living in foreign countries.

- Cassette Machine, model C-80, is identical to the standard CBM except that it has an alarm which is activated when the battery requires recharging, and a pitch-restoration device which provides near normal voice pitch with increased playback speed.

- Combination Machine, model CT-1, plays both discs and cassettes, is physically larger and heavier than the standard TBM or CBM, can switch sides of a cassette automatically, has a tone arm with special location and damage minimization features, has variable speed control for discs and cassettes, and can be operated with or without a battery.

- Easy Cassette Machine, model E-1, is a cassette machine that is extremely easy to operate, has no battery, is smaller than a standard CBM, and is microprocessor controlled.

- Accessories include headphones, pillowphones, breath switches, solar battery chargers, amplifiers, remote controls, and extension levers which are available to patrons of the service who have a demonstrated need for these special devices.

One of the most important functions NLS performs with respect to the audio playback equipment portion of the program is to determine new equipment production needs, solicit and award contracts for the production, and monitor that production. Appendix 2-1, Machine Production Schedule, presents the machine production schedule as published by NLS for the period 1990-to-1997 for all machine models produced and yet to be produced during this period. The most important changes to note vis-a-vis new production is the discontinuance, after FY94, of TBM production (both A-1s and A-2s), increased overall production of CBMs (both C-1s and C-2s), and discontinuance of CT-1 production.

NLS has relied upon one manufacturer for all of its machine production needs (models C-1, A-1, E-1 and CT-1), but is currently in the process of bringing another, "second source" manufacturer on-line (for model C-2). NLS intends to eventually award 60% of production to the lowest bidder and 40% to the highest bidder for future needs once the second source is up and running. The FY94 scheduled production of C-1 machines was 58,437 units, up from 45,000 units in FY93.

The equipment production quantities required are forecasted by NLS based upon network needs and fiscal constraints. However, from experience the NLS knows that given the approximate current level of network activity in term of readership served, circulation of recorded books (which drives machine usage), repairs performed, machine attrition and machine longevity, the network requires approximately 4,000 new C-1s per month. If the moving average production over a period of several months declines much below this level, NLS has found, the system "starts to fold"; this has been found to be true regardless of some variations in the number of machines reported as being available and/or in repair (i.e. the stock potentially assignable, or "working inventory").

NLS rationalizes the need for new production arising for four reasons: 1) a net growth in national readership consisting of approximately 15,000 patrons annually, 2) attrition of machines via loss by patrons, inability to locate patrons and hence machines, or known theft of machines, 3) attrition of machines that cannot be accounted for in the data reported by network agencies, and 4) disposal of machines, which are reported as such, that are damaged beyond repair, or that require repair but have been deemed "obsolete" by the NLS. The forecasting cycle is performed annually, but two years in advance of procurement for the forecasted period. The NLS will adjust the let dates of the production contracts to smooth the production schedule of the manufacturer, else the NLS will be charged higher prices in future periods.

In addition to the determination of production quantities, the NLS develops and maintains specifications for the equipment, and solicits bids and proposals for the production of the equipment, evaluates them, and awards production contracts; the solicitation and award of contracts is also assisted by the Library of Congress Contracts and Logistics Service. The equipment specifications are also a formal adjunct to the contracts.

NLS also performs on-site QC on the production of new C-1s at the manufacturer's facility in a room dedicated to that function. A 2-week inspection cycle is used, and an entire two-week batch of production is set aside for QC purposes. An 8-machine sample is extracted from each lot, which is one day's production, or approximately 176 machines, and subjected to QC testing; this equates to 80 machines (8 X 10 workdays) being inspected during one trip. The primary test equipment required for the QC consists of frequency generators, oscilloscopes, and volt meters. If a lot is rejected for a defect determined from the inspection of the sample, the entire lot is inspected for that specific defect. The inspections NLS performs do not involve opening up the machines, although NLS has had the manufacturer open up machines at times as required. In NLS's opinion, the QC is worth the effort expended. NLS is currently finding the machine to be relatively reliable with very few major component failures. After NLS QC approval, the machines can be shipped by the manufacturer to their directed destinations, and the manufacturer then bills NLS for the associated production.

2.2.1.3 Manage Inventory of Equipment

The primary inventory management responsibilities of the NLS with regard to audio playback equipment consist of allocation of equipment, maintaining accountability and control of the national inventory while in the custody of other parties, and controlling the disposal of equipment. The responsibility of other parties with respect to inventory control of equipment in presented in other portions of the report.

Equipment Allocation

New C-1 production is allocated to network machine lending agencies based upon the percent of total national recorded book readership that each machine lending agency constitutes as reported in the annual September readership and circulation reports submitted to the NLS; this is currently the sole criterion for allocation of new C-1 production. Until several years ago, the allocation basis used was the percent of total national population that the population of each agencies' service area constituted as reported by the Bureau of the Census, U.S. Department of Commerce. The study team is unaware of any other allocation schemes used prior to that of total population, although that could have been the case. New production of C-1s is allocated strictly to MLAs, not SLAs; MLAs make all subsequent allocations to SLAs, if any. No machines are allocated to an MLA unless a valid service agreement is in place between the NLS and the agency.

Appendix 2-2, C-1 Machine Allocation, FY94, shows the calculation of C-1 machine allocations for FY94 by network MLA. Total readership by MLA was calculated as the number of reported individual patrons plus four (4) times the number of reported institutional patrons for the end of FY93 (the previous year's data is always used). This policy was supposedly to be changed to use a factor of six, however, FY94 allocations still used a factor of four, and this total ranged from a high of over 36,000 readers for Florida, to a low of 178 for the Virgin Islands. A total of 46,720 C-1 machines were allocated for FY94 production, ranging from a high of 3,545 to a low of 19 machines. The annual allocation by MLA is then divided into approximately equal monthly allocations (in multiples of 4 machines, for overpack shipments, wherever possible), and the manufacturer is directed by the NLS to ship those quantities to the specific locations on a monthly basis.

Manage Inventory

The C-1 is the only machine with a formal allocation by NLS as described above. CT-1s, E-1s, A-1s, C-80s, extra C-1s and older standard CBMs, overseas machines and accessories shipped directly from the manufacturer are stored in, and distributed from, the MSCs upon MLA request, which in the cases of breath switches, solar battery chargers, amplifiers, remote control units and C-1s/standard CBMs require the approval of the NLS Equipment Control Officer (ECO).

The MSCs are the primary holding areas for distribution of new CT-1s, E-1s, A-1s, and overseas machines, but secondary storage points for the distribution of C-1s and older standard CBMs. The NLS ECO makes allocation decisions for the controlled items based upon need as determined by the NLS. The information used to make these needs determinations is contained in Monthly Machine Reports (MMR) submitted by network agencies and MSCs which quantify machine inventory by model and by status (i.e. (1) available for issue, (2) in repair, or (3) assigned to a patron). Information contained in the Blind and Physically Handicapped Inventory Control System (BPHICS), which is addressed later in this subsection, is not in any way used for these determinations.

Appendix 2-3, National Machine Activity and Inventory Summary, FY93 and FY94, contains a consolidation of national MMR roll-ups for each month of FY93 and FY94, showing the reported activity during each year and the status at the end of the period for all models of machines that are required to be reported to the NLS; this exhibit is presented in the standard format of the MMR. Models classified as "obsolete" (deemed by NLS to be too old to repair if defective) are not required to be reported in the MMRs. There are, however, two problems with these data: (1) the annual activity summaries have error introduced because, if an MLA does not report data for a given month, the last data reported is used instead ... this introduces relatively minor status errors, but more substantial activity errors, (2) throughout FY94, including Sept. 94, virtually all MSC inventory status data was reported as assigned, while in reality none is assigned.

Exhibit 2-2, Total Machine Inventory, End of FY94, presents another stratification of the data contained in Appendix 2-3, which groups all TBM, CBM, CT-1 and E-1 models into four classes, by status, as of September 30, 1994. Finally, Appendix 2-4, CBMs by Location, September 30, 1994, contains a further detailing of only standard CBMs, stratified by the three basic types of inventory status and the reported or estimated physical location of the inventory. Exhibit 2-2 and Appendix 2-4 contain corrections for the incorrectly entered MSC MMR data.

Authorization of Disposal

The third basic responsibility of NLS with regard to control of the national inventory of equipment is the authorization of equipment disposals. There are two justifications for disposal of equipment: 1) it is damaged beyond repair, i.e. it is deemed not worth repairing if, generally speaking, it cannot be fixed with 2 hours or less of labor and/or it is so fundamentally damaged (including chronic insect infestation and/or extensive corrosion of the deck) that it cannot be repaired without replacing virtually every component; and, 2) it is defective *and* it is an "obsolete" model.

The decision to dispose of a machine is made locally by either network agency staff and/or repairers (whether volunteers, warranty or commercial) and is based upon a number of factors and judgements; however, permission to dispose must be requested from the NLS ECO. The agencies and/or repairers send model and serial number information to the NLS ECO who examines the data to ensure that none of the machines are under warranty, and who also examines "where the agency stands" in terms of the status of their inventory, i.e. the number of machines in repair and available relative to readership. The ECO then forwards requests to the NLS Director for approval or rejection (nearly always approval), issues disposition instructions to the agency/repair group, and usually sends shipping labels for disposal shipment to Landover, Maryland.

Exhibit 2-2

TOTAL MACHINE INVENTORY
AS OF 30 SEPT 1994

			Assignable			
Machine/Model No.	Total Inventory	Assigned to Patrons	Available	In Repair	Total	% Assignable
(1)	(2)	(3)	(4)	(5)	(6)	(7)
TBM - A1, A74-A80	167,686	141,155	21,553	4,978	26,531	15.8%
CBM - CT-1	17,667	2,941	14,456	270	14,726	83.4%
CBM - E-1	37,143	26,044	5,350	5,749	11,099	29.9%
CBM - C-1, C-76-C80	550,542	488,543	28,214	33,785	61,999	11.3%
Total	773,038	658,683	69,573	44,782	114,355	14.8%

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However, two other courses of action may be followed with regard to disposal: 1) local disposal may be authorized, with a reminder to absolutely ensure the removal of batteries (which are environmentally hazardous), or 2) to first cannibalize salvageable parts and then send the remains to Landover or otherwise dispose of. The ECO, after authorizing disposal, sends the model/serial number data of the machines to the BPHICS contractor for update of the national inventory database.

2.2.1.4 Promulgate Equipment Management Procedures

Another way in which the NLS manages the national inventory of audio playback equipment, albeit indirectly, is via promulgation of procedures to be employed by network agencies. Promulgation of inventory management procedures occurs in two ways: 1) distribution of standard documentation to all agencies, and 2) direct contact via telephone, telefax and mailed correspondence on an as-needed basis to network agencies.

The formal document containing NLS promulgated equipment inventory management procedures is the Machine-Lending Agency Inventory Procedures Manual, some portions of which are dated January, 1990 and others dated June, 1991. This document covers most of the important aspects of procedures to be followed by network agencies including: the basic responsibilities of machine lending agencies; the tracking of activity and maintenance of inventory records; the procedures for receiving, issuing, transferring, storing and disposing of equipment; procedures for the write-off of equipment; responsibility for repair of equipment; relations with and responsibilities of sublending agencies; and, reporting requirements, including all forms to be used in such reporting. All of these functions are discussed in Subsection 2.2.3, Regional Libraries and Machine Lending Agencies, and the details with regards to automated systems are contained in Subsection 2.3. Other promulgated documentation includes memos and addenda that are to be used as adjuncts to the procedures manual, and Lending Agency and Sublending Agency Service Agreement contract formats and contents. The Network Library Manual also treats machine-lending activities.

It is noted that NLS has determined that monthly reporting of various equipment related data, i.e. MMR submissions, BPHICS submissions, etc., is the best frequency for submission of such data. Reporting of such data by network agencies used to occur semi-annually, and it was determined through experience that this was not frequently enough for effective inventory management at the national level.

2.2.1.5 Procure and Control Repair Parts

The NLS is responsible for providing equipment repair parts to network agencies, volunteer repair groups and commercial repairers for use in the repair of audio playback equipment. Although some parts are obtained via reclamation and cannibalization of machines, the vast majority of repair parts are purchased new from both the machine manufacturer and from several other vendors.

Based upon a listing of repair parts stocked in August, 1993, the current equipment manufacturer provides 84% (329 of 392 line items) of parts required for CBM repair, and other vendors provide the remaining 16% of the line items. Because detailed parts consumption data is not available from NLS due to the lack of an automated parts inventory control system, detailed parts consumption information on both physical and financial bases could not be compiled and presented in this report. The NLS provided an estimate of $1,816,000 for FY95 budgeted expenditures for repair parts for audio playback equipment; approximately $658,000 of this total is attributable to the purchase of NiCad batteries, which is the most notable item not supplied by the equipment manufacturer.

Because of the lack of an automated inventory control system for parts, reorder requirements are determined via the compilation in an electronic spreadsheet of consumption data extracted from manual inventory cards maintained for each line item. A two-year consumption inventory-on-hand quantity is the general target stock in the NLS parts procurement cycle, primarily because the lead time is approximately one year for most parts. This one-year lead time is due to delays resulting from the NLS/LOC procurement function itself, and the orders must be submitted to the U.S. equipment manufacturer who, in turn, forwards most orders to a Japanese subcontractor who must receive the orders, manufacture the parts and import them into the U.S. The U.S. manufacturer must then inspect the parts, and finally deliver them to the NLS. Recent practice has been to place two orders annually for replenishment of repair parts; an initial large order early in the year, and a second, smaller order later in the year, if required.

2.2.1.6 Store, Distribute, Allocate and Manage Repair Parts

In addition to needs forecasting and procurement of repair parts, the NLS also stores, distributes, manages and when necessary, allocates, repair parts to network agencies and repairers, both commercial and volunteer, and this function is performed at NLS itself in Washington, D.C. The repair parts operation listed 392 stocked line items in August, 1993 for CBMs, and additional parts are stocked for TBMs. An 18-month to 2-year supply of parts is targeted for most line items due to average lead times of one year and biannual buys. With average annual parts expenditures of approximately $2 million, the inventory-on-hand is approximately $3 million. Although approximately 10 high velocity line items are stored in and distributed from the MSCs, including batteries, these constitute a small portion of the total line items.

The NLS parts operation supports all network agency, volunteer, and commercial repair functions throughout the country with the exception of warranty and non-warranty (E-1) repairs performed by the machine manufacturer, and even has some coordination with a handful of repair groups in Canada. A listing of repair facilities to which repair parts are shipped, provided by the NLS and dated August, 1993, contained 258 locations. Appendix 2-5, Shipping Locations for Repair Parts, By State, contains a summary, by state, of the number of locations to which parts are shipped by the NLS. The actual number of distinct repair sites which use these parts is, in all probability, greater still because, at some of the 258 sites, especially some of the RLs/MLAs, the parts are further distributed to other, subsidiary repair sites that do not order directly from the NLS.

The ordering cycles of the various repair groups are, in practice, somewhat random and vary depending upon activity and the degree of inventory control of parts at the local level. NLS promulgates a target inventory-on-hand of 6-months supply of repair parts. Repairers place orders using a standard form, which is mailed to the NLS and the data are then entered into an electronic spreadsheet. A repair parts clerk picks the orders from pick-line stock, if available, or retrieves from back-up stock, if necessary. A stock card is annotated when an order is picked, noting the date, quantity picked and the customer. The orders are packaged and shipped free-matter, except in a few instances where UPS has been used to expedite urgent deliveries. The order picking workload per requisition is more dependent upon the number of line items per requisition than the total quantity of items requested in any given order.

Repair parts are received in bulk from suppliers; as previously cited, two orders per year are typically placed. But in addition to new parts arriving from suppliers, four other types of inputs also are received at the NLS parts operation, which are: 1) returns of excess parts from some volunteer repair groups, 2) reclaimed/cannibalized parts from some select groups that perform salvage activities, 3) a limited quantity of machines sent to NLS by manufacturers and repairers for NLS QC and/or inspection, and 4) machines erroneously sent to NLS for disposal that should have been sent to Landover, Maryland.

The parts stock is laid out in stock number sequence in bins, on shelves and, in the back-up stock room area, a few items are floor-stored in the aisles. Some items are stored in fixed issue quantities in packages, while others are loose stock stored in bins. A paper inventory is performed twice per year in the NLS parts operation for inventory control purposes. Appendix 2-6, NLS Parts Operation Profile, contains a tabular profile of the inventory, shelving and facility space utilized by the NLS machine parts operation.

NLS is considering three possible enhancements to the current repair parts operations which are: 1) the use of an off-the-shelf, PC-based automated inventory control system to automate the inventory control and reordering functions, 2) the possible bar-coding of bins in tandem with the use of a scanning device to automate the capture of receipt and issue transactions, and expedite the distribution function, and 3) the inclusion of a graphic locator system to expedite order picking.

2.2.1.7 Promulgate Repair Procedures Information

The NLS establishes and promulgates repair guidelines and procedures information to network agencies and volunteer repair groups, which together performed approximately 120,000 of the 126,000 reported CBM repairs in FY93 and virtually all of the approximately 19,000 reported TBM repairs in FY92. Warranty and commercial repairers, who together repaired approximately 6,000 CBMs in FY92 and again in FY93, although granted access to these procedures by the NLS, generally develop their own procedures and rules of thumb that must be approved by the NLS, but need not coincide precisely with promulgated procedures as long as contractually specified equipment performance is achieved.

The NLS develops procedures and guidelines for repair based upon its own analysis of repairability of the machines, as well as upon the use of warranty machine defect statistics as reported by the manufacturer. There is currently no organized compilation and consolidation of the detailed repair data (logs) reported by network agencies and volunteer groups, nor is there a use by the NLS of data ostensibly reported by the current commercial non-warranty repairer.

The procedural information and general guidelines for machine repair promulgated by the NLS currently is distributed in five ways. First, a series of six repair manuals, one for each of six progressive "programs", have recently been consolidated into one, large ring binder; this document constitutes the official NLS promulgated procedures on machine repair, including a comprehensive symptom/remedy chart and checklist, and was developed with the assistance of a volunteer repair group from Pennsylvania. There is also a "Reconditioning Guide" which is an adjunct to the manuals, that details the steps to be taken in reconditioning machines. Second, video tapes of repair procedures are available for use by repairers. Third, there is limited direct contact between NLS staff and network/volunteer repairers both in person, but mainly by telephone and some by mail, whereby repair procedures can be passed on to the repairers. Fourth, procedures are passed on to network and/or volunteer repairers in formal training sessions conducted periodically at the MLAs or repair facilities. Finally, repair procedures are also promulgated via bulletins (the "Machine and Accessories Report") and memos which are distributed to repair sites to either facilitate update of the manuals, or simply to convey the information they contain.

Promulgated procedures consist both of recommended detailed steps to follow in the handling, diagnosing, and repairing of defective machines, and of overarching guidelines that are applicable to the repair process. Two examples of overarching guidelines are the "2-hour rule", whereby defective machines are not deemed worth repairing if the estimated required labor exceeds two hours, and the "reconditioning rule", whereby defective machines undergo an automatic series of steps in the repair process including the complete replacement of wearing parts regardless of the diagnoses.

2.2.1.8 Procure and Control Warranty Repairs

The NLS procures services of the manufacturer of audio playback equipment in the form of warranty repairs, the specifics of which are addressed later in Subsection 2.2.5.2 of the report. The warranty essentially requires the manufacturer to provide all parts and labor required to bring a machine up to specified functionality within the warranty period, with the single exception of defects resulting from patron abuse, and to warranty the warranty repair itself for an additional year. Since 1991, C-1 machines have carried a 3-year warranty, while prior to that the warranty period was for two years. The 3-year contract is more comprehensive than the two-year contract, in that the repairer is required to provide batteries, instruction materials and proper packaging as a part of the warranty, whereas the 2-year contracts did not and the NLS was separately and incrementally billed for those items.

The warranty is a part of the manufacturing contract, and has been itemized separately from the costs of machine production in the contract since 1991, but was not separately itemized prior to that time. The cost for warranty repairs for 3-year C-1s produced under the 1991 contract was $12.36 per machine, and with a production quantity of 42,000 machines, amounted to approximately $520,000 for the coverage provided. The number of C-1 warranty repairs performed by the manufacturer for the calendar years 1988-1993 is shown in Appendix 2-7, C-1 Warranty Repairs, 1988-1993, and was 3,389 machines for calendar year 1993.

The NLS cites three benefits to having a warranty agreement with the manufacturer: 1) it motivates the manufacturer to build reliability into the product, 2) it educates the manufacturer facilitating design improvements in the product, and 3) it provides additional repair capacity to the network. The NLS also views the costs of warranty repairs as being associated with three elements: 1) payments for the performance of the repairs themselves, 2) an "insurance premium" for coverage against any major defects that could manifest themselves after production and distribution that evaded both manufacturer QA and NLS QC, and 3) payment for the collection of statistical data in the form of frequency distributions of machine defects encountered in the performance of the warranty repairs (Reference Subsection 2.2.5.2).

Although NLS has the option to subject warranty repaired machines to QC procedures, the current practice is not to QC the warranty machines but rather to focus all NLS QC efforts upon new production. This is done because the historical return rate of warranty repaired machines is very low, and the manufacturer is additionally held to a one-year warranty on the warranty repair itself.

When network agencies send warranty machines back to the manufacturer for repair, they also send a copy of the standard warranty repair form to the NLS. The data on these forms are not compiled by the NLS directly; however, the symptoms of the defects noted on the forms are input by the manufacturer into an electronic spreadsheet compiled on a weekly basis and submitted to NLS on a monthly basis, so this information is provided to the NLS indirectly. This data includes the machine serial number, defects, reported symptoms, and submitting agency. These records are then consolidated into a standard monthly report that consists of a frequency distribution of machine defects sorted in descending order for all C-1 warranty repairs ever performed. This information is then used by the NLS to assess machine reliability, to monitor the warranty repairs and provide backup to the manufacturer's invoice, and to order parts for non-warranty repairs performed by network agencies, volunteer and commercial repairers.

2.2.1.9 Procure, Control and Allocate Non-warranty Commercial Repairs

The details of the non-warranty commercial repair function are described in Subsection 2.2.6, and are not repeated herein. The NLS's direct responsibilities with respect to non-warranty commercial repairs of audio playback equipment are the procurement, allocation and control of the function.

The NLS obtains the services of a commercial repairer through open competition for the provision of non-warranty repairs that provide labor, repair equipment and overhead, but not repair parts, for repairs on a per-unit-repaired basis; NLS provides all repair parts required for the repairs directly to the contractor. The repairs are themselves warranted for one year from the date of repair, and the machine must be brought up to specified functionality. The incumbent contractor has been working for the NLS for approximately seven years, and this repair volume has increased from approximately 200 to 3,600 CBMs annually. The current cost of the contract is approximately $90,000 annually.

Because machine lending agencies are explicitly responsible for the provision of all non-warranty repairs required for the machines in their custody, the allocation of this relatively limited repair capacity is sometimes a sensitive issue, i.e. it is technically not the responsibility of the NLS to provide these services to the network, and the demand for such services exceeds the supply. In practice, the NLS has recognized that there are a number of problem spots in the network with respect to the provision of adequate repair capacity and/or quality at the local level, and the performance of some centralized repairs for those locations became mandatory. One additional, secondary use of this function is the repair of machines that some agencies or volunteer repair groups do not want to attempt, i.e. the harder than average machines to fix.

In rare instances, some of these machines have been shipped to a location other than the submitting entity, which is the exception not the rule; in general, all machines are shipped back to the MLAs that submitted them for repair.

There are no strict rules for allocating this limited resource, but two important considerations are: 1) whether an agency has reached the point where no machines are available for issue to patrons, and 2) the number of months backlog of machines in repair, the first consideration being relatively more important. The number of months backlog of machines in repair is determined from annually reported repairs per network agency annual reporting, and monthly reported inventory status data contained in agency MMRs.

The third major responsibility of the NLS with respect to commercial non-warranty repairs is the performance of on-site QC, which is performed every 5-to-13 weeks, with the average frequency being approximately every six weeks. Statistical quality control procedures are applied to distinct repair lots of 100 machines the contractor stages for NLS inspection before return shipment to the submitting network agencies. If a lot fails inspection, the entire lot must be inspected by the contractor for those specific defect(s).

It is noted that historical information could neither be obtained from NLS nor the contractor regarding parts consumption and defect frequencies associated with commercial non-warranty repairs, although the contractor ostensibly compiles and provides such information to the NLS. It is, therefore, assumed that no use is made of such information by the NLS in the same manner as the data provided for warranty repairs by the manufacturer.

2.2.1.10 Procure, Control and Allocate Supplies

The NLS procures, controls and sometimes allocates supplies in support of the audio playback equipment portion of the free library program. Such supplies, as distinct from playback equipment and repair parts for equipment, essentially consist of: packaging supplies; standard forms; inventory and repair manuals; and printed, braille and cassette tape instructions for equipment operation. These supplies are procured by the NLS, which uses an automated inventory control system to monitor inventory on hand and consumption to assist in inventory control and replenishment determination. These items are stored in and distributed from MSCs, not the NLS, and for the most part the quantities ordered by agencies are shipped by the MSCs (if in stock) without any required NLS approval. There have been a few exceptional instances wherein some supplies have been rationed when quantities on hand fell to low levels, and NLS has had to give specific direction to the MSCs regarding any such rationing.

2.2.1.11 Procure and Oversee MSC Operations

The NLS provides MSC operations to network agencies to support various aspects of the services provided, including audio playback equipment related functions. The details of MSC functions related to equipment operations are presented in Subsection 2.2.9 and are not repeated here, but essentially the MSCs are entities operating under direct contract to the NLS which store and distribute equipment, some repair parts, and supplies to requesting network agencies, volunteer repair groups and, very occasionally, commercial repairers and patrons. There are currently two MSCs which cost the NLS approximately $760,000 annually to operate, which include functions other than the support of equipment operations; at one time there were four MSCs, but two have been closed and consolidated with the others.

The NLS monitors and controls MSC operations via: 1) the collection of reports and statistical data reported by the MSCs, 2) the performance of periodic site visits to the MSCs, and 3) on-going correspondence via telephone, telefax, and mail regarding the subject functions. Reports of equipment activity and inventory status are collected monthly, copied and examined, and detailed transactions are forwarded to the BPHICS system for input, and aggregate statistics are compiled into the MMRs. Reports of repair parts and supplies activity and inventory by line item are collected monthly for management of these items, including reordering requirements, using an automated inventory control system. Both quarterly and annual comprehensive reports are also collected from the MSCs, which include summaries of equipment inventory and activity, and facility space utilization by major function; however, all other data in these reports are at an aggregated level, with no delineation between those relevant to equipment (e.g. machine cartons), and those that are not.

2.2.1.12 Procure and Control BPHICS Contractor Operations

The NLS uses an automated, centralized inventory control system, the Blind and Physically Handicapped Inventory Control System (BPHICS), to formally track the inventory of GFE that is on loan to network agencies in accordance with machine lending agency service agreements, any equipment which is stored in the MSCs, and any new production that has been shipped by a manufacturer but that has not yet been received by an agency. The system is operated for the NLS by a contractor at a current annual cost of approximately $44,000.

The details of the BPHICS function are presented in Subsections 2.2.8 and 2.3 and are not repeated here, but the BPHICS system essentially tracks machines by model and serial number to the machine lending agency, MSC and manufacturer level of custody, but has no information regarding status of inventory, i.e. the units which are in repair, on loan or available for issue at any given location. The system is fed detailed transaction data from the network machine lending agencies, MSCs and manufacturers, sent via NLS in hardcopy (which is currently being shifted directly to the BPHICS contractor) and directly to the contractor if submitted in a machine readable format. The data is entered into the system and batch processed, and from this effort inventory, activity, audit and reconciliation reports are generated and distributed to appropriate parties.

The responsibilities of the NLS with regard to the BPHICS function are to procure the services of the contractor, monitor the performance of the contractor and ensure the generation and receipt of all required reports, and assist the system contractor, which includes: 1) receiving from network agencies, MSCs and manufacturers source data transactions for BPHICS and reviewing, possibly editing, copying and forwarding these transactions to the contractor (this processing stream is being shifted to the contractor), and 2) coordinating with the contractor regarding enhancements or changes to the system, or changes in procedures or formats in the source data submitted. The incumbent contractor has performed the function for the NLS for almost six years, and the contract is recompeted every three years. Site visits are only rarely required.

2.2.1.13 Perform Equipment Disposal Operations

The NLS, in addition to both reviewing requests for disposal of equipment submitted by network agencies, repair groups (all types) and MSCs, and authorizing the disposal of such equipment, actually performs part of the disposal function itself at an annex facility in Landover, Maryland. It is estimated that currently approximately 6,000 CBMs and 8,000 TBMs per year are sent to Landover for disposal, based upon statistics provided by the LOC Logistics Service. Some machines are also disposed of locally after authorization by the NLS ECO, and these are not processed by Landover; it is estimated that 2,000-8,000 CBMs per year, but very few TBMs, are disposed of in this manner. Additionally, approximately 2,000 CBMs/year are sent directly by MLAs to the Phoenix, AZ reclamation center.

The primary reason that most machines are shipped to Landover for disposal is for the NLS to ensure that the batteries have been removed from the units prior to disposal in a landfill. The batteries contain cadmium, which is an environmental hazard, and require special disposal (Ref. Subsection 2.2.1.14 and 2.2.10.4). A byproduct of this process is the reclamation of some machine components and packaging materials.

Machines arrive in both good and bad packaging materials in bulk mail containers at the LOC annex, where they are then unloaded and palletized (sometimes additionally shrink-wrapped) by warehouse personnel, and conveyed to a corner of the facility and staged (floor stored) in several aisles; many TBMs arrive unboxed with mailing labels pasted directly onto the machines. Approximately 30 palletloads of machines of all types were on-hand in Landover on the date of the site visit, and this constituted approximately a 3-month backlog.

NLS personnel perform the disposal function approximately once per month, and begin the process by opening all boxes. The machines are then weighed to determine whether or not the batteries have been removed (which is the responsibility of the sender), and if they have not been removed are separated for separate disposal; the screws to the battery compartment are also supposed to have been removed by the sender, but in some cases are not. Good packaging materials are separated from other packaging materials (which should have been used) for reuse, and the spent materials are scrapped. NLS indicated that a significant quantity of packaging materials are recovered in this manner. Sometimes machines still under warranty are received, and if this occurs, they are sent to the manufacturer if deemed not damaged beyond repair.

All C-1s are then boxed and mailed to a volunteer reclamation group in Arizona, all non-C-1 CBMs are palletized (unboxed) and staged for later disposal in a landfill, and some TBMs are sent (boxed) to a volunteer reclamation group in Minnesota. Possible alternative uses for the materials scrapped in the landfill are being considered, specifically recycling of some type, but nothing is currently being recycled from this disposal stream. The serial numbers of the disposed machines are not logged by the NLS, but ostensibly are sent by the MLAs to the NLS ECO for forwarding to BPHICS, and this results in the machine records being removed from the BPHICS master file (this is the only way a machine is removed from the master file).

2.2.1.14 Procure and Control Battery Disposal Operations

The NLS currently uses the services of a contractor that disposes of the rechargeable Nickel-Cadmium batteries used in CBMs in accordance with EPA approved methods via high-temperature incineration. These batteries cannot be disposed of in conventional landfills due to the environmental hazard posed by the cadmium contained in the batteries. The cost of this service is approximately $6,000 annually.

The NLS has been acting as a pass-through for the disposal of spent NiCad batteries, but network agencies and repair groups are currently being told to directly forward these items to the contractor beginning in early 1994. The NLS itself also sends batteries to the contractor that have been removed from machines submitted for disposal, even though those machines are supposed to be void of batteries upon shipment to Landover. No on-site inspection or supervision of this function is required by the NLS.

2.2.1.15 Coordinate and Control Volunteer Reclamation/Repair Operations

It is estimated that approximately 90% of total non-warranty machine repairs are performed by volunteers; the exact number is unknown because repair statistics are annually reported at a level of aggregation that does not yield an exact count. Appendix 2-8, Machine Repairs by MLA, FY92 (this is the most recent data for which ManTech has a CBM/TBM, TP/other breakout by MLA), contains a table showing the number of repairs performed in FY92, by MLA, and the national total, stratified into the following four categories: 1) TBM repairs by Telephone Pioneers (12,312 in FY92), 2) TBM repairs by other than Telephone Pioneers (6,858 in FY92), 3) CBM repairs by Telephone Pioneers (76,587 in FY92), and, 4) CBM repairs by other than Telephone Pioneers (46,735 in FY92). The "other" category consists of both in-house staff repairs and volunteer repairs by groups other than the Telephone Pioneers, the most notable other single volunteer organization being the Elfuns, and this non-TP mix varies with each MLA.

Direct liaison with volunteer repair groups on a day-to-day operating basis is the responsibility of the MLAs, not the NLS, as is the overall responsibility of repairing machines. However, the NLS does perform three other functions with regard to volunteer repair activity in the network: 1) maintains a liaison at the national level with the Telephone Pioneers, Elfuns and several other volunteer repair groups, 2) directs and monitors the efforts of a few select volunteer groups that perform specialized work, and 3) coordinates the inter-MLA transfer of machines for repair.

Liaison with volunteer repair groups is effected via mailed correspondence, newsletters, telephone contact, and meetings regarding issues other than the promulgation of repair procedures previously addressed. The specialized work performed by several select volunteer repair groups consists of reclamation of relatively expensive parts from C-1 machines (Arizona), repair of PCBs (approximately 10 locations), repair of E-1 machines (New York), repair of overseas machines (New York and Colorado), repair of a limited quantity of C-1 and C-79 machines (Illinois), and repair of accessories (Maryland and Colorado). Finally, the NLS also facilitates some inter-MLA transfer of machines for repair from those sites having excess machines in repair to those repair sites with excess repair capacity; there is no statistical data available to quantify these transfers, or the extent to which NLS coordinated the transfers.

2.2.1.16 Perform Research and Development

The NLS performs research and development in several areas including audio playback equipment operations. Because this function was not in the mainstream of the project, it is not detailed in this report. This function's primary objective is to research and evaluate new technologies regarding the storing and retrieving of information in ways that are potentially useful to the free library program, both with regard to advances in books and equipment. When such new technologies and/or technological enhancements are identified, the research and development group is tasked with developing plans and procedures for implementation of the same, and for managing and monitoring any implementations.

2.2.1.17 Procure, Control and Provide NLSNET

The National Library Service Network (NLSNET) is a store-and-forward type of telecommunications network that is used by network agencies, the NLS, and MSCs to transmit data in support of some functions of the free national library program. Because NLSNET is used by some entities to transmit both BPHICS and MMR data to the NLS systems contractor that accepts and processes the data for both applications, it has relevance to the project.

However, a more detailed discussion of its use in connection with these applications is contained in Subsection 2.3 rather than here.

The NLSNET is maintained by a contractor that implements enhancements to the system and also provides hotline support to users. The NLS's responsibilities with regard to NLSNET operations are to: 1) procure the services of the contractor, 2) monitor the services of the contractor, 3) provide network agencies with (typically) standalone workstations (as GFE on indefinite loan) for the exclusive use of NLSNET, 4) receive feedback from users regarding satisfaction or problems with the system, and 5) promulgate procedures for use of the system to users.

2.2.1.18 Procure, Control and Provide READS

The Reader Enrollment and Delivery System (READS) is an automated library circulation system used by over 20 network agencies whose design was, and continued development is, financed by the NLS with the intent of providing this support to network agencies; network agencies must, however, purchase the system and its upgrades. The system development is performed by a contractor under the direction of the NLS Automation Officer. NLS procures and monitors this service, and coordinates with the contractor regarding system requirements and enhancements, and with network users regarding satisfaction and/or problems with the system. Because the system has features facilitating the provision of equipment related functions, it has relevance to the project. READS is discussed in more detail in Subsection 2.3 of the report, and has a current cost of approximately $250,000 annually.

2.2.1.19 Procure, Control and Provide CMLS

The Comprehensive Mailing List System (CMLS) is a contractor-operated, batch transaction oriented automated database of patron information of individuals and institutions that use the free national library program. It is a mailing list for generation of mailing labels for shipment of direct circulation magazines to patrons, as well as a demographic database.

Patron source data provided by network agencies are input into the system by the contractor who then generates mailing labels for magazines and management reports for the NLS. It is currently not used in any manner by the NLS for the direct management of equipment operations in the network and, therefore, was not in the mainstream of the study.

However, the patron record does contain data elements ostensibly showing reported custody or non-custody of: 1) TBMs, 2) CBMs, and 3) Combination machines, which potentially provides a statistical count of readership, by media, and machines assigned, by these three major categories (but not by model, excepting the CT-1). In current practice, the data contained in CMLS pertaining to equipment is not used in any manner to manage or control the inventory at a national or agency level, and problems with the timeliness, and hence accuracy, of the data was cited as the reason it was not used.

The NLS responsibilities with regard to the operation of the CMLS are to procure and oversee the contractor's performance of the function and promulgate data submission procedures to network agencies. Unlike the situation for BPHICS (until very recently), the NLS does not act as a pass-through for source data submissions to the system. The need for site visits to monitor contractor performance is minimal, but the NLS COTR has frequent contact with the contractor via telephone and mail. The contract has a current cost of approximately $417,000 annually.

2.2.2 United States Postal Service

The USPS transports the vast majority of items pertinent to the audio playback equipment portion of the free national library program among the various organizations that play a role in the program's operations. These items include equipment, supplies, repair parts, correspondence and documentation moving about among the NLS, equipment manufacturers, supply and parts vendors, network agencies, commercial and volunteer repairers, systems contractors, MSCs, and patrons. The only notable exception to this rule is bulk shipments of certain supplies from some suppliers to the MSCs.

Mailed items are treated as free matter and the associated mailing costs are congressionally subsidized in a specific appropriation, and are processed in the USPS bulk mail system and handled with a parcel post priority, which relies exclusively upon ground (and sea) transportation. Virtually all free matter mail is conventionally addressed with human, but not machine-readable, mailing zip code by the sender, whoever they may be. Free matter bulk mail in large quantities is often consolidated and transported within either large bulk mail containers or cages. The majority of parcels are sorted several times between pick-up and final delivery, and typically traverse on conveyors at several points within the bulk mail centers.

Because USPS operations are outside the scope of this study, as are any impacts that would result from any implementation of recommendations from this study, only the above salient points are mentioned. The only other specific role the USPS plays in the current operations of the audio equipment portion of the free library program is that it acts as the official agent of the NLS as recipient of new production from the current equipment manufacturer, and "signs-off" on the Certificates of Mailing (CMs) accompanying the outgoing new production from the manufacturer's plant.

2.2.3 Regional Libraries and Machine Lending Agencies

The third major component of the free national library program regarding the provision of audio playback equipment services consists of regional libraries (RLs) and independent machine lending agencies (independent MLAs). For discussion purposes, MLA refers to both of these types of organizations. During FY94, 53 of the 56 regional libraries in the network were MLAs, and there were additionally four independent MLAs providing equipment services, for a total of 57. The site visits performed for the study included seven RLs and one independent MLA.

2.2.3.1 Register, Maintain and Remove Patrons

MLAs, directly or indirectly, are responsible for the initial registration of patrons (including verification of eligibility), the maintenance of patron records, and the removal of patron records upon the patrons leaving the service for any reason. A patron is registered with the free library service in an MLA's service region, usually by reader advisors or a registrar, and with the CMLS database using the standard CMLS form.

If an MLA uses SLAs in its service region, the initial registration and that for CMLS is usually performed by the SLA (if the SLA is also a SRL, otherwise the MLA performs this task), but the full patron record is also forwarded to the MLA for approval of eligibility, regardless of the specific services that the MLA will be providing in the way of equipment. In the case of independent MLAs, registration can take place either at the MLA (as Minnesota does), or at the regional library in the MLA's service region, and this may result in the two organizations using different patron identification codes in their respective ADP systems (as is the case in Minnesota).

Appendix 2-9, Readership and Circulation Profile, FY92, contains readership statistics as reported by RLs, and a national total for FY92. As shown in this table, there were approximately 147,000 individual TBM patrons, 11,000 institutional TBM patrons, 383,000 individual CBM patrons, and 23,000 institutional CBM patrons nationwide at the end of the period. Patrons are registered either as individuals or institutions (deposit collections), and the practice varies among MLAs as to whether patrons within institutions are registered as individual patrons as well.

Maintenance of patron records relevant to the provision of equipment services essentially consists of updates such as address and phone number changes, and issues and returns of equipment. Address and phone number changes, and changes in equipment type requirements, are entered into ADP systems by reader advisors, whereas issues to and receipts from patrons are handled by machine operations personnel (and possibly by computer operations staff as well in systems that rely on centralized data key entry, such as Florida, which is true even for SLA orders that are telecommunicated, because the picking order is not S/N specific).

Methods of patron information exchange between SLAs and MLAs, and between RLs and independent MLAs, varies but is generally done via mail using hardcopy forms which are then keyed into the MLA's ADP system. MLA ADP systems vary as to whether a machine history by patron, i.e. the serial numbers and issue/return dates, is maintained, and whether or not the MLA's system is set up to track patron custody of machines at that level (e.g. the Virginia and Kentucky MLA ADP systems do not have this history for patrons serviced by an SLA, rather, the SLAs track the machine to the patron level). All MLA systems examined contain patron records having basic data necessary to provide service including a unique id code, name, address, phone number, etc.; if the MLA system is tracking machines to the patron level, then models and serial numbers of machines on loan are included in this record.

2.2.3.2 Select Equipment for Patrons

As part of the registration process, MLAs must inform patrons of the service options available and then select the types of equipment a patron will require to use the services for which they are being registered. This function is typically performed by either reader advisors or registrars who, according to NLS procedures, are to take into account the following criteria in making equipment selection for patrons: 1) previous experience with equipment, 2) patron preferences, 3) age of patron, 4) disability of patron, 5) mobility of patron, 6) occupation of patron, and 7) types of equipment available for service. The MLAs visited follow these guidelines in general, and in rare instances allow the custody of two CBMs for patrons with special circumstances, which is technically not permitted under the machine lending agreement.

2.2.3.3 Train and Instruct Patrons in Use of Equipment

MLAs are responsible for instructing patrons in the proper use of audio playback equipment. In some MLA or SLA service regions, in-person instruction is performed with walk-in patrons and in some areas, via home visits. In other operations, the patron basically learns to operate the equipment by themselves and/or with the help of someone else using equipment operating instructions in print, braille or on tape, and also via telephone conversation with RAs or machine operations personnel located at the MLA or SLA.

Which of the above approaches is used in practice varies with the resources of the MLAs and the distribution of the readership. An important concept that must be conveyed to patrons in this function is the requirement for charging and discharging of the batteries in standard CBMs least they be rendered useless in a short period of time. In the few service areas that have independent MLAs, a part of the education process is to ensure that the patron knows which of the two operations to contact for which services.

2.2.3.4 Troubleshoot Problems for Patrons

MLAs have a responsibility to assist patrons with the operation of any equipment issued to them via advice concerning its proper operation and help in troubleshooting problems. This type of assistance is rendered both in-person, in the case of walk-ins and MLAs that provide home visits, and by telephone. In the case of walk-ins and telephone assistance, the job may be performed by either RAs (in some libraries patrons are assigned to individual RAs, and in others they are not), if they have the requisite knowledge, or otherwise by machine operations personnel, depending upon the MLA in question. If the RA, machine manager, or outreach staff determine that the equipment problem requires a repair, they instruct the patron to immediately return the machine in the packaging in which it came (in the case of outreach workers, usually taking the defective machine back with them), and inform them that a replacement will be issued immediately.

2.2.3.5 Place Patron Orders and Requests for Patrons

A distinct function performed in MLAs is the receipt of patron requests and the generation of orders that pertain to equipment services of all types. These requests and orders include: 1) issues of equipment (machines and accessories) to new patrons, 2) issues of replacement equipment to existing patrons, 3) issues of packaging supplies, instruction materials, and sometimes parts (needles) to patrons, and 4) placement of orders with the MSCs for special accessories for patrons. Two additional types of relevant transactions that occur, but that do not generate shipping orders, are : 1) notification that equipment is being returned, but no replacement is sought (deceased patron or patron leaving service), and 2) notification that a patron is moving, or has moved, into another MLA's service region and the patron is retaining custody of the equipment on loan (which generates a "paper transfer").

The placement of orders for new equipment and special accessories are usually made by an RA or registrar, but placement of orders for replacement equipment, packaging supplies, instruction materials and parts are often made by both RAs and machine managers. Orders may be placed upon an MLA's system by both patrons and, in some cases, the MLA's SLAs if the SLAs do not carry, or do not have available, the specific type of equipment required. For example, in Florida, SLAs can place shipping orders directly onto the MLA's system via telecommunications if they don't carry an item or are stocked out of it. In another example, in Pennsylvania (West), SLAs do not carry CBMs, and any order placed directly by patrons on the SLAs for CBMs are forwarded to the MLA for fulfillment. The ADP systems encountered in the study varied with respect to whether the close-out of an order was performed automatically by the system, or must be explicitly canceled "manually" by the user.

2.2.3.6 Issue Equipment and Supplies

MLAs issue both new and used machines, accessories, and packaging supplies, and new parts to patrons and SLAs in their service areas; issue used machines to warranty, commercial and volunteer repairers, and occasionally transfer used machines to other MLAs or MSCs; issue new parts to volunteer repairers; and issue used machines to be disposed of to the NLS or a local site. Typically 5% or less of total issues arise from walk-in activity.

Orders accumulate in an MLA's system that originate from the above mentioned sources that require shipment of items from the MLA. Several procedural methods are used by MLAs in fulfilling shipping orders depending upon both the ADP system used and local practice; based upon the site visits performed, the following summaries are illustrative of these differences.

Florida - Orders are placed on the ADP system by RAs directly, and SLAs via paper and telecommunicated orders. A picking list is generated consisting of pressure sensitive labels (not 3x5 pick labels) containing patron shipping information and model type required, but not S/N. An assignable machine is selected from stock, a functionality check is performed, and the S/N, model number, and patron id are handwritten onto a log sheet. The log sheet is then centrally key entered into the system charging patron with custody of the machine, closing out the open shipping order, and decrementing inventory. Issues by SLAs to patrons are reported on hardcopy log sheets at serial number/model/patron id level to MLA for input to MLA system, thus facilitating complete inventory on MLA system.

Arizona - Orders are placed on the ADP system by RAs directly, and SLAs via telephone request or mail. Using file cards containing the handwritten serial number/models of available machines, the machine manager keys into each open order record the serial number of an available machine, updating patron, machine and transaction records. The system then generates 3x5 shipping cards as pick tickets containing patron mailing data, model, and serial number of machine. Boxed machine is picked from shelf of recently checked machines, card is inserted into envelope and machine is mailed. Issues by SLAs to patrons are reported on hardcopy log sheets at serial number/model/patron id level to MLA for input to MLA system, thus facilitating complete inventory on MLA system.

Minnesota - Orders are placed on the ADP system by RAs (within MLA) directly; there are no SLAs. The system contains a file of open shipping transactions that is viewed on a monitor in the shipping area, a 3/9 bar-code label (that is both human and machine-readable) on an available machine is scanned, and a pressure-sensitive mailing label with patron data, model, and serial number is generated, attached to the machine carton, mailed out, the open order is closed-out, the patron is charged with custody, and inventory is decremented. Machines given functionality check prior to issue.

Pittsburgh - Orders are placed on the ADP system by appropriate staff directly; SLAs do not handle CBMs. The system generates pressure sensitive mailing labels with patron data, model required, but not serial number. The pressure sensitive labels are pasted onto NLS free matter blanks. An assignable machine is selected from stock and given functionality check prior to issue. The serial numbers and models of machines are input to the system to close out open orders, charge patrons with custody and decrement inventory.

Virginia - Orders are placed on the ADP system by RAs directly. Hardcopy report of open orders is generated weekly by system and contains model type and patron id. Pressure sensitive labels with patron data are then generated using another routine. The labels are then hand-annotated with a request code, and attached to NLS free matter blanks, and sorted by request code. The labels are then affixed to specific machines and the serial numbers and model data are annotated on the open order hardcopy report. The machines are mailed, and the serial number, model and patron id are keyed into the system to close out the shipping transaction, charge the patron with custody, and decrement inventory. Machines issued by SLAs are not tracked by MLA system, i.e. SLA is always patron of record.

North Carolina - All orders for equipment are placed on the ADP system by RAs located in the MLA; North Carolina has no SLAs. The orders are model, but not serial number, specific. The list of open orders is then screened by the machine manager, who examines a listing of available machines of the applicable model, and selects machines on a LIFO basis (because machines are stored with batteries inside). Age of the machine is not a consideration, but the number of times repaired is considered. The specific unit is highlighted on the ADP system screen, and its status is changed from available to assigned. Pressure sensitive labels with patron mailing information and machine model and serial number are then generated, which are pasted onto NLS free-matter blanks. The appropriate machines are then selected from available stock, the labels are affixed to the machine cartons, the cartons mailed, and the labels "posted" to the system, which completes the process.

Kentucky - Although Kentucky uses the READS system, some of the procedures it employs are different from those used in Virginia. Orders for equipment are initiated by RAs, who both enter the open orders into the system, and hand annotate pick-tickets and convey them to the machine manager; these orders are model, but not serial number, specific. An appropriate machine is then retrieved from available stock, the patron id, model and serial number of the machine is written onto a log sheet, the labels are affixed to the machines and mailed, and the log sheets are keyed into the system at the end of the day to close out the process. Order processing at Kentucky's SLAs is completely independent of the MLA, and specific custody of machines issued by SLAs is known only to the SLA systems.

Texas - All orders for equipment are placed on the ADP system by RAs located in the MLA; Texas has no SLAs. The orders are model, but not serial number, specific. The orders are batch processed overnight, and pick tickets for open orders are generated at the Texas distribution center first thing the following morning, which is located five miles away from the MLA, and are model, but not serial number, specific. An appropriate unit is selected from available stock, the bar code on the unit is scanned, and the barcode number, model and serial number of the unit is displayed on a monitor in the shipping area. The bar code on the pick ticket is then scanned, which matches the open order to the machine selected; if there is a mismatch of machine type, the user is warned. The pick ticket/address card is then hand annotated with the model and serial number of the machine, inserted into the carton pouch, and the machine is mailed. A batch verification process in the system then closes out all shipping transactions for the day (i.e. decrements inventory, charges patron with custody, and closes open orders).

The net effect of any of the above procedures is to fulfill orders, charge the patron with custody of equipment, and decrement the inventory of available equipment. Patrons of record in the MLAs systems can be patrons of the service, SLAs, or repairers; in the case of transfers and disposals, there is no patron of record because the unit is removed from net inventory. All transfer and disposal issue transactions are reported to BPHICS at the model/S/N level as described in more detail in other portions of the report. Appendices 2-10A, 2-10B, 2-10C, 2-10D and 2-10E present detailed issue and receipt statistics for the Florida RL, Minnesota, MLA, North Carolina RL, Kentucky RL and Texas RL, respectively. Of the eight MLAs visited, these five have data available to quantify all issues and receipts (because issues and returns to and from patrons, repairers, and SLAs do not affect MLA net inventory, maintaining these statistics is not an MLA requirement per NLS or BPHICS).

Allocation of machines to SLAs varies with local practice. Five of the above eight MLAs visited have SLAs, and of these four handle CBMs; in the case of Pennsylvania, all CBMs are stocked, issued and repaired in the MLA, and none in the SLAs. Allocations to the SLAs are usually made upon request, and any required rationing, determined by the MLA machine manager, is typically based upon current readership and inventory levels of each site.

2.2.3.7 Receive and Check-In Equipment and Supplies

MLAs perform a distribution function which consists of receiving and checking-in the following types of inputs:

1. New production received from the manufacturer, which in the case of C-1s is the monthly allocation for that MLA, and often but not always, arrives in one, or only a few, days per month.

2. Transfers-in from MSCs, which can consist of new and used machines and accessories, as well as supplies and repair parts.

3. Transfers-in from other MLAs, which can consist of actual physical receipts, but usually consists of a paper transfer between MLAs, i.e. the patron moves with their equipment.

4. Returns of machines from patrons either because they are quitting the service for any reason, or for replacement of a defective machine, or by another on behalf of a deceased patron; a special case is that of a recovery, whereby a machine previously written-off is received.

5. Returns of machines from off-site repair groups, whether volunteer, commercial, or warranty.

Of the above types of functional receiving transactions, the receipt of new machines and transfers-in from MSCs and MLAs all increase net inventory, but the receipts of returned machines from patrons and repair groups do not (except for recovered machines that are not damaged beyond repair) because the machines never left the MLA inventory. In the case of MLAs that use SLAs, any transfer activity by an SLA must be reported to the MLA as they impact net inventory of the MLA, but whether or not returns from patrons or repair groups are reported varies with local practice. Appendix 2-3, previously presented, shows the new production receipt and transfer-in aggregate activity of all network MLAs and MSCs for FY92 and FY93, which was derived from the summation of 12 months of national MMR summaries for FY92 and FY93, respectively. Return activity, which consists of strictly internal accounting transactions, is not reported to the NLS directly or indirectly by the MLAs, and is kept routinely by some MLAs (e.g. Florida and Minnesota), but not by others (e.g. Arizona and Virginia).

Despite differences among ADP systems and MLA procedures, all operations have several common features. All new production C-1 machines are received from the manufacturer with Certificates of Mailing (CMs), which list the serial numbers of all machines in the shipping lot. As new production is received at an MLA, the overpack boxes are broken open and the CM is annotated for machines not received, if any. The serial numbers of new machines are then entered into the MLAs ADP system by one of several methods to increment the available inventory, and the machines are physically staged as available stock. The annotated CMs are then filed (previously forwarded to the NLS ECO). All of the above steps occur regardless of the ADP system used.

Transfers-in can be physical or paper only. Most physical transfers, i.e. confirmed transfers, are shipped to an MLA by an MSC, but occasionally come from another MLA. Paper transfers-in occur by a patron moving into an MLA's service area, the transfer is reported on the standard patron transfer and machine transfer NLS forms, and an unconfirmed increment to the MLA's net inventory is made. However, if the patron cannot be located by the gaining MLA, or if the patron can be located but insists he/she does not have the equipment, then the MLA does not add it to net inventory. Transfers from MSCs could be new or used equipment, while transfers from other MLAs, whether confirmed or unconfirmed, are virtually always used equipment; paper transfers are entered as assigned, while physical transfers-in are entered as available or in-repair depending upon whether it is new (from MSCs possibly) or used, and upon local practice. Detailed transaction records by model and serial number are submitted by the MLAs to the BPHICS system for all transfer-ins from any source, as they impact net inventory.

Returns potentially can arrive from patrons or off-site repair locations of all kinds. They do not affect net inventory of the MLA (except for recovered machines), but rather the status of net inventory, i.e. what is in repair, available or assigned. In any return transaction, the patron of record is relieved upon return of the equipment, the machine is placed into either an available or in-repair status (this is true even for systems like the one Texas employs, called "In-Warehouse", which is counted as available per NLS inventory status) depending upon local procedures and the system used, and in the case of those systems which hold open "orders" effectively informing the MLA of the impending return of equipment, these records are closed-out.

2.2.3.8 Repair and Manage Repair of Equipment

Although all equipment furnished by the NLS to MLAs is federal GFE that is owned by the NLS and is on loan, it is technically the responsibility of MLAs (and their supporting SLAs, if any) to repair any defective equipment in their custody, or to slate unrepairable equipment for transfer or disposal. There is no ambiguity concerning the responsibility for the performance of this function; it is clearly spelled out in the machine lending contract all MLAs have with the NLS. Individual MLAs do, however, have discretion as to how this function is accomplished, and there exists some variation among MLAs as to how this function is actually performed. Additionally, there are a few exceptions concerning repair responsibility of the MLAs, which are addressed.

There are five possible ways in which defective machines are repaired in current operations, and these are:

1. Warranty repairs, which are performed by the manufacturer of the equipment, and whose costs are directly or indirectly borne by the NLS in the procurement of the machines,
2. In-house repairs, which are performed by paid staff who are employees of an MLA, or are directly contracted to perform repairs by an MLA,
3. Volunteer repairs, which are performed by volunteers either on-site at an MLA, and/or in off-site locations,

4. Commercial repairs, which are performed by a commercial firm under contract to the NLS, and

5. Special repairs, e.g., to E-1s and CT-1s, which are performed by either the equipment manufacturer (non-warranty) under contract to the NLS, or by select volunteer repair groups that are directly managed by the NLS.

In all but the last case cited above, machines do not leave the book inventories of the MLAs; in the last case, i.e. special repairs, the machines are transferred out of an MLA's inventory for the repairs to take place. Consequently, only transfers-out pertaining to special repairs must be reported in the form of detailed transaction records to the BPHICS system, while there exists no BPHICS reporting requirements for the other four cases, which involve internal transactions only.

Machines which become defective during their warranty period are eligible for warranty repair, which is the responsibility of the machine manufacturer. The procedure that is generally followed for the repair of warranty machines is: 1) identify that the defective machine is eligible for warranty, which in practice is done by either the MLA machine manager, or once "in repair", by a repairer, by manually examining the serial number on a machine and comparing to a "warranty cut-off date" (which is often posted on the wall), 2) fill out the standard NLS form listing symptoms of the defect(s), as well as machine model, serial number and submitting agency, one copy of which is retained, one copy of which is mailed to the NLS, and one copy of which is mailed along with the machine to the manufacturer, 3) issue the machine to the manufacturer for repair, which is a shipping transaction, and 4) receive and check-in the repaired machines sent back by the manufacturer (and if the machine is scrapped by the manufacturer, remove it from inventory). Some MLAs track the warranty machines that have been issued to the manufacturer by a special status code (e.g. Arizona), others use a specific patron of record code for the manufacturer (e.g. Virginia), while still others use a "notes field" to show temporary custody by the manufacturer (e.g. Pennsylvania) as opposed to any other locations for machines listed as in-repair.

MLAs have differing philosophies regarding the utility of warranty repairs, and these differences are evident to the extent that they utilize the option. At one end of the spectrum are MLAs that believe all defective machines eligible for warranty repair should be sent back to the manufacturer, often without even examining the machine for minor defects that are technically not under warranty (dirty playback heads, low and dead batteries, and some with no problems). At the other end of the spectrum are MLAs that believe warranty repairs are neither worth the staff time to perform the necessary output, input and reporting functions (which is approximately 15 minutes per machine), nor the total time that the machine is out-of-service (which is approximately 2 or 3 months, on average, but can range from 5 weeks to longer than 3 months). Finally, there are MLAs that have a philosophy that lies somewhere between these two extremes, which is essentially to locally repair minor defects even if under warranty, but to send machines with major defects back to the manufacturer. Appendix 2-12, Warranty Repair Utilization by MLA, shows both the absolute (total number of warranty repairs) and relative (number of warranty repairs per 1,000 patrons per year) utilization of the warranty repair option by network MLAs in FY93 and, as this table indicates, the number of warranty repairs per 1,000 patrons per year ranges from 0 to 78.

Some MLAs have in-house staff (e.g. North Carolina) that perform all repairs on defective CBMs, but the majority of machines in the network are repaired by volunteers either within the MLA facility, and/or in remote location(s). Appendix 2-8, previously presented in Subsection 2.2.1.15, shows the distribution of repairs by MLA during FY92 stratified by TBMs and CBMs, and additionally by whether the repairs were performed by Telephone Pioneers, or by other than Telephone Pioneers (which includes repairs by both non-TP volunteers and paid staff). As this exhibit indicates, approximately two-thirds of total CBMs repairs were performed by TPs, and it is estimated that approximately 90% of the total are repaired by all volunteers, TP or otherwise. It is the responsibility of MLAs to coordinate volunteer repair efforts, schedule work, track issues to and receipts from their groups (including any machines which are scrapped), and QA the work as necessary. Most tracking of machines issued to and received from volunteer repair groups is tracked by ADP system entries if issued to off-site locations, but some tracking is done "off-line"; if the repair location is within the MLA facility itself, a special patron of record or special status code is usually not used, i.e. the machines are simply "in-repair" within the MLA facility.

It is also the responsibility of MLAs to order repair parts for in-house repair staff and/or some of their repair groups from the NLS, and store and provide those items to the group(s) whether on-site or off-site. However, some repair groups order directly from the NLS, thus relieving the MLA of having to order their portion of total needs; in August, 1993 the NLS listed 258 distinct locations to which repair parts were shipped, and there is further redistribution of parts from some of these locations, most notably from MLAs, and some from SLAs. Most MLAs use a manual repair parts inventory tracking system, which relies on periodic visual assessment of stock on hand, and record keeping with index cards; cited supply targets differ only slightly, with the NLS promulgated six-month target an approximate average. Florida and North Carolina, however, have recently implemented PC-based automated parts systems to assist in inventory control and reordering; these were the only operations observed that had this capability.

Repairs of machines in the custody of MLAs are occasionally performed by a commercial repairer under contract to the NLS (Ref. Subsections 2.2.6 and 2.2.1.9), and totaled approximately 3,600 CBMs for FY93. Since repairs are the responsibility of MLAs and not the NLS, authorization for such repairs must be made by the NLS, and are not at the discretion of an MLA. If such repairs are authorized, machines are shipped to the repairer but retained in the MLA inventory; the same machines are later returned by the contractor to the MLA. This transaction is generally handled in the same manner as for issues to off-site volunteer repairers or warranty repairers (except no standard form is filled out by the MLA for the commercial repairer).

Finally, a few special types of repairs are handled differently than standard CBMs. Defective CT-1 and E-1 machines, if under warranty, are directly returned to the manufacturer for repair as is done for standard CBMs. However, due to the relatively complex nature of these machines, out-of-warranty machines are not repaired locally; rather, defective E-1 units out-of-warranty are sent to the MSCW and staged for repair at select volunteer groups and commercial repair by the manufacturer (i.e. out-of-warranty), and defective CT-1 units out-of-warranty are sent back to the manufacturer for repair (and some are also being shipped to the MSCW as well for handling similar to that for the E-1s).

The perceived usefulness of machine repair history information seems to vary among network MLAs. No automated systems were observed which contained records of what repairs were previously performed on a machine, but some are capable of showing which patrons have previously owned a given machine and/or when a given machine previously went in and out of an in-repair status. Some repair groups use machine history cards which provide insight into past repairs, but most repairers (staff or on-site volunteers at MLAs) stated that a given sequence of steps is typically performed regardless of machine history, and the instance wherein machine history may be most useful is in the repair or scrap decision, which is sometimes made prior to placing a machine into a repair queue.

The philosophy of screening machines returned for ostensible defects differs among MLAs, and these differences significantly influence the flow of machines in the system. At one end of the spectrum are some MLAs that reason virtually all machines being returned by patrons that are reported as defective by the patrons, and sometimes even all returns by patrons (whether reported as defective or not), require repair and hence all are placed into an in-repair status and are later counted as repaired (or scrapped). However, at the other end of the spectrum are MLAs that practice "triage", i.e. the machines are checked for operational functionality and are screened for minor defects, and just as importantly for no defects, and minor fixes and adjustments (battery recharging or changing, overall cleaning, playback head cleaning, and possibly simple head alignment) are made by MLA staff "on the spot", or later during the course of the working day, and the remainder of the input stream is split into two groups, reparable and scrapable. The reparable group of machines are repaired in a dedicated repair operation (staff, volunteer, warranty, or commercial) as previously described, and the scrapables are slated for disposal and staged awaiting NLS disposition instructions. Appendix 2-13A, Machine Receipts and Issues, Pittsburgh Regional Library, shows statistics recorded by the Pennsylvania (West) RL for November, 1993, which is an operation that aggressively employs triage. As this exhibit shows, the portion of total receipts (net of new production) that are "turned around" through triage is 70%. Specific analyses of machine logs employed at North Carolina, Texas and Utah yielded fringe turnaround rates of 49%, 51% and 62%, respectively; these analyses are shown in Appendix 2-13B.

2.2.3.9 Manage Inventory of Equipment and Supplies

It is the responsibility of MLAs to properly manage the GFE that is in their custody, and to additionally manage any supplies related to and required by their audio playback equipment operations. These responsibilities are encompassed by several functions which are: 1) provide secure storage for equipment, 2) provide accountability of equipment, 3) retrieve machines from patrons, and 4) order supplies and non-allocated equipment as necessary.

NLS procedures dictate that all GFE is to be securely stored within MLAs (and SLAs, if any), and that only individuals directly involved in machine related functions should have access to stored inventory. In practice, machines are both received and shipped from common receiving/shipping areas, and in these functions individuals other than machine personnel (typically circulation staff) also have access to machines. Among the MLAs visited, the degree of storage security varied, and in practice, MLAs are often limited by the internal configuration of their facilities as to whether separate secure storage is available for machines; in general, it is not, because many operations are located in facilities not designed for the application.

MLAs must retrieve GFE from patrons who should have returned equipment, but have not yet done so; e.g. if a replacement has been issued, but a defective unit has not been received, or alternatively if the patron has left the service for any reason, but has not returned equipment. NLS procedures require that at least three distinct documented attempts be made by the MLAs to retrieve such equipment; if all such attempts fail, the equipment is then written-off. The typical times between retrieval attempts is 30 days, but can vary among MLAs (e.g. three-weeks). Some MLAs use mailings only in these attempts, but others make a telephone attempt on either the second or third attempt; Florida actually makes four attempts, three mailings and a telephone call as the final attempt. MLAs differ with respect to the level of automation support available for this process (automatic prompting, generation of letters), and with regard to who performs the attempts, e.g. in Arizona, machine operations personnel make the attempts, while in Florida RAs do. If an MLA fails after three attempts to locate the patron, equipment is typically written-off as location unknown. Sometimes contact is made with the patron and the patron informs the MLA that the equipment has been returned, but the MLA has not yet received it yet; in this instance, the equipment is typically declared lost. However, there is some confusion regarding the distinction between unknown and lost, and the opposite meanings are also used. Finally, very occasionally, equipment is stolen (clearly defined per inventory procedures as involving a police action), and is uniformly written-off as stolen.

MLAs must also track any equipment they have issued to SLAs in their service area (if any). Some MLAs, such as Florida and Arizona, track all SLA machines to the patron and serial number level in their own systems, and require detailed reporting by those SLAs for all shipping and receiving (or transferring and scrapping) transactions, while others such as Virginia and Kentucky treat each SLA as a "patron" and do not require the periodic reporting of detailed inventory and throughput transactions. For those MLAs that do track to a detailed level at their SLAs, entries into the MLA ADP system must be made, which are typically from hardcopy forms (such as in Florida and Arizona).

MLAs must also order supplies required for machine operations from MSCs, which is done via a standard NLS form which is mailed or faxed; occasionally orders are telephoned in to the MSCs. MLA ADP systems generally do not maintain a continuous inventory of supplies, but some have the ability to issue such items to a patron (e.g. a mailing carton); it is noted that the Minnesota system does have the ability to maintain a running inventory of supplies. Monitoring of supplies on hand is generally done visually and periodically, with replenishment requirements thus determined and orders for the MSCs generated and mailed or faxed.

Two MLA systems that are noteworthy with regard to inventory control techniques are those used by the Minnesota MLA and the Texas RL. These are the only MLAs in the network currently using bar coding to both expedite distribution functions and minimize transcription and keying errors. All machines not containing a bar-code are bar-coded at a special workstation upon receipt (either new, or used, if the label is damaged) using a 3/9 type barcode, which is both human and machine readable in the Minnesota system, that contains the model and serial number of the machine, i.e. the bar code is the actual S/N; in the Texas system, another identifier is "cross-walked" within the system and the bar code is not the machine serial number. All machines are scanned upon receipt or issue from the facility in both systems, and upon status changes within the facility, and the system performs all matching between inventory and patron records to perform updates as necessary. The managers of the operations are extremely pleased with the systems. and claim that they have both expedited distribution operations and reduced both keying and transcription errors. Barcoding is not, however, used by Minnesota or Texas for tracking accessories.

2.2.3.10 Dispose of Obsolete and Damaged Equipment

MLAs have the responsibility of disposing of equipment that is deemed by a machine manager and/or a volunteer repair group under their direction to be damaged beyond repair, for whatever reasons. Additionally, this responsibility also exists for machines that are both defective (not necessarily damaged beyond repair) and have been declared obsolete by the NLS ECO; in the case of CBMs, machine models C-77 and older have been declared obsolete. In the two-year period FY93-FY94, an average of 16,000 CBMs were disposed annually. If machines owned by an MLA are disposed of by the machine manufacturer in the performance of warranty repair, or by the NLS commercial repairer in the course of non-warranty commercial repair, the physical disposal process is performed by these two contractors and the MLAs make subsequent updates to their ADP systems and generate associated BPHICS transactions.

Standard operating procedures require that MLAs request authorization for disposal from the NLS ECO, who evaluates all requests and either approves or denies them; in practice, approval is granted 99% of the time. The ECO then directs an MLA to take one of three courses of action with such equipment: 1) ship the machines as they are to the NLS disposal operation in Landover, Maryland, 2) cannibalize specific parts from the machines, and then ship to Landover, or 3) dispose of locally. If machines are to be shipped to Landover, the ECO sends mailing labels to the MLA for use in these shipments, and if they are to be disposed of locally, the MLA is reminded to ensure that all batteries and identifying plates have been removed prior to disposal in a landfill. It is estimated that approximately 6,000 CBMs annually are disposed of at Landover; this implies that MLAs are, in aggregate, locally disposing of an additional 8,000 CBMs annually, and shipping 2,000 directly to the Phoenix reclamation center.

MLAs must remove batteries from all machines to be disposed of due to the environmental hazard they pose, whether shipped to Landover or not, and the batteries are then shipped directly to the NLS contractor that disposes of the batteries via a special process. Old packaging materials are also to be used for shipping machines for disposal, not good packaging materials, and the screws to the battery compartment of the machines are supposed to be removed.

2.2.3.11 Report Activity

There is a considerable quantity and diversity of information which is reported by MLAs to the NLS or other parties with regard to playback equipment related functions; the details of some of these requirements are further discussed in Subsection 2.3 of the report. These reporting requirements include:

1. Monthly Machine Report activity and inventory status data at the model number level, monthly basis. Submitted to NLS if hardcopy, and contractor if electronic.

2. BPHICS activity transaction data at the model and serial number level, monthly basis. All transactions (exclusive of CM) affecting MLA net inventory submitted to contractor.

3. Standard forms for any transfer of machines out of service area, forms for transfer of patrons (with machines) out of service area, forms for warranty repair machines, repair logs of machines repaired; monthly and on-going.

4. Number of machine repairs within service area (by TP/non-TP, CBM/TBM), not including warranty or commercial (NLS paid) repairs, annually.

5. Number of recorded book readers, by media, submitted semi-annually (recorded book circulation data submitted also) sent to NLS in hardcopy.

6. Annotated BPHICS Monthly Machine Activity Reports (MMAR), sent back to contractor in hardcopy noting exceptions to any inventory transactions reported back by BPHICS.

7. CMLS transactions sent to the system contractor on an on-going basis detailing patron adds, deletes and changes, including equipment custody at CBM/TBM/Combination level by patron, using hardcopy standard forms.

8. Other reports possibly required by an MLA's own administering agency that pertain to equipment operations.

In general, there are no requirements by the NLS for MLAs to report internal activities such as issues and receipts of machines that do not leave the MLA's net inventory. In practice, some MLAs track these statistics (e.g. Florida and Minnesota), while others do not (e.g. Arizona and Virginia).

2.2.4 Sublending Agencies

Sublending Agencies (SLAs) are used by some MLAs as additional equipment storage, distribution, patron contact and repair locations within their own service areas, i.e. they are adjunct, subsidiary operations within an MLA service area. Seventy-one (71) Subregional Libraries (SRLs) in the network are also SLAs, but the converse is generally not the case (there are 301 SLAs and 86 SRLs in the network). Some MLAs have no SLAs at all, e.g. North

Carolina and Texas, and the practice varies widely as to whether or not they are used, and if so, how. Appendix 2-14, Network Profile of SLAs by MLA, FY93, shows the number of SLAs by MLA in the network at the end of FY93, which ranged from zero to 64. Rather than repeating the discussion of functions that SLAs perform that are identical to MLA functions, the most important differences are focused upon here.

SLAs all have sublending agency contracts with their "parent" MLAs regarding the storage and distribution of NLS GFE that are very similar to contracts MLAs have with the NLS, and they do not have direct agreements with the NLS. No equipment is allocated directly to SLAs by the NLS; it is first allocated to an MLA that subsequently allocates it to an SLA, typically based upon request or perceived need by the MLA machine manager. MLAs are also supposed to periodically visit their SLAs and advise them as necessary in writing in the execution of equipment related functions.

Similarly, virtually all reporting on machine related activities, i.e. inventories, transfers, repairs, etc., is forwarded to the SLA's MLA for consolidation prior to forwarding to NLS and/or the BPHICS contractor for MMR and/or BPHICS updates, and not directly to the NLS by the SLA. The one SLA visited during the course of the study could not cite any information reported directly to the NLS, with the single exception being that of a copy of the standard NLS warranty repair form when a machine is submitted to the manufacturer for warranty repair.

The relationships between SLAs and MLAs differ throughout the network. In the case of Florida and Arizona, SLAs must report detailed transactions to their MLAs including both transactions which impact the MLA's net inventory (transfers in and out, disposals, location unknown, etc.) and transactions which impact inventory status (machines issued and returned), so that the MLA system can track an individual machine to an individual patron of record. However, in the case of Virginia and Kentucky, only transactions impacting the MLA's net inventory are reported by SLAs, and only the SLAs' systems can track an individual machine to an individual patron of record. The Minnesota MLA, and the North Carolina and Texas

RLs, do not use any SLAs in their service areas, while the Pennsylvania (West) MLA uses SLAs for storage and distribution of TBMs, but not for CBMs, the latter of which the MLA handles in entirety. Without exception, SLAs report MMR data, typically using the standard form, to their MLAs for consolidation prior to submission to the NLS or the systems contractor; however, the type of "roll-up" varies as to whether SLA machines are all treated as "assigned" or are also "in-repair" and "available".

One primary function of SLAs, in general, is a focus upon local contact with patrons, with a particular emphasis upon walk-in patrons; however, machines are also mailed to patrons from SLAs and, in fact, constitute the majority of issues. As previously noted, SLAs generally stock "standard" equipment, i.e. high velocity items such as standard CBMs and TBMs, and generally must order special machines and accessories from their MLA when the need arises; these items are, generally speaking, then shipped directly to the patron who requires the item. Most of these issues by MLAs on the behalf of SLAs directly to patrons are mailed, telefaxed or telephoned into the MLA; however, Florida has a system whereby the SLAs can telecommunicate issue orders directly into the MLA system's order queue. The SLA in Fairfax, Virginia targets a 2-month supply of CBMs for their available inventory.

MLAs, almost without exception, do have basic patron data of patrons registered and serviced by all of their associated SLAs in their systems; whether or not equipment custody is a part of those records varies with local practice, as previously cited. The fundamental requirement that makes an SLA an SLA is that it have both a patron record containing any equipment in that patron's custody that they have issued, and machine records indicating the patron of record for any individual item of equipment for which they are responsible.

Some SLAs manage their own repairs, and this was the case for the Virginia SRL visited; the Virginia MLA does not get involved in the management of repairs for this SLA. The Virginia SLA: performs triage (checks and charges batteries, cleans playback heads and capstans, and cleans exterior of machines); performs a functionality test and annotates and attaches routing slips to the defective machines listing model, serial numbers and symptoms, and sends the machines out for repair to a remote location; and, performs all coordination necessary to accomplish repair, including tracking of the equipment to and from the repair location. This SLA does not, however, order and stock repair parts for its repair group; the repair group orders from the NLS directly. Warranty repair machines are directly shipped back to the manufacturer for repairs by the SLA, and the MLA is not involved in this process. On an annual basis, SLAs forward reports detailing machine repairs performed for them (or possibly by them) to their MLAs for consolidation prior to submission to the NLS.

The Virginia SLA visited rarely declares a machine damaged beyond repair; rather, its repair group makes that determination. However, the repair group does not dispose of the machine, but the SLA requests permission from the MLA machine manager (who in turn requests permission from the NLS ECO), and forwards labels for mailing to Landover to the SLA. The SLA then follows standard procedure for disposal of the machines.

Two other standard functions performed by an SLA are: 1) ordering supplies from MSCs, which is done directly and not via its MLA, and 2) machine retrieval attempts, which in the case of the Virginia SLA noted consists of an initial phone attempt followed by two form letters; prompting of staff for retrieval attempts is performed via a "machines to be returned" report automatically generated by the ADP system (READS), in the case of the Virginia SLA. Two additional points are noteworthy concerning the Virginia SLA operating procedures: 1) patrons are not assigned to specific RAs, they receive service from staff on duty at the time a contact is made, and 2) the SLA attempts to individually register all patrons within institutions even if the institution itself is a patron on file in the system.

2.2.5 Equipment Manufacturers

Equipment manufacturers potentially perform five basic functions for the NLS in support of the national free library program's audio playback equipment operations, which are: 1) manufacture and distribute new equipment, 2) receive, repair and return warranty repair machines, 3) manufacture and/or provide repair parts, 4) receive, repair and return certain non-warranty machines, and 5) report these activities to the NLS. The current equipment manufacturer of CBMs and TBMs is Telex Communications Inc. of Blue Earth, Minnesota, which also performs all warranty repairs, provides the vast majority of repair parts (but is not the only supplier), and performs some out-of-warranty repairs (but is not the only commercial repairer). It is noted that a second manufacturer is soon to be brought on-line. Because the focus of the project was upon the distribution and repair of standard CBMs, these areas received emphasis.

2.2.5.1 Manufacture and Distribute New Equipment

Telex manufactures and distributes C-1, A-1, E-1 and CT-1 machines per NLS specifications and directions, which account for approximately one-third of the total manufacturing output of the Blue Earth plant. The specifications and production quantities determine the manufacturing requirements, and the monthly or *ad hoc* allocations of new production determine the distribution requirements. The production quantities of playback machines were previously presented in Subsection 2.2.1.2, and are detailed in Appendix 2-1; FY93 production of C-1 machines was approximately 45,000 at a cost of approximately $7,500,000 (including the warranty, which is separately priced for the 3-year machines). The allocation of new C-1 machines was previously presented in Subsection 2.2.1.3, and detailed in Appendix 2-2; this allocation is based exclusively upon annually reported cassette book readership. The price of a new C-1 machine is approximately $170 of which $12.50 is for the warranty (currently 3-years, used to be 2-years), $10 is for the battery, $1.5 is for packaging materials, and $0.50 is for an instruction cassette.

The current C-1 design is very mature, and has been produced by Telex for the NLS for over 12 years. Some of the parts, including the decks, are purchased from a major subcontractor/supplier, Shinwa, while other parts are manufactured by Telex. A recent change in the production of the machine is use of ostensibly more durable rubber drive parts in the 3-year machines (but not in the older 2-year machines) that Telex worked closely with Shinwa to implement, and will ostensibly result in greater reliability of the machine. Although Shinwa uses their own serial numbering scheme for their decks, Telex finds it confusing and assigns their own serial numbers for quality assurance purposes.

Approximately 176 C-1 machines are currently manufactured per working day at Telex and, in the opinion of the production supervisor and manager, the process is currently going very smoothly. The production flow is essentially an "E-shaped" configuration, with major subassemblies, most notably the decks (themselves tested and QAed on a lot basis by Telex), wire harnesses, jack panels, and boards, each flowing down subassembly lines to the main assembly line and installed into the primary chassis assembly. All units undergo a "line QA" utilizing test equipment by an individual who is part of the production team, an additional "manual" functionality test in the production area, which is performed by another individual without the use of any test equipment, and a separate and distinct QA test by an audit group, outside the production area, whose specialty is QA itself.

After production lots pass Telex QA, the NLS performs on-site QC on the same lots in their own room within the plant; each day's production constitutes one inspection lot, and QC is performed with the battery in the machine. When these lots pass NLS QC, they are conveyed to the packaging area where; 1) the metal S/N plate is affixed to the front of the machine, 2) the battery is removed, a S/N sticker is placed in the battery compartment, and the battery is installed, 3) a S/N sticker is placed on the individual shipping carton, 4) a S/N sticker is placed on the overpack shipping carton, 5) a S/N sticker is placed on a Certificate of Mailing (CM, a packing list) that is sent to the receiving network agency, and 6) a S/N sticker is placed on the CM that Telex retains. The machines are then packaged into their individual cartons and overpacks, and conveyed to the shipping department where they are transferred to the USPS, who signs the CM as a receiving agent for the NLS.

The machines are then mailed to their destinations by the USPS. One CM is mailed first-class to the receiving agency, two copies are mailed to the NLS (via Telex headquarters) along with the invoice for the associated production, and one copy of the CM is also forwarded to the BPHICS contractor for adds to the national inventory control system.

2.2.5.2 Receive, Repair and Distribute Warranty Equipment

The current equipment manufacturer is required to provide full warranty repair services for three (3) full years for the C-1 machines it is currently producing; this warranty period was two (2) years in length for each contract year until FY91, when it was changed to three years. The warranty period for all C-1 machines produced in a given annual period starting with the beginning date of the contract begins on the contract anniversary date, except for the machines produced in the last annual period of production (in a multi-year contract) for which the warranty period begins on the date the last machine produced under the contract is shipped. All first-time warranty repairs performed are themselves warranted for the balance of the production warranty period, or for an additional one year from the date of the warranty air, whichever is the longer period of time.

Warranty coverage for C-1 machines with 3-year warranties is separately priced from production, and was $12.36 per machine in FY91, which equates to approximately $520,000 for the 42,000 C-1s produced in that contract year. Warranty coverage was not separately priced in contracts for the production of the two-year machines. Appendix 2-7, previously cited, shows the number of C-1 warranty repairs performed by Telex (combined total for 2-year and 3-year machines) for calendar years 1988-to-1993.

The warranty repairs performed on both 2-year and 3-year C-1 machines must cover all parts and labor required to bring the machines up to operational specifications, including wear, with the single exception of defects determined to be the result of patron abuse, and this final determination must be made by the NLS on-site representatives. In the case of 3-year machines, the manufacturer's warranty includes replacement of batteries, packaging, labeling and instruction materials (print, braille and cassette). In the case of 2-year machines, the warranty did not include these items; Appendix 2-15, Warranty Repair Add-Ons, FY93, contains a frequency distribution of quantities and costs incurred for these incrementally billed items for 2-year machines for FY93, which totalled approximately $37,000.

Telex attempts to perform warranty repairs continuously, thus minimizing disruptions to the flow of work. A 2-week turnaround time is targeted by Telex, which is verified by statistical data provided to the study team from Telex's MAPICS (an IBM 36 mini-computer) inventory control system, in terms of time in the *"pure" repair process*; all machines are logged into the system when "received" and when shipped. However, as cited earlier in the report in the discussion of MLA repair functions, when mailing time and "input queue" time is considered, a machine is out of service for roughly three months from the time it is shipped out for warranty repair to the time it is received again by a network agency. Telex submits no input or output transactions to BPHICS with regard to warranty repairs...the machines never leave a network agency's inventory from a custody perspective.

The C-1 warranty repair function is performed from 7am to 3:30 pm, Monday to Friday. Four FTE staff are engaged in C-1 warranty repairs. Telex management stated that their workforce is, in general, well educated and compensated at relatively low labor rates, but employee turnover is almost non-existent. The supervisor and manager of the warranty repair function have the same responsibilities for the C-1 manufacturing function. The paragraphs below summarize the flow of work and procedures performed in the execution of the warranty repair function.

<u>Receiving Workstation</u>

Warranty machines shipped by network agencies arrive at the back door of the plant via USPS free matter mailings. The machines are loaded onto pallets, conveyed to the repair area of the plant, and staged. The machines are then unboxed, and the serial numbers are read off the machines themselves and transcribed onto hardcopy log sheets; Telex does not trust the accuracy of the S/Ns written on the individual cartons. Red dot pressure sensitive stickers are then affixed to the machines containing the Telex MLA code, which is different from the NLS MLA code, which stay on the machines throughout the entire repair process and are used to batch machines, by MLA, for shipment upon completion of QA/QC. The log sheets are conveyed to the computer room and the model, serial number, date received, MLA code, and control number are key entered into the inventory control system.

Machines are received both with and without batteries, user instructions, and proper packaging, but are always shipped back with these items; as previously noted, these items are incrementally billed for 2-year machines, but are a fundamental part of the warranty for 3-year machines. Batteries are then removed from the machines, and a basic functionality check is performed to determine if the machine "works" or not. Machines determined to be unrepairable are placed on a mobile cart for NLS inspection prior to actual shipment for disposal. All of the remaining machines are placed on another mobile cart along with the standard NLS warranty repair forms attached to the individual machines; it is noted here that, while Telex finds the information on the form of some use, it is of little use in their estimation.

Cleaning Workstation

The next step in the process is the cleaning of all machines. The machines are removed several at a time from the mobile cart, conveyed to the cleaning workstation, and the NLS form is removed. The machines are hand-cleaned using a spray cleaner; the top and side surfaces are cleaned first and wiped down, followed by the cassette area (if it is dirty), and lastly the back of the machine. Compressed air is then used to dry the machine externally.

The chassis screws and mounting feet are then removed, and the unit is opened up. Compressed air is then sprayed into the opened unit, and it is examined for insect infestation. If the machine is either badly corroded, oil has saturated the deck, or a significant insect infestation is found, the machine is deemed scrapable and staged for NLS inspection and subsequent disposal. The cleaning process takes approximately 15 minutes per machine, and the NLS form is reattached to the machines after completion; it is noted here that the 3-year machines have rounded ribs and are easier to clean than the 2-year machines, which have straight-edged ribs. Two-year machines are then conveyed from cleaning to the replacement workstation, and 3-year machines are conveyed to the repair workstation.

Replacement Workstation

All 2-year machines undergo a 100% replacement of wearing parts, i.e. tires and belts; this is not done automatically to the 3-year machines because these same components are considered significantly more durable than those in the 2-year machines, and are replaced only upon specific diagnoses of wearing parts related defects. The screws are first removed from the deck, the deck is removed from the machine, and the parts are replaced. The decks are then reattached to the machines and moved to the repair workstations.

Repair Workstations

Electro-mechanical diagnoses and repairs of defects are performed at the repair workstations, of which there are two. The operation of the machine is checked against the symptoms enumerated on the NLS warranty repair form even though, in the case of 2-year machines, parts have been replaced by this stage of the process. Because of the significant frequency of occurrence, playback heads are checked first; often a problem reported as a worn head is only a dirty head; therefore, the head is first cleaned. The head is then checked for proper alignment, and aligned if necessary. Finally, if the head is actually worn, it is replaced.

A series of electro-mechanical tests are then performed on the machines in order to diagnose specific defects, and any necessary components are replaced. A Telex form is then filled out for each machine repaired noting the parts consumed and the specific work performed. A "line QA" similar to that performed on new machines is then performed on the warranty machines at these workstations; if a machine fails line QA, the repairers fix the specific problem(s) on the individual machine. Finally, the machines are moved to the audit workstation.

Appendix 2-16, Warranty Repair Defect Frequencies, shows the frequency distribution of C-1 machine defects repaired under warranty during both FY93 and for all C-1 machines ever produced, sorted in descending order. This data is compiled from the Telex forms filled out by the repairers at the repair workstations and is input by Telex weekly into LOTUS spreadsheets, which are then forwarded to the NLS. This information is deemed useful to Telex with regard to enhancing the reliability of the machines in the design and manufacturing processes, and to the NLS as well with regard to an understanding of the reliability of the machines.

Audit Workstation

All warranty repair machines are subjected to QA by Telex at the audit workstation, which is staffed by individuals who are specialists in the QA function and are not directly associated with the repair process. The QA consists of selecting a random sample of 13 machines out of lots of 50 machines and subjecting them to full functionality tests including wow, flutter, speed, distortion, ejection, etc. using appropriate test equipment. If one of the 13 machines in the lot fails the test, the entire lot of 50 machines is inspected for the specific defect encountered. A green tag is attached to a lot once it has passed audit, and the machines are then conveyed back to the repair area of the plant on a mobile cart. During this process, the machines still have attached to them the standard NLS warranty repair form.

Shipping Workstation

The shipping workstation in the repair area is the same as that used for receiving; the functions are simply performed at different times of day, i.e. receiving in the morning and shipping in the afternoon. The machines are sorted on a large worktable and batched in piles by owning MLA using the red dots with Telex MLA codes to facilitate the sorting. Although it is not a contractual requirement to send machines back to the same MLAs that submitted them for warranty repair, this is the practice that Telex has been generally instructed to follow; on rare occasion, Telex has been specifically directed by NLS to ship repaired machines to other than the submitting MLA.

After sorting, the next step performed is the filling out of a "Warranty Repair Shipper" form for each lot of 50 machines, which is then conveyed to the computer room. The data from this form are then keyed into the MAPICS system, which both records the date the machines are shipped, and generates pressure-sensitive MLA shipping labels for the machines. The labels are then conveyed back to the shipping workstation in the repair area.

At the shipping workstation, the red dots are removed from the machines, a cursory clean-up/wipe-down is performed, and the machines are wrapped in polyethylene. After this, the machines are placed in individual cartons with styrofoam inserts and instructions (braille, print and tape) and the serial number of each machine is written on each individual carton; both old and new individual cartons are used for packaging machines. The individual cartons are then consolidated into overpack boxes for those MLAs being shipped multiples of four machines, which is the majority of the lots. The MLA pressure sensitive labels are then affixed to NLS-provided free-matter blanks, and the mailing labels are then affixed to the overpacks and, if any, individual cartons being mailed that day. The packages are then conveyed to the Telex shipping department, where the USPS dates and signs Certificates of Mailing for the warranty machines and removes them from the plant.

NLS Quality Control

Although NLS has the option to subject warranty repaired machines to QC procedures, the current practice is not to QC the warranty machines but rather to focus QC efforts upon new production. Telex reasoned that, from the NLS perspective, the return rate of warranty repaired machines is low and Telex is additionally held to a one-year warranty on the warranty repair itself. In the current *modus operandi*, Telex can release warranty machines at any time after the completion of contractor QA.

Repair Parts for Warranty Repairs

A distinct and separate inventory of spare parts from those parts used in the manufacturing process is maintained for warranty repairs, and is housed in close proximity to the repair area. The contractor targets a 3-month supply on-hand for warranty repairs, and replenishment needs are assessed, and orders placed, monthly, the primary supplier being themselves. In instances where the warranty repair operation has stocked out of parts, a transfer has been made from manufacturing parts inventory as required.

2.2.5.3 Manufacture Repair Parts

Telex is the major supplier of repair parts to the NLS for audio playback machines, and supplied 84% (329 out of 392 line items) of the CBM parts on inventory at the NLS in August, 1993. Recent annual expenditure on repair parts obtained from Telex is approximately $1,300,000. Telex manufactures some of the parts supplied to the NLS, but many are "pass-throughs" manufactured by other firms, most notably Shinwa.

2.2.5.4 Receive, Repair and Distribute Non-Warranty Equipment

In addition to the provision of the functions previously discussed, Telex also performs out-of-warranty repairs on E-1 and CT-1 machines for the NLS. These machines are relatively complex and sophisticated, and repair by the manufacturer (or other competent commercial repairer) is, in general, warranted vice repair by a volunteer repair group (although a few select volunteer groups are repairing E-1 machines). These models requiring repair are either forwarded directly by network agencies to Telex, or to the MSCW, which is used as a pass-through point for repair of these machines. Out-of-warranty repairs are performed by Telex under separate contract from any machine production and warranty repairs of the same; the FY95 budget for out-of-warranty E-1 repairs is $64,000.

2.2.5.5 Report Activity to NLS

Reports and/or other information pertaining to the four functions discussed above are furnished to NLS with at least a monthly frequency. The most important elements of this reporting are as follows:

New Production - CMs are forwarded to network agencies, to NLS both along with an invoice (and consolidated count of production) and to the ECO for review, and to the BPHICS contractor.

Warranty Repairs - Monthly invoices (previously accompanied by itemization of add-on expenses for the 2-year machines) are forwarded to the NLS for payment. Weekly spreadsheet files of warranty machine repair records detailing defects, model and serial numbers, submitting agencies, and symptoms reported by the submitting agency are forwarded to NLS on a monthly basis.

Repair Parts - Repair parts quantities and types purchased is sent to the NLS along with invoices for payment for the parts.

2.2.6 Commercial Repairers

Commercial non-warranty repair of standard CBMs is currently performed for the NLS by Cintrex Audio Visual of St. Louis, Missouri; commercial non-warranty repairs of E-1 and CT-1 machines are performed by the manufacturer of the equipment, which was addressed in the previous subsection. Cintrex has been performing repairs for NLS for approximately seven years, beginning with approximately 200 repairs in the first year, and this effort has gradually increased to the current level of workload of approximately 3,600 CBMs per year.

The contractor is reimbursed for work by the NLS for labor only, and all parts required for repairs, and packaging materials required for returns to agencies, are directly supplied by the NLS to Cintrex. Labor is charged at a current flat rate of $27.49 per machine repaired, regardless of the specific repairs a machine requires; additionally, a flat rate of $2.85 per machine is charged as a labor handling fee for machines that are deemed unrepairable. Machines are scrapped (after NLS approval) if the contractor determines that the combined cost of labor and parts equals or exceeds 75% of the cost of a new machine. The budget for Cintrex operations for FY94 was approximately $91,000.

Machines repaired by Cintrex must meet NLS defined specifications, and are subjected to quality control testing by the NLS, which sends a representative approximately once every six weeks to perform statistical quality control testing on production lots. Machines repaired by Cintrex are also warranted for one year from the date of repair, and are labeled as such by Cintrex, but the warranty does not apply to machines subsequently damaged during shipment or by user abuse (as determined by the NLS). The contractor provides no input or output transactions to BPHICS or the MMR function, since the equipment remains in an in-repair status in the custody of the owning agency while it is at Cintrex, with the single exception of machines that are scrapped; in this instance, the NLS and agency are notified of the model and serial number of the disposed equipment.

2.2.6.1 Receive Non-Warranty Equipment

The contractor receives non-warranty CBMs needing repair via USPS free matter mailings directly from network agencies that have been directed by the NLS to do so. The machines arrive in overpack boxes in USPS bulk mail cages and are initially staged in the receiving/shipping area of the facility. Cintrex is usually expecting the arrival of particular batches of machines from specific agencies having been given a "heads up" notification by the NLS; however, occasionally machines arrive that are unexpected. Approximately 75% of the receipts arrive "automatically" from the contractor's perspective, and the other 25% is sent after prompting of the NLS by Cintrex.

The contract requires that Cintrex be capable of storing up to 600 machines in its facility at any one time, whether in repair, awaiting repair, or awaiting NLS QC and shipment; at the time the site visit was conducted, approximately 700 CBMs were on-site. As a practical necessity, Cintrex has also found that a requirement exists for the storage of up to 600 cartons along with the machines themselves.

Machines are supposed to arrive at Cintrex in appropriate packaging materials, and most do (dirty and torn packaging materials are discarded), but machines generally do not arrive with instruction cassettes in them. Most machines that are received do not have machine repair history cards within them, but a few do contain them. Although there is no contractual requirement to process machines submitted by a given agency as a lot, Cintrex tries to do this to the maximum extent possible.

After physical receipt and staging in the mail room, the overpack boxes are broken up and the machines are conveyed into the repair room. An initial screening of the serial number is made to determine if the machine is eligible for warranty repair and, if it is, the machine is returned to the sending agency. A repair sheet (routing slip) is then placed in the door of all other machines that follows the machine throughout the repair, QC and issuing cycle, both for the purpose of tracking status and compiling repair workload.

2.2.6.2 Repair Non-Warranty Equipment

There is a designated room in the facility for NLS equipment repairs, and the work proceeds in a clockwise direction around the room through a series of five distinct workstations; this was the greatest degree of specialization of labor in the repair function observed during the course of the project site visits, including warranty, volunteer, and in-house non-warranty repair operations. The manager of Cintrex strongly believes in the need for good training of his repair staff, cross-trains his staff in all areas, and avoids layoffs at all costs. It is noteworthy that the manager does not believe that a strong background in electro-mechanical repair and/or electro-mechanical knowledge is required for proper execution of the repair function. Rather, he believes that proper training, strict adherence to documented repair procedures, and comprehensive quality assurance (by Cintrex) are the necessary ingredients in a good repair operation. Cintrex repair procedures have evolved over time, have been approved by the NLS, and were developed without any guidance from Telex or from statistical data on Telex warranty repairs.

The first workstation in the repair operation performs a comprehensive inspection of the machine, and makes a determination as to whether the machine should be repaired or scrapped; approximately 7% to 10% of machines are scrapped, and the manager of the operation contends that agencies send Cintrex "the very worst" machines they have that require repair. The individual at this workstation examines major machine components that are relatively critical to operation and are relatively expensive, such as; chassis, heads, power supply, boards, keyboard, jack panels, and overall cleanliness and integrity of the machine. If the decision is made to scrap equipment (the general rule of thumb is three or more bad major components), the machines are separated out and the serial numbers, model numbers and agency codes are sent to the NLS ECO. All tests performed at this workstation are done without a battery installed in the machine; bad batteries are shipped to Landover, Maryland for disposal by the NLS. Batteries are recharged, 24 at a time, in a cycling station near workstation one.

At the second workstation in the repair cycle, the machines are given a comprehensive cleaning. The equipment is cleaned via hand-scrubbing and wiping down using spray-on cleaning solutions. The manager of the operation is of the opinion that the machines are "not designed for cleaning" and, after trying dipping, compressed air, and ultrasonic cleaning techniques on the machines, has concluded that hand-cleaning is the best method to utilize.

The third repair workstation performs a 100% replacement of wearing parts, i.e. rubber tires and belts, after cleaning the battery contacts and installing the battery. Spindles and flywheels are replaced in this step as well if required, and the amp board is cleaned. The speed of the machine is then set using a power supply and frequency generator after all parts replacements in this workstation are completed, and the door of the CBM is then checked for proper tape ejection. The playback head used to be locked-in in this step, but current practice is to perform this action at the fourth workstation.

Workstation number four consists of playback head replacement, head alignment, jack panel replacement, and headphone jack replacement, if required. Playback head replacement and alignment, which constitute the bulk of work in this step, involves both a visual inspection and sound test of the heads; over 90% of machines have their heads replaced in this step. The last action performed at this workstation is the affixing of a sticker to the machine; the routing slip is essentially complete by this time.

The final workstation, number five, involves contractor quality assurance and data entry. Each machine is logged into a database tracking program, written in File Pro 16, that contains four different data entry screens. The model and serial number, agency number, torques, major parts used, battery voltage and completed date are logged into the system using a log-in screen. A QA screen is then pulled-up, the battery is replaced if it is low or dead, and the quality assurance individual then proceeds to perform essentially the same tests on the equipment that the NLS performs; in a few instances, the in-house QA actually applies tougher standards than the NLS QC evaluation. The QA test covers various aspects of operational functionality including key operation, sound quality, switch operation, shock test, power output, speed, crosstalk/wow/flutter, torques, "flip around test", jack insertion and removal, track switch operation and several other features.

A piece of masking tape is then attached to the machine containing the model, serial number, and owning agency code. If a machine is rejected in QA, it is separated and stacked and a "post-it" is attached to the machine annotated with the failing defect and is subsequently repaired for that specific defect; whereas, if it passes QA, it is assigned a lot number and stacked in a pile awaiting NLS QC. If the machine is being repaired under warranty (i.e. Cintrex warranty), a special screen is used to enter data on the repairs performed; approximately four warranty repairs per month are currently performed, which equates to a 1.3% return rate.

2.2.6.3 Distribute Non-Warranty Equipment

When anywhere from 5-to-13 100-machine lots have been accrued by Cintrex, the NLS performs QC on the repaired equipment; this QC consists of randomly pulling 20 machines from each lot of 100, and if one fails, the lot fails. If a lot fails QC, all machines are inspected and repaired for the specific defect for which the lot failed. It has been over five years since a lot has been totally rejected by the NLS. At the time of the site visit, approximately 400 machines were awaiting NLS QA, 250 were in the repair pipeline, and 100 were awaiting repair.

After NLS QC is completed, Cintrex stickers containing the NLS QC date (for warranty purposes) are affixed to the machines, and they are then shipped back to the agencies from whence they were sent. Machines are always issued with a good battery, although it is not a current requirement to ship a CBM with an instruction cassette contained within (this used to be a requirement). All boxes are labeled with the machines' serial numbers by the contractor, and Cintrex uses their own shipping labels for the return of the machines to agencies.

2.2.6.4 Repair Parts

Each workstation maintains approximately a one-month supply of necessary repair parts in the proximity of the workstation, and a back-up supply of one-to-two months parts supply is stored in a backroom. Cintrex obtains virtually all parts directly from the NLS, and has no major problems with this facet of the operation (sometimes NLS even sends greater quantities than requested). Some parts are also obtained via cannibalization of scrapped machines and, in these instances, the machines are not forwarded to Landover, Maryland, but the serial numbers are forwarded to the NLS ECO for input to BPHICS.

2.2.6.5 Report Activity to NLS

Cintrex is required by contract to maintain inspection and work records for each machine repaired that includes labor and parts used in the repair, and also to maintain a listing of unrepairable machines by model and serial number along with the agencies that sent them in for repair, and to furnish this data to NLS along with the contractor invoice. Additionally, Cintrex is required to submit a quality control and procedures plan to NLS for approval to ensure that the requirements of the contract specification are being met. Cintrex does provide serial number level control of machines in their inventory control database, and has provided NLS with their procedures and quality control plan.

Neither NLS nor Cintrex could furnish the project team with historical data in the form of frequency distributions of equipment defects; nor with frequency distributions of parts consumption, nor utilization of services by agency, in the same manner as that generated for repairs on warranty equipment. Cintrex did, however, provide a detailed listing of operating procedures, including the quality control plan, to the project team, as well as stating that California (north), New York (city), Tennessee, Maryland and Kentucky were the primary agency customers at the time of the site visit. Therefore, neither a compilation of non-warranty repair CBM defect and parts consumption frequencies, nor utilization by agency, could be prepared for this report, and a comparison with warranty repair and volunteer non-warranty repair defect frequencies could not be made.

2.2.7 Volunteer Repairers

Volunteers perform the majority of non-warranty equipment repairs required for the operation of the free national library program. It is estimated that volunteers perform approximately 90% of all reported non-warranty machine repairs (the exact value is unknown, 62% minimum), which amounted to an estimated 92,000 CBM repairs and 14,000 TBM repairs (Reference Appendix 2-8). In addition to the performance of normal repairs of standard machines, there are additionally several groups that repair special machines and/or perform reclamation of parts. Volunteer repairers must additionally coordinate their activity with both the MLAs and SLAs they directly support, and with the NLS. Each of these functional responsibilities is presented below, and additional data on these operations is presented in Section 3 of the report.

2.2.7.1 Receive, Repair and Return Non-Warranty Equipment

The basic function performed by all volunteer repairers is the receipt of defective non-warranty equipment from agencies they support, the diagnoses and repair of such equipment, and the return (or disposal) of this equipment to the agencies they support. This function involves: 1) coordination with the MLA(s) and/or SLA(s) that a given repairer or repair group supports; 2) coordination with the NLS in the case of those repairers that order parts directly from the NLS rather than through network agencies; and, 3) coordination with the NLS regarding preferred repair procedures to be followed.

Characteristics of volunteer repair activities vary in the manners listed below.

Location - Some repair operations are located within MLA (possibly SLA) facilities, while others are off-site in a variety of facilities (often sponsored, i.e. donated, space provided by another organization), often remote to the metropolitan area of the supported agency. Facility quality can vary considerably as well.

Available Staffing - Some repair groups consist of one individual, while the largest in the country consists of approximately 70 individuals. Available staffing can also be very seasonal (e.g. in Florida and Arizona).

Capacity - Capacity varies both with available staffing, and the number of hours worked per week per individual; it is a common practice for groups to work one, or maybe two, days per week.

Quality - The quality of repairs varies among groups, with some groups experiencing much higher return rates than others, which can be due to several factors including capability of personnel and procedures followed.

Specialization of Labor - The common denominator observed at every volunteer repair group seen during the site visits was that the same individual who performs the diagnoses of defects also performs the repair of the machine, i.e. an "assembly-line" approach is not used. However, at the largest operation observed (Elfuns in Ohio), all of the following areas of specialization were observed, and some other relatively large groups possibly approach work in a similar manner:

"Honcho" - A work leader who is effectively the overall manager and supervisor of the operation (also observed at an Arizona site).

Battery Workstation - Monitoring of cycling and "zapping" of batteries, disposal of batteries.

ADP Systems - Operation of PC-based tracking system to monitor status and record work performed on units, including input of source data.

Parts Reclamation - Salvage of parts from scrapped machines.

Parts Control - Ordering, monitoring and storing of repair parts obtained from the NLS.

Quality Control - Performance of quality control tests by individuals other than those who performed the repair (also observed at an Arizona site).

Repair Philosophy - Some repair groups follow the NLS promulgated "2-hour" rule, i.e. machines that are estimated to require in excess of 2 hours of repair should be scrapped/cannibalized, while others will spend up to four hours per machine on repair. Reconditioning is generally followed by all groups on 2-year C-1s and prior CBMs. Some groups will send warranty machines back to MLAs for forwarding to the manufacturer, while others will repair machines and send back to the MLA repaired.

Record Keeping - Most record keeping, including inventory control of machines and work performed on them, is manual; however, the Elfun operation in Ohio has an automated tracking system that produces the NLS required detailed logs, tracks machines in terms of dates received and shipped, and produces statistical reports on historical repairs using repair codes this group has established (and additionally contains the repairer and inspector in the repair record). {There is no national standardization of repair codes currently widely in use by volunteer groups, nor any national compilation of volunteer repair production by the NLS}.

In addition to "regular" machine repairs performed by volunteers, there are several select groups that perform repairs on non-standard machines, and who are coordinated and monitored by the NLS, not MLAs. Select groups known to the study team include: 1) an Elfun group in New York that repairs both E-1s and B-79s; 2) a TP group in Illinois that repairs surplus C-1s and C-79s; and, 3) a TP group in Colorado that repairs C-1As. No statistics were provided by the NLS quantifying the repairs performed by these select groups.

2.2.7.2 Reclaim and Salvage Equipment Parts

There are several select volunteers and volunteer groups that specialize in the reclamation, i.e. salvage, of components extracted from machines that have been slated for disposal by MLAs/SLAs and authorized by the NLS. These special activities receive direction from, and coordinate directly with, the NLS regarding their work, not network MLAs. A compl:te listing of these groups was not provided, and no statistics were available regarding the specific quantities of components salvaged in this manner on either a local or national basis. The NLS deems this volunteer effort worthwhile and beneficial regarding the recovery of parts, but does not deem it economically viable if performed on a commercial basis.

One operation for which the study team obtained information is located in Arizona, and focuses its efforts upon the reclamation of parts extracted from C-1 machines sent there by the NLS from Landover, Maryland, from some MLAs including Arizona and Texas) at NLS direction, and occasionally by the equipment manufacturer in the case of scraped warranty machines at NLS direction. Components extracted include case, doors, amp boards, heads, motors, jacks and jack panel boards, motor control boards, feet, some keys, pins and slide knobs; approximately 90% of recovered parts are shipped to the NLS, and 10% are shipped to specific points in the network at NLS direction. Occasionally, good packaging materials are recovered as well, but this is generally not the case; unusable cardboard used to be recycled, but no demand currently exists. Batteries are not supposed to be shipped to the reclamation center, but some machines do arrive with them; these batteries are shipped to a vendor in California for special disposal. Additionally, transformers for other than C-1 machines, and other scrap copper wire, are picked-up by a copper recycler. Finally, scrapped machine cases are sold to a plastics recycler for the manufacture of flower pots. No formal records are kept of the work at this location, but approximately 40 CBMs per week, or 2,000 CBMs per year, are currently processed by this group; TBM reclamation has almost ceased, but the few that are processed have the drive motors and turntables extracted from them.

Machines are received in bulk, especially when arriving from Landover, are first visually screened, and then turned on (plugged-in) to see if they function at all; the machines are supposed to have their serial number plates removed prior to this. Most of the machines received are deemed beyond repair, in the opinion of the work leader of the activity, but repair is not the objective of the operation. The work leader claims that only limited skills are required for the function, and that it takes an average of approximately 15 minutes to strip down and cannibalize a CBM, with C-1s requiring more time than older CBMs due to the use of "lock-tight" in the former. The group, consisting of approximately eight individuals, works one full day, once per week, and has been in operation approximately two years.

2.2.7.3 Report Activity

There are basically three types of reporting that are the responsibility of any volunteers that support MLAs and/or SLAs with machine repairs. The most time-consuming requirement is the compilation and submission of detailed machine repair logs, which is compiled daily and submitted monthly, and which are either submitted directly to the NLS, or via the MLAs as a pass-through to the NLS. These reports contain identical data as those that are completed by MLA in-house repair staff, and list each repair as a line item, including model, serial number, and what was done to the machine. However, the degree of specificity of the repair description and the repair codes used vary among sites, but all comply with the basic requirement for model and serial number identification. Virtually all these forms are manually compiled; however, the Elfun group visited in Cincinnati, Ohio generates these logs for the NLS via a PC-based tracking and control system (of course, this data was entered into the system from other, hardcopy routing slips). This system is also capable of generating summary reports of repair activity, and an example of this report is shown in Appendix 2-17, C-1 Repair Distribution, Elfun Operation, which is a frequency distribution of repairs for C-1 machines performed in the first 10 months of 1993.

The second type of reporting requirement consists of the total number of annual machine repairs performed, stratified by TBM/CBM. These statistics are reported annually at the end of the federal fiscal year to the groups' associated MLAs, and/or in some service areas, to state organizations. This data is in turn forwarded to the NLS for compilation at the national level for monitoring repair operations of the MLAs, specifically in the calculation of number of months backlog of machines in repair. The source data for these reports are usually the detailed repair logs, or possibly monthly summaries of repair log totals.

Lastly, volunteer repair groups also report directly to their associated MLAs for reasons that have little to do with NLS requirements. This data essentially consists of the models and serial numbers of the machines repaired in a batch or batches, or in a given period of time, including any that were damaged beyond repair and possibly cannibalized, scrapped locally, or forwarded to Landover (with prior MLA/NLS authorization). It is this data that is fundamental to the conduct of day-to-day operations, especially if the repair locations are remote to the MLA, and/or the repairers are working for more than one MLA (e.g. Arizona). The detailed data pertaining to any machines disposed of by volunteers are also reported to BPHICS, as these represent net inventory reduction transactions.

2.2.8 BPHICS Contractor

The automated system by which NLS tracks the custody of the national inventory of audio playback equipment that is both on loan to machine lending agencies and stored in MSCs is called the Blind and Physically Handicapped Inventory Control System (BPHICS). BPHICS is currently operated and maintained for the NLS by a contractor, Data Management Associates (DMA) of Palm Bay, Florida, for an approximate annual cost of $44,000. DMA is monitored by the NLS AO, who is the COTR on the contract. A more detailed discussion of the functioning of BPHICS within the context of automation issues is presented in Subsection 2.3 of this report, but the following discussion presents the salient aspects of BPHICS within the framework of overall equipment operations.

2.2.8.1 Basics

BPHICS is an automated database of audio equipment inventory records that consists of approximately 30 computer programs written in COBOL running in an IBM 3081 mainframe environment. It was developed in 1978 by Martin Marietta Data Systems to run in an IBM 370 environment, and is a batch oriented, relatively simple application. The system is designed to track machines (and, originally, some accessories) at a model and serial number level to the network machine lending agency or MSC that is the designated custodian of the equipment, but not to track the status of a machine at a particular location, i.e. BPHICS does not know whether a given machine is available, assigned or in-repair.

The tracking begins when the machine is shipped from the manufacturer to an MLA or MSC, to the time the machine is either disposed or declared lost, stolen, or location unknown. The system performs this function by accepting source data inputs provided by MLAs, equipment manufacturers and MSCs, and generating reports for the NLS, MLAs and the MSCs. There were approximately 954,000 machine records in the BPHICS database at the end of FY93, of which approximately 182,000 were in an "account", effectively a status; of lost, stolen or location unknown, yielding a net inventory of approximately 772,000 machines of all types. The only condition whereby a machine record is removed from the BPHICS master file is when the machine is officially reported as disposed, and the record is then deleted from the database; a separate file of these records is, however, maintained.

The database is approximately 50 MB in flatfile format, and 200 MB in database format, and is backed-up on both tape and diskette. Additionally, a five-year backup of transactions is also retained by DMA. DMA currently has no major operational problems with BPHICS. In addition to the operation of BPHICS, DMA also collects and compiles the source data necessary for the generation of the MMR, which has no connection to BPHICS, i.e. the sources of data are different, and the MMR is not "rolled-up" from detailed equipment transactions but rather from summaries at the model level.

2.2.8.2 Receive, Input, Edit and Verify Data

Source data for BPHICS and MMRs are received in hardcopy, on standard diskettes, 8" diskettes, and via telecommunications. All hardcopy documentation submitted by manufacturers, MSCs or network agencies used to be forwarded via NLS to DMA, but is now sent directly; all data contained on diskette or telecommunicated is sent directly to DMA. All inputs and outputs that impact an agency's or MSC's net inventory including receipts from manufacturers, receipts from MSC's or the NLS, transfers in and out, recovery of equipment previously written-off, disposals and write-offs must be reported to BPHICS at a model and serial number level, and the same must be reported at a model level for MMR compilation. Appendix 2-18, BPHICS Reporting Method, by MLA, contains a listing of how network agencies and MSCs submit data to BPHICS, and for MMR compilation; in the case of equipment manufacturers, which are not shown in the table, CMs are now mailed to DMA directly.

DMA receives all relevant information in hardcopy format and electronic submissions on a daily basis. DMA uses approximately 15 key entry operators for all projects, six of whom focus part of their time on key entry of hardcopy data for BPHICS and the MMR; DMA estimated that approximately 70% of source data volume is key entered, and 30% is electronically entered into the system. Data that is keyed goes through a 100% visual verification by an individual other than the keyer. DMA has developed a number of programs to automatically parse and separate data sent to BPHICS via CIDS and diskette, but NLS has promulgated only certain formats for this application. In general, the contractor would prefer if all data arrived via telecommunications, and believes that the use of Internet as a conduit looks very favorable in this regard.

Agencies and MSCs are required to submit their inputs to BPHICS by the fifth of the month following the reporting month, but DMA has until the 15th of the month following the reporting month to generate data for the subject period. After data is received, input and verified it undergoes several system edit checks, including a check for duplicate records.

Duplicate record and other errors are then compiled by the system for generation of a management report for NLS.

2.2.8.3 Produce Reports

The various types of reports produced by BPHICS are discussed in detail in Subsection 2.3 of this report, but generally speaking, there are four fundamental types of reports produced by the system: 1) management reports used by NLS at the national level; 2) activity and inventory reports used by network agencies and MSCs at the local level; 3) audit reports used by auditors for the purpose of performing periodic audits of agencies and MSCs; and, 4) activity reports used by DMA to monitor and control the operation of BPHICS itself. Management reports available for use by the NLS include: Suspense Reports, Semi-Annual Reports, Inventory Summary Reports, Edit/Update Add and Change Reports, Monthly Machine Shipment Reports, Monthly Machine Delete Reports, and the Monthly Machine Report (produced by DMA, but not by BPHICS).

These reports are furnished to NLS in hardcopy and on 8mm cartridge tape or diskette. Information used by network agencies and MSCs include: the Monthly Machine Activity Report, which is a detailed hardcopy listing of equipment transactions that is annotated by agencies/MSCs on an exception basis and returned to NLS; and, the Selected Agency Listing, which is a detailed listing of all equipment on file for a given location detailed by model and serial number that is generated on an as-needed basis, and can be produced in hardcopy and on diskette. The Random Audit Report is used by auditors in the periodic performance of audits to determine compliance with GFE inventory control procedures, and is generated in hardcopy. Finally, the Data Entry Verification Report is used by DMA to manage and control the data entry functions of BPHICS itself.

2.2.8.4 Manage and Modify System and Documentation

The final component of BPHICS operations is the maintenance of the system itself and its associated documentation. In the opinion of DMA, the system runs in a relatively stable and reliable environment, and the fact that it is written in COBOL has not hindered any of its required applications (DMA currently designs new software primarily in C and Assembler). DMA has designed a number of front-end utilities for data receipt and translation/reformatting that have made BPHICS more versatile than previously. In reality, several of the features available within BPHICS have been deactivated in the recent past, including several types of report generation routines, and the use of most of the "in-transit" accounts. The documentation supporting the system has been recently updated.

2.2.9 Multistate Centers

Multistate Centers are operations under contract to the NLS that directly support network operations, both audio playback equipment related functions and other functions, via the receipt, storage and distribution of various items. Although there were at one time four MSCs, there are currently two multistate centers. The Multistate Center West (MSCW) is located in Salt Lake City, Utah, is operated by the Utah State Library, and incurred operational costs of approximately $350,000 during FY93. The Multistate Center East (MSCE) is located in Cincinnati, Ohio, is operated by Clovernook Home and School for the Blind, and also incurred operational costs of approximately $350,000 during FY93. In addition to supporting audio playback equipment functions in the network, MSCs also interlibrary loan braille and recorded books and back issue magazines from backup and special collections directly to patrons, and distribute various supplies and publications directly to RLs and MLAs that support book circulation services. This project was concerned only with those MSC functions relevant to audio playback equipment operations, therefore, only those functions are addressed below.

2.2.9.1 Receive, Store and Distribute Equipment

One of the primary ways in which the MSCs support audio playback equipment operations in the network is that they receive, store and distribute new, "overflow", "backup", and "passthrough" equipment and accessories (each defined below) directly to network agencies and to repair locations. In this regard, the MSCW is significantly more important than the MSCE both in terms of inventory stored and activity. Appendix 2-19, MSC Equipment Inventory Activity and Space Used, contains statistics on the annual equipment activity of both MSCs for FY93 as well as the inventory of equipment at the end of FY93 and FY94 as reported to NLS in MSC monthly equipment reports, and additionally the facility space occupied by audio equipment and supplies at both facilities and in total.

New equipment, in this context, refers to the storage and distribution of new production in which the MSCW is among the agencies, or is the only one, which receives a new production allotment from the manufacturer. "Overflow" equipment refers to portions of new production allocation allotted to network agencies that some agencies determine they do not need (or, occasionally, could not physically store) and are then redirected to the MSCW; this is a small percentage of total annual production, but nevertheless accounts for some of the total inventory on hand. "Backup" equipment refers to an NLS targeted safety stock of equipment, at one time set at an 18-month supply but is currently less, that is intended to serve exclusively as a backup supply in times of extraordinary demand and/or unexpected curtailments in supply; this subset of total inventory theoretically consists of new and refurbished machines. "Passthrough" equipment refers to equipment requiring repair or disposal that is sent by network agencies to the MSCW at NLS direction, and is then either forwarded to one of several special repair groups, returned to the MSCW and designated "ARC" (Authorized Repair Center) and stored for later reissue to network agencies, or is alternatively shipped to Landover, Maryland for disposal by the NLS. These inventory categories are not tracked, *per se*, but it is for the above reasons that the MSCs have equipment inventory to store and distribute.

At any given time, the MSCW has in its inventory new/unused equipment, used refurbished equipment ready for issue, some equipment that is defective and awaiting repair, and some equipment that is defective and/or obsolete and awaiting disposal. All equipment stored in the MSCs are stored in their appropriate cartons, palletized, and floor stacked.

Serial numbers of all equipment issued to network agencies are retained by the MSCs in hardcopy, forwarded to the receiving agencies in hardcopy, and forwarded to BPHICS in hardcopy. The MSCs' READS systems do not track equipment to a unique location/serial number level, but the systems do know which equipment is on-hand at any time. Additionally, all equipment is also tracked at a macro, i.e. line item (model) level, by the NLS using an inventory control system which generates inventory reports depicting IOH (unit of inventory count) by location, consumption in each of the two previous fiscal years, an average monthly consumption, and the IOH in terms of number of months' supply.

The following summaries describe the current inventory of equipment at the MSCs and major activities pertinent to particular models of machines.

A-1s - Stored and distributed to network agencies from backup stock, 11,444 on hand at the MSCW and 417 at the MSCE at the end of FY94. Issued to network agencies upon request.

B-79s - All are stored in and distributed from the MSCW, none from the MSCE, 2,572 on hand at the end of FY94. Sent to an Elfun group in Cincinnati for repairs and returned to MSCW for reissue.

C-1s and C-79s - There were 1,286 new C-1s in stock at the MSCW at the end of FY94 and 23 at the MSCE; these are issued to the network at the direction of the NLS ECO, not upon agency request. There were 381 refurbished, i.e. ARC, C-1s and C-79s on hand at the MSCW at the end of FY94, but none at the MSCE. C-1s and C-79s needing repair are sent by the MSCW to a repair group with current capacity, repaired, and returned to the MSCW; these are issued to the network at the direction of the NLS ECO, not upon agency request.

C-1As - There were 502 C-1A overseas CBMs in stock at the MSCW at the end of FY94, and none at the MSCE. C-1As requiring repair are sent to a TP group in

Colorado, repaired, and returned to the MSCW; these are then issued to overseas patrons as required.

C-80s and C-80Rs - There were 1,238 C-80Rs in stock at the MSCW at the end of FY94 (none at MSCE), and 1,071 C-80s in stock at the MSCE (none at the MSCW).

C-77s and Older - All CBMs C-77 and older received at the MSCs from network agencies are sent to Landover, Maryland for disposal by the NLS.

CT-1s - All new CT-1 production is shipped to the MSCW where it is stored and issued to network agencies upon request. There were 13,229 CT-1 machines in stock at the MSCW at the end of FY94, and none at the MSCE.

E-1s - There were 2,094 new E-1s in stock at the MSCW at the end of FY94, and 238 at the MSCE. The MSCW receives all E-1s needing repair from the network, and sends them to an Elfun group in New York, or the manufacturer for non-warranty repair, where they are repaired and returned to the MSCW for reissue. At the end of FY94, there were 4,715 E-1s awaiting repair at the MSCW, and 304 E-1s that had been repaired and were ready for issue.

Other Accessories - The largest stock of accessories is stored at the MSCW. However, both MSCs distribute accessories (other than those controlled by the NLS) to the network.

2.2.9.2 Store and Distribute Special Accessories

A special case within the storage and distribution function at MSCs concerns control of special accessories, specifically amplifiers and remote control units. As previously mentioned, these two items are subject to special controls and are issued only by the NLS ECO subsequent to the receipt of the necessary types of certification at the NLS. Appendix 2-19, previously cited, shows the activity and inventory for these special accessories for FY93 as reported in the MSC monthly equipment reports submitted to NLS.

2.2.9.3 Store and Distribute Repair Parts

The MSCs serve only as secondary storage and distribution points for repair parts for network needs; agencies, volunteer repair groups, and commercial repair contractors obtain most or all of their repair parts directly from the NLS repair parts operation in Washington, D.C. However, the MSCs do stock and distribute some high velocity line items, most notably batteries, and additionally playback heads, instruction cassettes, CBM motors, idler wheels, TBM needles and TBM amplifiers directly to agencies and repair groups. These items are requested from MSCs using a standard order form. Appendix 2-20, MSC Repair Parts Inventory and Activity, shows repair parts inventory and activity at both MSCs for FY93 as reported in the Comprehensive Quarterly Inventory Report.

2.2.9.4 Store and Distribute Supplies

There are two basic types of supplies that are relevant to network audio equipment operations that are stored by the MSCs. The first consists of packaging supplies including machine cartons, both individual boxes and overpacks, and styrofoam inserts. The second type of supply consists of standard forms for applications and orders; operating instructions in hardcopy, tape and braille; and manuals on inventory procedures and repairs. These items are ordered directly by network agencies from MSCs using the standard MSC supply requisition form, and generally do not require authorization and allocation by the NLS ECO unless the items are in short supply and are being rationed. Appendix 2-21 shows the inventory and activity of MSC supply items directly relevant to network equipment operations for FY93. These items are accounted for in the NLS inventory control system, previously mentioned in connection with equipment storage and distribution, in the same manner as that for equipment and repair parts.

2.2.9.5 Report Activity

The MSCs are responsible for reporting on both their status and activity to the NLS, and additionally to their own administering (i.e. parent) agencies. The types of reporting relevant to the support of audio equipment functions are as follows:

- "Multistate Center Monthly Inventory Report", which details equipment inventory and activity for the month by model and is effectively the same information as an MLA provides in an MMR, and is used for the same purpose, i.e. it is sent to DMA for compilation in the monthly MMR for the network.

- Quarterly progress reports are submitted to the NLS which detail equipment activity and status by model, and additionally supply requisitions and line items requested and filled; however, the supply data does not distinguish among equipment related supplies, repair parts and all other supplies.

- Monthly inventory reports are submitted to the NLS which detail inventory on hand by line item; this is the source data for generation of the Comprehensive Monthly Inventory Report that is used for inventory control and reordering of supplies.

- Annual progress reports are submitted to the NLS which report information in the same format and level of detail as the quarterly progress reports, but additionally detail facility space utilization by functional area and all GFE (non-inventory items, i.e. used to support the MSC operation itself) is itemized.

- Transactions pertinent to the BPHICS system which consist of hardcopy listings of serial numbers of equipment received from the manufacturer or transferred-in from network agencies (or from the other MSC), and serial numbers of machines transferred out to network agencies (or the other MSC) or shipped to Landover, Maryland for disposal, are forwarded to the BPHICS contractor. It is also possible that a minimal number of lost/location unknown transactions may arise in the MSCs if machines are lost in transit going to or from ARCs, to network agencies, to the other MSC, or coming from the manufacturer.

2.2.10 Other Contractors and Vendors

In addition to the various organizations and associated responsibilities previously discussed, there are five other major functional responsibilities without which the free national library program could not operate as it does currently. These other major areas of functional support are discussed below.

2.2.10.1 Provide and Support ADP Systems

With only a handful of exceptions, all RLs and MLAs in the network, and both MSCs, utilize ADP systems that support audio playback equipment functions within their operations. Some of these systems were designed, developed and are supported by private firms, while others were designed and developed and are supported by in-house staff, and still others were originally designed and developed in-house, but are currently supported by private firms or independent consultants. Appendix 2-22, ADP Systems Used by MLAs, contains a comprehensive listing of the various ADP systems currently employed throughout the network that support equipment operations, and the type of system employed by each RL/MLA. In short, this profile is as follows:

- Data Research Associates (DRA) has developed and supports an ADP system used by 14 MLAs,
- DMA supports the Reader Enrollment and Delivery System (READS), originally developed for NLS by another contractor, which is used by 20 MLAs and both MSCs,
- Keystone Associates Inc. (Keystone) has developed and supports an ADP system used by two MLAs,
- The Carnegie Library of Pittsburgh and the New Jersey RL designed, developed and support an ADP system known as the "Consortium of User Libraries" or "Penn/Jersey" system which is used by five RLs,
- 10 MLAs use independently developed and supported ADP systems; some of these are supported by contractors, while others are supported by in-house staff, and
- Six MLAs are not automated.

With the exception of the READS systems, MLAs deal directly with the firms/entities that support their systems regarding problems, enhancements, etc. In the case of READS, the NLS negotiates directly with the contractor regarding problems, enhancements, etc., but MLAs are responsible for purchasing any upgrades or modules that are developed.

2.2.10.2 Provide Repair Parts

The current CBM/TBM manufacturer is the primary supplier of repair parts to NLS and indirectly, the network, and supplies the majority of repair parts. Based upon an inventory listing of CBM repair parts dated August, 1993 which consists of 392 line entries, Telex supplied 329 line items or 84% of the total number of parts. Because detailed parts consumption data is not available from NLS due to the lack of an automated parts inventory control system, detailed parts consumption information on either a physical or financial basis could not be compiled and presented in this report. The NLS provided an estimate of $1,800,000-to-$1,900,000 for current annual expenditures for repair parts for audio playback equipment.

Several vendors other than Telex provide repair parts to the NLS, the most notable single firm being Panasonic, which was budgeted to provide approximately $534,000 of C-1 batteries during FY94, or 29% of total FY94 parts expenditures; the corresponding values for FY94 are $658,000 and 36%. Other suppliers, such as Digi-Key or other resellers, provide electrical components. The largest sources of parts are procured under fixed quantity type contracts, while several of the smaller suppliers have indefinite quantity open purchase order contracts.

2.2.10.3 Provide Supplies

There are two primary types of supplies used by the network in the performance of audio equipment operations, which are shown in Appendix 2-21, previously cited in the discussion of MSC operations. Packaging materials, primarily consisting of individual and overpack boxes and styrofoam inserts, are purchased at the rate of approximately 56,000 per year in the case of CBMs, which constitute the majority of the total requirement. Standard forms, manuals, instruction sheets and instruction cassettes are the second major type of supplies required for equipment operations; forms and documents are obtained through the GPO, and instruction cassettes are obtained under contract.

2.2.10.4 Provide Battery Disposal

A contractor is currently engaged in the disposal of dead batteries for the NLS, the batteries being environmentally hazardous because they contain cadmium and require disposal via high temperature incineration. This contractor is based in western Pennsylvania, and the current annual budget for the performance of this function is approximately $6,000. Dead batteries are now being forwarded to the contractor directly by the MLAs, whereas they had previously been passed-through the NLS.

2.2.10.5 Provide CMLS

The current contractor for the operation of the CMLS is also the current BPHICS contractor, i.e. DMA. Although the CMLS function is financially and physically an order of magnitude larger than the BPHICS function ($417,000 plus per year versus $44,000 per year, respectively), its actual role in audio playback equipment operations is minimal.

The CMLS is an automated national database of basic patron information used for the generation of mailing labels for direct circulation magazines. It also functions as a demographic database of patrons, and MLAs are expected to register all patrons in it regardless of whether or not they subscribe to any direct circulation magazines.

The source document for registration with CMLS is a standard form, which contains only three data elements specifically relevant to equipment operations: 1) whether or not the patron has been issued a CBM, 2) whether or not the patron has been issued a TBM, and 3) whether or not the patron has been issued a combination machine. The management report that is generated twice per year (March and September) for NLS use, i.e. "Subscriber Characteristics Analysis", can be produced at a national or agency level, stratified by individuals and institutions, and contains six statistics relevant to equipment operations, which are the number of patrons: 1) with CBMs only, 2) with TBMs only, 3) with both CBMs and TBMs, 4) with CT-1s only, 5) with some combination of CBMs, TBMs and/or CT-1s, and 6) with no equipment. The accuracy of this information is entirely dependent upon the accuracy and timeliness of data submissions by MLAs, as is the case for BPHICS.

It should be noted that currently no use is actually made of equipment information contained within CMLS by the NLS vis-a-vis inventory control of equipment; the CMLS is considered a patron database, not an equipment database. As noted earlier in the report, new production allocations are made based upon recorded book reader statistics as reported annually by RLs, not upon readership reported in CMLS. Similarly, there are no correlations or comparisons made between the equipment count data contained in CMLS with either data contained in the MMRs, or with data contained in BPHICS.

Appendix 2-23, CMLS National Yearly Change in Patrons, which shows a six-year history of national net patron changes as provided from CMLS is, however, included in this report because it contains information that is of interest to the study. Namely, this information consists of the increases and cancellations underlying the net changes which constitute a close approximation of the workload of adding and deleting patrons from the service, and the associated workload of issuing machines to first-time patrons and deleting patrons from the service.

2.2.11 Patrons

Although patrons are the customers of the free national library program and are not themselves "factors of production" and technically do not perform any supporting service functions *per se*, they nevertheless are explicitly responsible for any GFE that has been issued to them and is in their possession, and are implicitly responsible for providing information on such equipment as required by the NLS and/or the MLAs. These areas of responsibility are discussed below.

2.2.11.1 Operate Equipment

It is the responsibility of all patrons to operate any equipment issued to them in a proper manner, i.e. the manner in which the equipment was designed to be operated, and in which they have been instructed and/or trained. Patrons have a responsibility neither to misuse, nor intentionally abuse, equipment in their possession. The majority of patrons comply with these responsibilities, and the majority of equipment abuse that occurs is of an inadvertent and accidental nature, with only isolated instances of intentional abuse cited by MLAs or repairers.

The one area of patron equipment operation responsibility that warrants special mention is battery cycling, i.e. allowing batteries in standard CBMs and CT-1s (if this option is exercised for the CT-1) to fully (or near fully) discharge and fully charge them again. It is the responsibility of any patron who has been issued such a machine, and who wishes to utilize the battery powered portability feature of that machine, to routinely cycle the battery in the course of ordinary operation. If the patron does not perform this routine cycling of the battery, the machine will be rendered useless after a relatively short period of time.

2.2.11.2 Return Equipment

It is the responsibility of patrons to return all GFE to their respective MLAs when/if they choose to leave the free library program, and indirectly the responsibility of their families/custodians to do so upon their death, regardless of the condition of the equipment. It is the responsibility of a patron to return defective equipment to the appropriate MLA when it becomes defective, regardless of whether or not the patron has requested a replacement for that equipment, in order for the equipment to be repaired or scrapped by the MLA hence maximizing the use of available inventory for the good of all concerned. Additionally, patrons are responsible for retaining and using the mailing cartons and inserts that came with the equipment when it was issued for such returns. The majority of patrons comply with these responsibilities, especially given the *modus operandi* whereby MLAs issue replacements for defective equipment upon request by the patron, which is typically prior to the receipt of the equipment being returned.

2.2.11.3 Respond to Audit

It is the responsibility of patrons, to the extent that they are physically able, to respond to inquiries from MLA staff and/or auditors in connection with the performance of equipment audits. These responses typically involve reading and reciting the model and serial number of equipment within their possession to the individual making the inquiry, in either an unassisted manner or assisted by another individual. In the current scheme of operations the audit is mandatory, and its accurate and rapid completion is highly desired by all parties concerned.

2.2.11.4 Respond to Other Requests

It is lastly the responsibility of patrons, to the extent that they are physically able, to respond to other requests for information and inquiries made by MLAs, or possibly by the NLS. Such inquires may include self-audits by MLAs, general customer satisfaction or fact-finding surveys by MLAs or the NLS, or other inquiries by MLAs that directly pertain to audio playback equipment services of the free national library program. Such information requests are made for the continued improvement of the program and constitute a necessary, but minor, intrusion upon the patron's time.

2.3 AUTOMATION IN CURRENT OPERATIONS

The objectives of this study, from an ADP perspective, were to: examine the current MLA, MSC and NLS ADP operations; define/document the current operation of collecting and processing machine related data; identify the positive/negative aspects of the process; and, make recommendations for improving the process (i.e., maximizing efficiency and effectiveness).

The scope of the effort was limited to reviewing current operations, not examining undocumented tentative plans for enhancements. Every multi-user system software application used by more than one MLA in the network was examined, i.e., READS, DRA, Consortium of User Libraries, and Keystone. Three independent systems ("one-of-a-kind") were also observed. These reviews were not intended to critique the MLA systems, nor specifically to make recommendations for improving MLA software applications, but were to define how these systems functioned in processing and communicating machine data and document any major findings or beneficial characteristics.

Three of the MLA systems (DRA, Consortium, and Keystone) were considered proprietary packages or were designed/developed by an independent source for resale. Analyses of these systems was limited to examining system functions and documentation that would not conflict with the proprietary rights of these systems.

Network agencies use a variety of ADP systems in the support of machine operations. The distribution of these systems by agency is shown in Appendix 2-24, Method of Reporting Machine Data by ADP System. There are four ADP systems that are used by more than one MLA, and 10 MLAs that operate totally independent systems. The NLS network also has a repository of machine data which is stored in the BPHICS database, i.e., the centralized database of the national equipment inventory.

The following information addresses what type of ADP system functionality the MLAs visited possess, procedures used for processing machine transactions, methods used in sending machine data to NLS/BPHICS, and the processing and storing of machine inventory data by BPHICS.

Since the publication of the Study II, Part 1, Phase 1, Draft Report, the NLS has revised some procedures associated with processing machine activity and status transactions that were not scrutinized in the phase 2 effort. The NLS has instructed ManTech to incorporate these *changes into this report, however, the study team has not evaluated these changes, but has revised the corresponding flow charts and text.*

2.3.1 Automated System Functionality

The ADP systems at each of the MLAs visited were examined to identify what capabilities or functionality each system has in tracking equipment. Analysis of those software systems not developed by the NLS was limited due to proprietary software rights of the applications.

Each system was analyzed to determine the capabilities of the programs/applications, type and configuration of hardware being used, machine status codes used by the MLA within each system, types of reports the systems produced for the NLS, and system archiving and back-up procedures for the data.

2.3.1.1 Program Capabilities

Each MLA system examined operates using a Menu Driven approach. None of the programs reviewed operate in a Windows environment, although some of the existing hardware is capable of handling a Windows operating system. Functionality of each system is relative to the last time the system's machine module was revised. The recently revised systems have more capability, are faster, and to some degree easier to use than earlier versions.

All of the systems have the same basic fundamental features expected in a database tracking system, i.e., the ability to add, delete, or update/modify a machine data record. Most of the systems have the capability to add multiple machines for a particular model on a single data screen or, add a series of machines automatically for the same model if the machine serial numbers are in numeric sequence. All systems track the machines by model and serial number and provide the capabilities for assigning a machine to a patron, placing a machine in some type of repair or out-of-service status, or establishing a machine's availability for loan.

Each of the MLA systems tracks who sent the machine to the MLA, e.g., manufacturer, MSC, etc., and how the machine was received, Transfer-In or Recovered. As machines are added to the inventory, each system creates a Receipt Date for the machine. A date is also recorded every time the status of the machine changes. Some applications automatically produce a mailing label following the generation of a patron request for a machine.

The majority of the MLAs have the capability to track the machine history for a particular patron, as opposed to specifically tracking the history of the machine (i.e., number of times assigned, number of times repaired, etc.). Some of the systems can track the number of times a machines has been repaired. One of the systems prompts the user with a warning message if the user is about to issue a machine that has been repaired two or more times.

Some of the MLAs have developed a suspense routine whereby the system tells the MLA staff that a patron should be in the process of returning a machine. The system reminds the MLA staff that the patron has an outstanding machine until the machine is received and the suspense is closed-out. Several of the systems track at 30-day intervals. Some of the MLAs would like to see the system automatically produce recovery letters in conjunction with this suspense process, and several MLAs are in the process of developing this capability.

Edit capabilities were examined, and all of the systems have look-up tables to verify machine model numbers (e.g., C-79, C-78, etc.) and to identify an MLA's valid three-digit identification code (e.g. NC9, WA9, etc). Machines may only be assigned to a registered patron or pre-established holder, e.g., repair facility, already existing in the database, and each of the systems identifies and prevents duplicate records from being added to the database. All of these systems permit a patron to have more than one machine of the same model assigned to them. However, some of the systems do have a patron waiting list for machines that does not permit a patron to have two requests pending for the same machine model.

Matching edit routines are used by most of the systems to ensure that the holder's name is appropriate for the status code assigned to the machine, e.g., repair holder - repair status code. Most of the systems do not permit a machine to be assigned to a patron when the machine has a status code of In Repair. However, some of the systems do not provide for this cross-checking edit process.

The majority of the systems have a Note field for each machine record in the inventory wherein comments can be entered regarding the machine. The number of characters for this field varies between 20 and 128. In each case, this Note function is purely a text field and the user can neither search nor query on this field.

Viewing reports that are ready for printing, or for transmitting to a diskette, is limited in the MLA systems. Currently, none of the MLAs have the capability to view a report on the computer monitor before printing it or sending the report to diskette. Some of the MLAs are planning to add the screen feature in the future. Providing the user with the capability to view a report on a screen will allow the report to be checked/verified before printing to hardcopy, assuming the requirement for hardcopy is retained in the future.

Utilities which import/export data into/out of the MLAs' databases are limited. Several have the ability to extract/export data and place the information in a common or generic data format such as dBASE III or ASCII. Most of the export routines have been either pre-programmed into the application, or accomplished by means of a report writer program. None of the MLAs have a utility that imports machine data, in an electronic format, into their machine database.

2.3.1.2 Hardware Configuration

Most of the MLAs are either in the process of upgrading their systems, have recently upgraded, or want to upgrade in the future. The main processors for these systems are either DEC or IBM/compatible. Some of the MLAs have the main processor performing all the system functions, while other MLAs have placed a File Server between the main processor and the users. The main factors for determining the configuration were the amount of activity the main processor was handling, and the age and capacity of the main processor. The life expectancy of the older main processors is being extended by using front-end File Servers to manage and reduce activity on the main processor.

Each of the MLAs operate in a Local-Area-Network (LAN) environment, the network architecture being Ethernet, Novell or Token Ring. The majority of the MLAs either use Novell or are planning on, or in the process of, converting to Novell. The workstations connected to these LANs are either dumb terminals, IBM/Compatible PCs, or Macintosh PCs. Most of the MLAs are replacing their dumb terminals and providing a PC environment. Several of the larger MLAs are concentrating on improving their data communications capabilities by obtaining more and faster modems, and examining Public Access Networks to enhance their data exchange capacity.

Acquisition of hardware for most of the MLAs is controlled by their Administering Agencies. In most cases, the major emphasis has been placed on the MLA remaining compatible with the parent agency. The rate at which most of the MLAs are advancing, from a hardware perspective, is also dependent upon the availability of funds. Each of the MLAs visited recognized the need for improving their hardware capability and the benefits to be gained by becoming more automated.

2.3.1.3 Use of Status Codes

This explanation of ADP system machine status codes has been separated from the discussions of other operations because of the importance placed on the usage of the status codes by the NLS and MLAs. Appendix 2-25, Status Codes, provides a listing of the status codes in use by the four multi-user ADP systems and Florida's ADP system. As indicated by the list, each MLA has their own interpretation of how status codes should be used. The majority of the MLAs have structured their status codes around how they process machines, and this process determines how many status codes they have and how they apply them.

One of the differences among the systems is the procedural design of the software application. Most of the MLAs have designed one machine data screen from which the status of a machine can be changed. However, the Florida MLA has designed multiple machine data screens for changing the status, i.e., one screen adds a machine from a manufacturer, a different screen adds a machine from an MSC, another screen is used to transfer a machine, etc. The latter design shows all the activities (added, transferred, etc.,) on one data screen for a particular machine record. In order to determine the current status, the user must look at the date assigned to each activity; the most current date indicates the status of the machine, in most cases. The Florida system is an older design than the other systems examined.

The difference between the newer designs is how the MLAs procedurally process their machines. Some of the MLAs do incremental tracking, i.e., want to know exactly where and in what status the machine is in at any given time. Incremental tracking is usually associated with MLAs who experience delays in their process. For example, returned machines are received at the end of the day and placed in a temporary staging status such as awaiting repair. The next day, the user places the machine in an In Repair or Available status after an initial review of the machine. Other MLAs may leave the machine assigned to the patron until the condition of the machine can be determined, at which point the status may be changed to In Repair or Available. The latter method usually receives and processes the machine all in the same day.

Most of the MLAs are using status codes to delete Damaged Beyond Repair machines or to remove Lost, Stolen or Location Unknown machines from their inventory. The North Carolina and Texas MLAs retain their Lost, Stolen or Location Unknown records so they can identify recovered machines. The other MLAs delete the record from the machine inventory, but retain the machine model/serial number in the patron history data file.

Some of the MLAs use the status codes to assist in producing a segment of the Monthly Machine Report; another uses a menu utility to perform this function. These status codes identify the number of machines available, assigned, or in repair.

Some MLAs use status codes to indicate that a machine is being transferred. Of these some use one status code to transfer-in, and a different code to transfer-out. Another uses a status code for transfer-out, and uses the menu Add function to transfer-in. The Florida system and READS employ menu functions to transfer machines in and out. Specifically, READS exercises the Add function to record a transfer-in, and the Delete function to transfer-out.

Some of the MLAs have chosen to use the status codes as a tool for providing more detailed information about a particular machine, i.e. when a machine has been re-assigned, when a machine is pending return from a patron, or when the same machine is sent back to the patron. Usually these status codes represent a temporary status, and may or may not be recorded permanently in the patron/machine history file.

2.3.1.4 Report Capability

The Machine-Lending Agency Inventory Procedures Manual requires that the MLAs provide the NLS with monthly statistical reports. There are two types of reports required by the NLS: the Monthly Machine Report (MMR), and the BPHICS transactions. The MMR provides a statistical summary of the monthly activity and month-end status associated with TBMs and CBMs, by machine model, and also includes accessories inventory availability to include; pillow speaker, remote control, headphone standard, and headphone light weight. The BPHICS transactions identify machine activity by specific machine model and serial number, and apply to machines: transferred in/out; damaged beyond repair or obsolete; lost, stolen, location unknown; or, recovered.

Each of the systems examined have the capability to extract these statistics, place the information in a standard format, and print the information. However, there are a few exceptions whereby MLAs with SLAs are required to manually add the SLAs' transactions into the MLA's printed report, and this occurs where the assigning of machines to patrons is recorded at the SLA level only.

The NLS has provided the MLAs with three methods of submitting both MMR and BPHICS transactions data: NLSNET, diskette, or paper. The NLSNET is a stand-alone program that permits the MLA to key the statistics into data screens which are then transmitted to the BPHICS contractor via a modem. The diskette method permits the MLA to copy the statistical data, in a BPHICS machine-readable format, to a diskette and mail the diskette to the BPHICS contractor; this diskette utility is only available to READS users (the NLSNET and diskette processes are discussed in more detail later in this report). The paper method requires the MLA to print the report and mail it to BPHICS.

These monthly reports are pre-programmed into the system to compile specific data and then print the information in an NLS standard format. These reports are executed from a menu option and require the user to answer a few questions in order to define the parameters of the report, i.e., time frame of report, person generating report, etc.

Some of the MLAs do have the capability to produce *ad-hoc* reports using report-writer software packages. These software packages operate as a separate entity from the actual MLA program, and read the data files and permit the user to produce queries and reports not available under the MLA's program. Although several of the MLAs have this capability, very few are comfortable with using the application with the exception of those MLAs who have technical computer personnel on staff. Most of the report-writer software packages are difficult to interpret without continued use, or a concentrated effort to understand the functionality, and most of the MLAs are not using the capability.

2.3.1.5 Data Archiving/Back-up Capabilities

Every MLA examined has a regular routine for backing-up their data. Although the method or media type is different, each MLA uses solid procedures for archiving data. Most of the back-up and restore programs are batch routines executed from a menu option. Each of the MLAs performs daily back-ups, and some of the back-up routines are slow, depending on the capability of the hardware. A few of the back-up routines require that the user not be processing transactions during the back-up operation.

Retrieval/restoring of data from an archived state did not appear to be a problem with any of the MLAs. Each MLA understands how the restore routines operate, and are satisfied with the process.

2.3.2 Types of BPHICS Transactions

The NLS requires that MLAs maintain a manual or automated information file system for machines issued to them, and these systems must be able to provide the NLS with statistical and activity information regarding these machines. The NLS stores serial number-level custody information in the BPHICS database, which is the formal centralized inventory tracking system at the national level.

For reporting purposes, the MLAs must be able to provide the NLS/BPHICS with the following types of serial number specific transactions: confirmation of machines received from the manufacturer, MSCs or NLS **(Acquisitions)**; request for deletion of machines from the MLA's inventory **(Deletes)**; validation of machines transferred to/from an MLA **(Transfers)**; and notification that a machine was lost, stolen, location unknown, or recovered **(Unknown)**. The MLAs are also required to provide summary activity statistics at the model level pertaining to these types of transactions, and summary inventory status data including the number of machines available for issue, assigned to patrons, and in repair **(Monthly Machine Report (MMR))**. Appendix 2-26, Information Flow of Machine Data to NLS, provides an overview of how this information flows to the NLS.

Although the MLAs do provide the NLS with the number of machines available for issue, assigned, and in repair for the MMR, this information is tracked in summary form only (i.e. model level) and has no direct relation to the BPHICS database, i.e., the source data, at the level of compilation (national), is different. In order to simplify the explanation of how data is processed between agencies and BPHICS, this section of the report addresses only those activities that affect BPHICS operations. The processes of issuing, assigning, and repairing machines are addressed elsewhere in this report, and do not affect an MLA's net inventory.

2.3.2.1 Acquisition of Machines (ADDS)

MLAs can acquire machines through two methods, either directly from the manufacturer, or through a transfer from an MSC or other MLA; the latter method is considered a transfer, and is addressed later in this section. The receipt of new machines from the manufacturer is basically a manual process (Reference Appendix 2-27, Information Flow of Machine Data by Type of Transaction, 1) Acquisitions/Adds).

The manufacturer initiates the process by producing a Certificate of Mailing (CM) that lists the model and serial numbers of the machines being shipped to a network agency. The manufacturer files a copy of the CM, mails a copy to the MLA, mails the original CM with the invoice to the NLS, and also mails one copy directly to BPHICS.

The NLS files a copy of the CM with the NLS/ECO and sends the original CM with the invoice to NLS Contracts. BPHICS reviews the CM, and enters the data into the MLA's inventory. At the end of each update cycle, BPHICS produces a Monthly Machine Activity Report (MMAR) that indicates what new machines the MLA should have received. This document is mailed to the MLA for confirmation.

The MLA is responsible for verifying receipt of each machine, and entering the machine type, serial number, and date received into their inventory file. If the MLA does not receive all the machines listed on the CM, they will circle the serial number(s), and retain a copy to match against the MMAR when received from BPHICS.

Receipt confirmation of a machine is accomplished when BPHICS sends the MLA their Monthly Machine Activity Report (MMAR). Action by the MLA is by exception, and is only required if the MMAR lists a machine that the MLA does not show as having been received. When this occurs, the MLA notes the exception on the MMAR and mails the listing back to BPHICS.

Any machines received that were not listed on a CM are reported directly to BPHICS on an Irregular Receipt Report. Machines listed on a CM that the MLA did not receive until after the 30-day waiting period are also reported to the NLS on an Irregular Receipt Report.

2.3.2.2 Damaged Beyond Repair or Obsolete (DELETES)

Transactions which remove machines from the MLA and BPHICS inventory apply only to machines which are in MLA custody and have been damaged and cannot be repaired, or for machines which are so old that repairing the machine would not be cost-effective. Delete transactions can be accomplished by use of paper or diskette. (Reference Appendix 2-28, Information Flow of Machine Data by Type of Transaction, 2) Deletes). The MLA writes the machine information on an Obsolete and Damaged Equipment Report (Form 73-162c), (READS libraries prepare a diskette) and this document is mailed or faxed to BPHICS. BPHICS produces a print-out list of the machines slated for disposal and forwards this list to the NLS. The NLS then verifies/approves the list, files a copy, and notifies BPHICS by telephone of approval of the list.

The NLS/ECO reviews and verifies the document and forwards it to the NLS Director for approval; the original document is filed, and a copy is mailed to BPHICS. NLS also mails a copy of the original document, the shipping labels and specific instructions to MLAs for processing the machines. Once BPHICS receives approval from NLS, they delete the Damaged Beyond Repair machine from the BPHICS Master Inventory. Obsolete machines are not in the BPHICS database, these machines are deleted when the NLS determines that the machine model is to be classified as Obsolete. The policy for deleting obsolete machines in this manner is currently under review by the NLS.

After the transactions are updated to the Master Inventory, the transactions are printed out to the Monthly Machine Delete Report (MMDR) and the MMAR. Obsolete machines are listed on these reports because they were not listed in the BPHICS database. The MMDR/MMAR is mailed to the NLS, and the MMAR alone is mailed to the MLA. The MLA reviews the MMAR, and notes those machines which should not have been deleted on the MMAR report. This report is filed so it can be compared with the next MMAR to ensure changes have been made, and a copy is mailed to BPHICS.

2.3.2.3 Transfers In/Out (TRANSFERs)

When machines are transferred from one agency's jurisdiction to another, the losing agency must report the transfer-out to NLS (Reference Appendix 2-29, Information Flow of Machine Data by Type of Transaction, 3) Transfers). Agencies are also required to notify the NLS when they receive a machine by means of a transfer-in, to include receipts from MSCs. Transfers between MLAs and their sublending agencies are not reported to NLS, since they do not affect MLA net inventory.

Machines received from MSCs are received in the same manner as a receipt from a manufacturer in that receipt of shipment must be verified by the MLA, and machines not received must be reported to the NLS. However, with regard to the MMR, the MSCs record the transaction as a Transfer-out, and the MLAs account for the machine as a receipt from an MSC. BPHICS records the transactions as a transfer-out from the MSC, and a transfer-in for the MLA.

An MLA that transfers a machine to another MLA is required to send the patron's machine history record to the gaining MLA, if a patron transfer is involved. The losing MLA is required to enter the model and serial number, and the gaining MLA (3 digit) code on an NLS Monthly Inventory of Machine Transfers (Form 73-162). The losing MLA will then delete the machine record from their inventory, and the gaining MLA is required to enter the machine model/serial number into their inventory, and the losing MLA (3 digit) code on a NLS Monthly Inventory of Machine Transfers.

The losing and gaining MLAs are required to send the Monthly Inventory of Machine Transfers form to BPHICS by the fifth working day of the following month. This information may be sent in paper, through NLSNET, or on diskette.

BPHICS then receives the transfer data and removes the machine from the losing MLA's inventory and adds the machine to the gaining MLA's inventory. After the transactions are posted to the Master Inventory, the updates are printed out to the MMAR. The MMAR shows transfers-out of one MLA to another MLA by indicating the code of the previous owning MLA on the transaction line, and the MMAR is mailed to the NLS and to both MLAs. The MLAs review their MMAR, and note only those machines which should not appear as transferred on the report, and mail them back to BPHICS.

2.3.2.4 Lost, Stolen, Location Unknown, and Recovered (UNKNOWN)

Machines that are lost, stolen, location unknown, or recovered must be reported by the MLAs to BPHICS (Reference Appendix 2-30, Information Flow of Machine Data by Type of Transaction, 4) Lost, Stolen, Location Unknown & Recovered). The MLA completes the Monthly Report of Equipment: Lost, Stolen, Location Unknown, Recovered (Form 73-162d) document and sends it to BPHICS by the fifth working day of the following month. This information may be sent by paper, through NLSNET, or on diskette.

BPHICS receives the transaction and removes/adds the machine from/to the MLA's inventory and adds/removes the machine to/from the XX1 inventory (a file created to house records of lost, stolen, location unknown machines). After the transactions are posted to the Master Inventory, the updates are printed out to the MMAR; the MMAR shows a lost, stolen, or location unknown action as transferred out of the MLA to XX1. Recovered machines are reported as transferred in from XX1. The MMAR is mailed to the MLA, and the MLA reviews the MMAR and notes on the MMAR only those machines which should not have been removed/added. A copy of the revised MMAR is then mailed to BPHICS for correction.

2.3.2.5 Production of Monthly Machine Report (MMR)

The MMR is a summary report of activity and inventory status listed by machine model. A flow diagram is provided in Appendix 2-31 that defines the data flow of this process. This report has no direct effect on the BPHICS database. Each MLA must print their MMR in hardcopy in order to verify that the report is correct. Once the report is accurate, the MLA can send the report to BPHICS, the method used depending on the ADP System, i.e. by paper, NLSNET, or diskette.

The BPHICS contractor receives or retrieves the data, depending on the method sent, and updates the NLS MMR file. This file is a Lotus spreadsheet structured in the same format as a standard MMR, and the contractor updates this file using Lotus macros. Once the file is updated, it is copied to a diskette and mailed to the NLS.

2.3.3 Data Communications to BPHICS

The ability to account for the location of machines across the NLS network at the MLA level and communicate this information to a central repository, i.e. BPHICS, is key to tracking custody of the NLS machine inventory. Currently, the NLS network is using three types of media to send data to the BPHICS contractor; 1) paper, 2) diskette, and 3) electronic format via modem. MLAs submitting data on diskette are using the READS program, while MLAs transmitting electronic data via a modem are using NLSNET.

The data sent to BPHICS comes in two forms. One of the forms indicates activity by the type of transaction, and this activity relates directly to what custody state the machine is in by model and serial number: i.e., deleted; transferred; or lost, stolen, or unknown. For purposes of discussion, these transactions have been defined as BPHICS Transactions. The second form is a statistical summary, i.e., the Monthly Machine Report (MMR), of cumulative monthly activity and inventory status by model of machine (e.g., C01, C79, C78, etc.).

How the MLAs transmit or send their data to BPHICS is directly affected by the method or ADP system that the particular MLA is using to administer its machine program. Appendix 2-24, Method of Reporting Machine Data by ADP System, provides a breakdown of what ADP system and type of media each MLA is currently using. Approximately 80% of the MLAs are using the same type of media for both report forms. The remaining MLAs are using paper for BPHICS transactions, and NLSNET for the MMR. Exhibit 2-3, Percentage Distribution by Media Type, provides a comparison of the report forms (BPHICS transactions or MMR) and indicates the percent of usage by media type.

Exhibit 2-3
Percentage Distribution by Media Type

Media Type	BPHICS Transactions	MMR
Paper	70%	49%
Diskette	20%	20%
NLSNET	10%	29%
expEDIte *	0%	2%

* Previous Public Data Network currently not being funded by the NLS.

The following discussion provides an explanation of how some of the MLAs are sending machine data to BPHICS using diskettes (READS) and NLSNET. The paper process is a manual procedure, and was described in Section 2.3.2.2, Types of Transactions.

2.3.3.1 NLSNET

The NLS requires that MLAs maintain a manual or automated information file system for machines in their custody. These systems must be able to provide the NLS with status and activity information regarding this equipment, and one method for reporting this information to the NLS is via the NLSNET.

The objective of NLSNET is to provide the libraries with a tool to improve service to their customers. NLSNET was designed: to be user-friendly and flexible to meet future expansion needs; to not require extensive space or impact agencies' internal automation plans; not to interfere or interrupt current library operations; and, to require minimal costs for installation.

The scope of NLSNET is limited to applications which address information exchange rather than information processing; NLSNET's functions are oriented toward data collection and data transfer to the NLS Host System (i.e., BPHICS). Essentially, the data is keyed into NLSNET data screens which look similar to the NLS forms used to submit the data manually. This data is then transmitted to BPHICS in transaction/report file format via asynchronous (error checking/correcting) modems.

NLSNET contains multiple applications that perform numerous functions. These functions include:

- **Comprehensive Mailing List System (CMLS)** - identifies patrons and circulation materials,
- **BPHICS** - pertains to machine data,
- **Copy Allotment** - includes information about the distribution of materials for libraries within the NLSNET system,
- **MSC Transactions** - contains information supporting requisition requests for materials, and supplies and Interlibrary Loan requests, to MSCs,
- **NLS Report Forms** - are electronic forms for the purpose of tracking subscribers, circulation materials, circulation statistics, machine repair statistics, TBM/CBM inventories (e.g. MMRs), and system hardware,

- **XESS (Excess Materials Program)** - is a process that allows network libraries to dispose of excess materials and permits other libraries to select among the repository of excess material to enhance their collections,

- **Communications** - option allows users to send transaction/report files, including BPHICS data, and electronic mail messages to the NLS and their contractors for processing,

- **Utilities** - houses the administrative functions required to maintain the NLSNET system.

BPHICS, NLS Report Forms, Communications, Utilities are the NLSNET functions associated with machines.

NLSNET-BPHICS Function

The NLSNET-BPHICS function gives the MLAs the capability to electronically process machine transactions. Appendix 2-32, NLSNET Processing of Machine Data, indicates how the information flows from the MLA to BPHICS. The NLSNET-BPHICS menu supplies the user with the following options:

B1 - Machine Shipment
B2 - Certificate of Mailing
B3 - Machine Transfer Out
B4 - Machine Transfer In
B5 - Unexpected Receipts
B6 - Unreceived Shipments
B7 - Lost, Stolen, Unknown
B8 - Obsolete and Damaged

The purpose of options B1, B2, B5, and B6 are under review and have been turned off per direction of the NLS. B3 - Machine Transfer Out, is used to process a machine transfer to another MLA or MSC, and B4 - Machine Transfer In, is used for machines that are recovered or are transferred to the MLA from other MLAs/MSCs **(Transfers)**. The B7 - Lost, Stolen, Unknown option provides notification to the NLS that a machine has been lost, stolen, or the location is unknown **(Unknown)**. B8 - Obsolete and Damaged **(Deletes)** is functional, but the NLS has requested that the MLAs not use this option and rather submit all requests for deletes on paper only.

NLS Report Form Functions

NLSNET also provides the user with the capability to enter data for the Monthly Machine Report (MMR). This routine is accomplished in the NLS Report Forms function, and has two options relating to the MMR; Machine Inventory - CBM, and Machine Inventory - TBM.

The CBM option requires data input into three screens. The first screen, Part 1(A), indicates the quantity of CBM machines: received; transferred; damaged; lost, stolen, or unknown; and total inventory based on these additions and deletions. Part 1(B), the second screen, shows the number of CBM machines available, assigned, in-repair, and net inventory. The third screen accounts for accessory equipment available for assignment (i.e., pillow speakers, remote controls, standard headphones, and light weight headphones). The TBM option has only two data input screens, Part 1(A) and (B).

Utilities Function

The Utilities function contains the options for printing the data, backing up/restoring the data, and converting the data to a BPHICS machine-readable format, and this function is designed as a three-step process. After all the data has been entered, a print-out of the information is produced and verified against the source documents to identify errors, and all errors are corrected before moving to the next step.

Once the input is error-free, the data is backed-up on the hard disk and can also be saved to diskette. The back-up program contains a copy of the current month's data, plus that for the two previous months. If the active files become corrupted, there is a restore routine that will recover the data from the back-up files. The third step converts the input data to a BPHICS machine-readable format. Once the data is converted, the information can be transmitted to the BPHICS contractor using the NLSNET Communications function. If the data transmission to BPHICS fails, a diskette copy can be mailed in lieu of the telecommunications process.

Machine Data Processing and Communications

NLSNET is a standalone process in that data can only be manually keyed into the program. NLSNET does not have a utility that permits MLA data to be electronically transferred from an MLA system into the NLSNET program for processing. The NLSNET-BPHICS process starts after the MLA has extracted, in hardcopy, the BPHICS data from their system.

The MLA selects the appropriate option from the Main Menu, and the data is key entered into the BPHICS transactions and MMR data screens. Once the input data is error-free, NLSNET creates transaction files by converting the transaction types (i.e., transfer, lost, etc.) to a BPHICS machine-readable format. The record layout and field definitions for the converted transactions are shown in Exhibit 2-4, NLSNET Machine Data Conversion to BPHICS, whereby the MMR data is placed in an ASCII screen format which looks similar to the hardcopy MMR.

These transaction files are finally transmitted by modem to BPHICS via a Public Data Network (CIDS). The BPHICS contractor retrieves the data, electronically transfers the data onto the system, revises the MLA's inventory, and updates the MMR spreadsheets.

Exhibit 2-4
NLSNET Machine Data Conversion to BPHICS

```
 1  2   3  4  5  6                           7 8      9      10
11
 |  |   |  |  |  |                           | |      |      |   |
DC9J12 NLSDC9A7800001234                     41000001AK9    0194
DC9J12 NLSDC9A7800001234                     61000001AK9    0193
DC9L11 NLSDC9C7800001234                       000001       01940
XX1C11 NLSDC9C0100003456                     71000001       0194L
XX1C11 NLSDC9C0100005678                     71000001       0194S
XX1C11 NLSDC9C0100006123                     71000001       0194U
DC9C11 NLSDC9C0100007345                     71000001       0194R
```

1 - MLA or XX1 - Hold file
2 - BPHICS Transaction Code
3 - Transmitted via NLSNET
4 - MLA
5 - Model Type
6 - Serial Number
7 - BPHICS Status
8 - Quantity
9 - MLA being transferred to
10 - Month and year of transaction
11 - Indicates specific transaction (i.e., L - Lost, S - Stolen, etc.)

2.3.3.2 READS

Another method used by MLAs to maintain and report information on machines is the Reader Enrollment And Delivery System (READS). READS is designed to assist small and medium-size network libraries and affiliated support agencies in distributing and tracking talking books, recorded circulating magazines, and playback equipment. READS encompasses the broad functions of library service for the network libraries, and two of these functions are the machine inventory control and assignment process, and the READS-BPHICS function. The machine inventory control and assignment function provides many of the same utilities associated with other library computer systems, i.e., adding and updating records, and producing reports. The READS-BPHICS function permits the MLAs to produce machine transactions and statistics in a BPHICS machine-readable format on diskette.

Machine Control and Assignment

The READS program has utilities that record the assignment and activity of machines, and as machines are added to the inventory, or as a machine's status changes, transaction records are created and stored in transaction files. The creation of these transaction files is automatically accomplished by the program, and is invisible to the user. These transaction files are used to produce the end-of-month reports for BPHICS.

As shown in Appendix 2-33, READS Processing of Machine Data, READS provides BPHICS machine information for: deleted; transferred; lost, stolen, or location unknown; and the Monthly Machine Report (MMR). Machines received from manufacturers (Adds) are compiled for the MMR, but are not recorded as a BPHICS transaction. The process by which BPHICS accounts for Adds in the inventory is explained later in this report.

As machines become Damaged Beyond Repair or Obsolete, READS removes these machines from the MLA's inventory **(Deletes)**, and records these activities as BPHICS transactions. Although NLS has indicated that all delete transactions will be submitted on paper, READS users submit delete transactions on paper and diskette. The BPHICS contractor is aware of the NLS requirement, and removes the delete transactions from the READS submission prior to processing. The delete transactions are included in a later processing cycle after receipt of approval from the NLS.

READS records the movement of machines between agencies as BPHICS transactions **(Transfers)**; transfers are recorded as a transfer-in, or transfer-out. A transfer-in action may be in one of three forms. One method can be an MLA receiving a machine from another MLA. A second mode may be an MLA receiving a machine from an MSC/NLS, in which case the BPHICS transaction is recorded as a transfer-in, and the MMR shows the action as a receipt from an MSC/NLS. The third type of transfer is a recovery action, which is the result of a lost, stolen, or location unknown machine being returned to the MLA.

As machines become lost, stolen, or location unknown **(Unknown)**, READS records this activity as a BPHICS transaction. READS distinguishes the type of transaction for BPHICS by placing a category code at the end of each transaction record, e.g., L - Lost, S - Stolen, U - Location Unknown.

As machines are entered/updated, they are given a status code indicating whether the machines are available for assignment, on loan to a patron, or being repaired. READS compiles this data as an end-of-month snapshot, by status and machine model. This data, along with the number of machines deleted, transferred, lost, stolen, or location unknown, and the quantities received from the producer, MSCs and NLS, are used to produce the Monthly Machine Report **(MMR)**.

READS-BPHICS Function

At the end of each month, READS produces the BPHICS monthly reports. READS has a utility that prints the reports in the NLS standard formats, and has developed a separate routine for users who wish to submit their data on diskette.

Whether the user is submitting data on paper or diskette, they must first produce the reports in hardcopy to verify their accuracy. Once the information is correct, the user will execute the command "BPHICS all". If the MLA is operating on a READS Local-Area-Network, they must ensure that the READS workstations are turned off, or are not being used for database input or update. The conversion routine creates two files, an MMR and a transaction file; the transaction file is then converted to a BPHICS machine-readable file. Exhibit 2-5, READS Machine Data Conversion to BPHICS, provides the record layout and an explanation of what is in each field of the transaction file. For the MMR, data is placed in an ASCII screen format and looks similar to the hardcopy MMR.

Once the data is converted, READS is designed to copy the converted files to diskette and create two sets. The first set of diskettes is mailed to the BPHICS contractor, and the second set of diskettes is a back-up copy. The back-up copy is retained until the data input can be verified against the Monthly Machine Activity Report received from BPHICS.

Exhibit 2-5
READS Machine Data Conversion to BPHICS

```
1 2   3 4 5 6                                 7          8  9
| |   | | | |                                 |          |  |
KY1AMC RDSKY1A7800999999                      SM         0291
KY1CLA RDSKY1C0100998877                      SL         1291
XX1DPA RDSKY1A7800999996                                 0791
KY1CST RDSKY1C0100998877                      CO         1291
KY1CST RDSKY1A7800998877                      CO         1291
```

1	-	MLA Code or XX1 - Hold file
2	-	BPHICS Transaction Code
3	-	Indicates Data was from READS System
4	-	MLA Code
5	-	Model Type
6	-	Serial Number
7	-	BPHICS Status Code
8	-	Month and Year of Transaction
9	-	Category Code (i.e., L - Lost, S - Stolen, etc)

After READS creates the diskettes, the transaction files are emptied. The Net Inventory figures from the MMR are then stored for the next monthly update, while the transaction counters are reset to zeros.

The READS-BPHICS program does have two other commands for managing the files. The "BPHICS Copy" command allows the MLA to make additional copies of their back-up copy, should the need arise. The "BPHICS RMV" command permits the MLA to empty the transaction files, if the "BPHICS all" command is not used. The transaction files are active repositories for machine data; consequently, if the "BPHICS all" or "BPHICS RMV" commands are not executed, these transaction files will continue to grow.

2.3.4 BPHICS

As previously mentioned, the BPHICS contractor is responsible for receiving machine data from agencies, adding or updating this data to the master database, and disseminating this information, in report form, back to the NLS and agencies. As stipulated in the BPHICS contract, the contractor must be able to process machine transactions received in a machine-readable format (fixed-format ASCII).

Transactions are received on paper, on diskette, and by telecommunication via asynchronous (error checking/correcting) modems. The contractor maintains a tracking log of receipts, and performs pre-processing and editing to ensure that duplicate or incorrectly coded records are not processed.

The contractor is also responsible for coordinating with the NLS on analyzing system operations and programs for improvements. The contractor must also have the capacity to modify/expand the current automated system if and when required by the NLS, to include updating all documentation. The following information is based on documentation available to the study team at the time this report was produced.

2.3.4.1 Processing BPHICS Transactions

The BPHICS contractor is responsible for performing updates and edits to machine transactions submitted by MLAs and MSCs for inclusion into the BPHICS database. These updates/edits are designed to ensure integrity as the data flows through the system. Appendix 2-34, BPHICS Processing of BPHICS Transactions, provides a flow diagram of the process.

Appendix 2-35, BPHICS Transactions Reported by Agencies, provides the approximate number of transactions being processed by BPHICS. These figures were derived from 12 consecutive months of MMRs and, therefore, constitute a surrogate measure of transaction volume. Although all of the MLAs did not report data on a monthly basis, these numbers do provide an estimate of the amount of activity associated with processing transactions.

When the source documents are received from the agencies or from the NLS, they are examined by the contractor for completeness and clarity. Documents passing this initial screening are assigned a document control number, and this number is used as a control variable in the processing of the data from the source document.

The source documents are first grouped by type of transaction, i.e. transfers, deletes, etc. The documents are recorded in a BPHICS Receipt Log, shown in Exhibit 2-6, grouped in lots of 100, and then assigned a batch number. The lots are recorded in a BPHICS Batching Log, shown in Exhibit 2-7, and copies of these logs are mailed to the NLS/ECO each month. The batch number is carried with the transaction throughout the edit/update cycle, and this link provides an audit trail to locate source documents for transactions rejected during the processing. Once all transactions have been batched, they are ready for data entry, and data is then manually input directly from the source document.

Once all transactions have been entered, the data is printed. A visual verification, rather than a key verification is performed by comparing the original source document to the printout, and every transaction is checked to ensure accuracy and reliability of the data entered. Verification is always performed by an individual other than the operator who entered the data.

After verification, the data is processed for editing and updating of the master file. Acquisition transactions are separated from change or adjustment transactions to permit processing of multiple transactions against the same master file in a given edit/update cycle. The edit/update program is executed twice during each cycle; first for machine adds, and then for all other transactions; i.e., transfers, deletes, etc. This process is performed in order to add the records to the file prior to the application of machine movement, such as transfers.

Exhibit 2-6 BPHICS Receipt Log

BPHICS RECEIPT LOG					
Date Received	Agency	Type of Trans	Number of Pages	Number of Trans	DMA Batch#

Exhibit 2-7, BPHICS Batching Log

BPHICS BATCHING LOG
DATE RECEIVED:_______ DMA BATCH NUMBER:_______   TRANSACTION TYPE:_____ NUMBER OF DOCUMENTS:_____   NUMBER OF TRANSACTIONS:______
OPERATOR'S INITIALS:_______   DATE ENTERED:________   TOTAL ACCEPTED:_______
COMMENTS:

Edit/Update Cycle

Edit/update processing occurs sequentially. Add transactions are sorted in ascending sequence by BPHICS transaction code within machine model/serial number. The Master File is ordered by machine model and serial number. The changes and deletions are sequenced by machine model and serial number in ascending order, and then by BPHICS status code in descending order.

After each update or report cycle is executed, all input and output counts are verified. The most critical output control total is the one generated by the edit/update cycle, and two sets of Input/Output counts are printed for each cycle.

The first count is generated from that part of the cycle that updates the file with acquisitions, or adds.

> The *Number of Transactions Accepted* and the *Number of Transactions Rejected* should total to the value for the *Number of Transactions Read*.
>
> The count from the *Number of Master Records Read* should equal the final count from the last update. The difference between the *Number of Master Records Read* and the *Number of Master Records Written* should equal the *Number of Records Created*. The count from the *Number of Transactions Accepted* should equal the *Number of Records Created* plus the *Number of Records Changed*.

The second set of counts is from the part of the cycle that updates the file with adjustments.

> The count from the *Number of Records Read* should equal the count of the *Number of Master Records Written* from the previous update of the acquisitions/adds. The *Number of Inventory Records Changed* and the *Number of Inventory Records Deleted* should total the count from the *Number of Transactions Accepted*. All other counts are derived in the same manner as the update of acquisitions.

Once the edit/update is completed, accepted and rejected transactions are saved on magnetic tape for future reference. All transactions rejected are included in the Edit/Update Transaction Report, and an example of this report is shown in Appendix 2-36, Edit/Update Transaction Report. This report is forwarded to the NLS for review and identification of reject trends.

The majority of the rejected transactions are corrected by the BPHICS contractor; BPHICS is currently experiencing a reject rate of 15% (Reference Appendix 2-37, BPHICS Edit/Update Transaction Report Summary). The bulk of the rejects are caused by the machine model/serial number not being in the BPHICS Master Inventory file. Most of these transactions are corrected by adding the machine record to the master inventory. The MLAs are responsible for a small segment of the rejects, and these are usually related to coding the transaction incorrectly. Approximately one-fifth of the rejects are duplicate transactions, or transactions which are in an unconfirmed status. These unconfirmed transactions will be automatically updated to a confirmed status if they have not been denied by an MLA by the end of a standard 60-day waiting period. Transactions that cannot be resolved by BPHICS are mailed to the NLS, along with the source documentation, for resolution. Corrected transactions are recycled in the next edit/update cycle, and all management and user reports are generated upon completion of the edit/update cycle and forwarded to the NLS and Agencies.

2.3.4.2 Processing MMR Data

The BPHICS contractor is responsible for updating the Monthly Machine Report (MMR). The MLAs and MSCs are required to submit their monthly machine reports to BPHICS, and the contractor updates the MMR and mails the information to NLS. Appendix 2-38, BPHICS Processing of MMR Data, defines the data flow of this procedure. The contractor receives the MMR data from the agencies in one of three media forms, NLSNET, diskette, or paper, and uses a different procedure for processing each media type.

The majority of the MMRs are received on paper directly from agencies. The MMR input is sorted by MLA, and a receipt date is entered in the BPHICS MMR Log for each agency by media type. This log is mailed monthly to the NLS for review, and a sample of this report is presented in Appendix 2-39, BPHICS Monthly Machine Report Log. Once the input is logged, the contractor uses the NLSNET program to enter the data, and data for each MLA are entered separately. After the data are entered, an operator verifies the input against the source document. When the input is correct, the data is uploaded to the mainframe for processing.

Data received on diskette is sorted by MLA and logged into the BPHICS MMR Log. Once the information is logged, the data is uploaded to the mainframe from the diskette. There are no edits performed on the data from the diskette.

Data received via NLSNET is retrieved from the Public Access Network, CIDS. The MLAs are identified, sorted and logged in the BPHICS MMR Log. After the input is logged, the data is uploaded to the mainframe. There are no edit checks performed on this data.

After all inputs have been loaded onto the mainframe, a COBOL program is used to consolidate the data into continuous columns without headers. This process simplifies the handling of the data for generating reports and loading the information into a Lotus spreadsheet format. Once the data is compiled, the information is downloaded to a diskette, printed to a hardcopy report in an MMR standard format, and is archived to magnetic tape. The MMR hardcopy report and diskette are then mailed to the NLS, and the NLS loads the diskette data to a Lotus spreadsheet by means of a Lotus Macro.

2.3.4.3 Generated Reports

As stated in the BPHICS System Description Manual, "the output reports were designed to provide management with the most effective means possible for monitoring the movement of property within BPHICS". The following is a list of the reports produced by BPHICS. Samples of some of these reports are included in the Appendices.

<u>Master Inventory List (Appendix 2-40)</u>: This is the primary management report produced as a result of executing the edit/update cycle, and is a list of all the machines recorded in the BPHICS Master Inventory. The report lists the information by model and serial number, in ascending order, sorted by agency. This report is produced on an 8mm magnetic tape cartridge and provided to the NLS on a monthly basis.

Random Audit Report: This report is produced upon request and is used as a management tool for audits of various agencies to determine compliance with federal regulations pertaining to property control and accountability.

Suspense Report: The Suspense Report is produced as needed at the completion of each update cycle. The report lists all inventory items that have been in a suspense status (all status codes other than CO) for 60 days or longer at the time of the update. (NOTE: as of May 1989, inventory records that have a status other than CO for more than 60 days are automatically confirmed during the monthly edit/update cycle.)

Semi-Annual Report: This report presents an overall representation of the models and status codes for all the inventory records in the database.

Selected Agency Listing: This document is produced upon request and can be created for one to twelve agencies. The listing consists of all models, sorted by serial numbers within models, for all machines assigned to the applicable agency(ies).

Inventory Summary Report (Appendix 2-41): This summary is produced monthly. The report reflects the number of machines, by model and status code, assigned to each agency in BPHICS. The machine counts are formatted in a BPHICS status code matrix with a total column.

Monthly Machine Activity Report (MMAR) (Appendix 2-42): The MMAR report is produced monthly, and shows the various transactions posted (status changes) during the current cycle for each agency. All agencies that had any activity for that month (i.e., received, shipped, etc.) would receive a copy of the report. The report is used as a turnaround document to confirm, report, or dispute the receipt or shipment of machines into or out of their inventory. The report is sorted by type of transactions, i.e., machines received, machines transferred, etc. This report contains a column, Receipt Denied (x), that is only used to indicate that an agency did not experience that particular transaction for that machine.

Edit/Update Transaction Report (Appendix 2-36): Edit/Update Add and Change Report is produced as a part of the BPHICS edit/update cycle. The Add segment of the report indicates the machines added to the BPHICS Master File, and identifies those Add transactions that were rejected during the update process. The Change section reflects the records deleted or modified in the BPHICS Master File. The Edit/Update Add and Change Report is sent to the NLS/ECO for review and correction on an as-needed basis.

Data Entry Verification Report: This report is used by the BPHICS contractor to produce a listing of all transactions keyed/entered by data entry personnel. The data is sorted by data entry personnel operator ID. This listing is compared to the original source document to verify each transaction keyed.

Monthly Machine Shipment Report (MMSR): The MMSR is produced on an as-needed basis and serves to track the number of machine shipments between the manufacturer and the lending agencies, agency-to-agency, MSC-to-agency, and agency-to-NLS (for disposal). The report is sorted by agency and model, and reflects the number of shipments for the current month plus a cumulative number based on the selection date parameters, e.g. April 1993 through September 1993.

Monthly Machine Delete Report (MMDR): The MMDR is produced monthly and used by the NLS to track the disposal of machines at the agency level. The report is divided into two parts, TBM and CBM. Each part lists the applicable model and serial number by agency, and reflects the number of machines deleted for each model, by agency, for the current month plus a cumulative number from the date the report was initiated.

Monthly Machine Report (MMR) (Appendix 2-43): The MMR is a management report that is not generated from the BPHICS Master Inventory file. The input for this report is submitted by the agencies to BPHICS and the document shows inventory action and status summarized by agency. There is no direct data link between the MMR and the actual machine transactions processed in the BPHICS database at the national level. However, at the local level, the source data for both the MMR and BPHICS are, hopefully, the same, i.e. transaction journal records. In addition to activity, i.e., adds, transfers, etc., the report reflects the number of machines assigned, repaired, and available by model type, i.e., status. All of the MMRs received from agencies for a particular month are consolidated. The report reflects the inventory status, by agency, with a summary national total at the end of the report. This data is input into a LOTUS spreadsheet format, produced in hardcopy, and forwarded to the NLS/ECO.

Section 3
Findings

Section 3
FINDINGS

This section of the report presents major findings based upon observations of current MLA, SLA, volunteer repair, NLS, contractor and MSC operations, and analyses of data collected during our site visits and surveys. Recommendations directed toward the elimination or attenuation of these problems are presented in subsequent sections and the addenda of this report.

OBJECTIVES

The second of the three primary objectives of the study was to identify and document major findings pertaining to the current audio playback equipment operations of the free national library program. The analyses performed were to identify and, if possible, quantify any deficiencies and/or inefficiencies in any aspects of current operations that were within the scope of the study. Such analyses always tend to accentuate the negative aspects of any operations analyzed, and this study is no exception.

It is, therefore, stated clearly here that the study team was very impressed with the dedication of staff involved in the performance of various functions that support audio playback equipment operations at all levels, but especially the dedication of personnel in network agencies. In general, network agencies are currently facing either constant or declining fiscal resources for their operations at a time when demand for these services is constantly increasing, albeit at a moderate rate. The enumeration of problems in this section of the report must, therefore, simply be viewed as a tool to ultimately further potential improvement of services to patrons by assisting in the development of recommendations to effect such improvements.

SUMMARY

The study team found significant problems in several areas of the machine operations. The problems include the availability of machines to patrons, the quality of repairs, the manner in which the national inventory of machines is managed, and the structure and relationship between the participants in the system. Some of the behaviors exhibited are due to the current condition of repaired machines, and such behaviors are to be expected, but should be required to change in the event that improvements are realized.

STRUCTURE OF PRESENTATION

This section of the study report is different in structure and content from the draft report of March, 1994. The presentation has been altered to be problem statement based, that is, the lead item in each discussion is a statement that identifies a particular problem facing current machine operations. The problem statements are organized around topical areas (e.g. repair) and are supported by detailed discussions and presentation of data. New problems are included and additional data and analyses have been provided. The degree to which each problem is related to the project's primary objective -- increasing the availability of machines -- is presented. Additionally, the problem's relevance to the three repair options developed (centralized, decentralized and regionalized) is also discussed.

TOPIC: AVAILABILITY

Problem 1: The national inventory of machines is not uniformly available to patrons

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The most serious problem encountered was patrons on waiting lists for standard CBMs. Availability of TBMs and CT-1s was not found to be a problem at any site, and only one site cited a recent shortage of E-1s (which they stated was "their own fault" for not ordering from the MSCW in time). These lists are composed of both new patrons waiting for initial issue, and existing patrons waiting for replacement units.

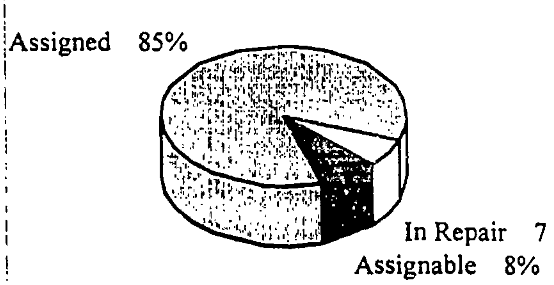
The national total of patrons on waiting lists is unknown; it is not reported to the NLS at any time and, of course, changes from day-to-day. Among the MLAs visited, three had patrons on waiting lists for CBMs. Another MLA without a waiting list estimated that they expected a backlog of equipment orders to develop in approximately one year based upon a simple, but telling, calculation of annual machine attrition (scrapped and unrecovered), net readership growth, and receipts of new production, with growing repair bottlenecks fortunately not being an existing or impending factor in their particular case.

There is additional evidence to support this conclusion. The study team prepared an analysis of the estimated "free" inventory for each MLA. Free inventory is defined as the excess of "working" inventory above a target, i.e. standard, level. Working inventory is defined as unassigned machines. The study team obtained excellent activity and inventory data during the site visit to Texas. Among other things, this data was combined with certain other MLA reported data to perform analyses of network-wide activity and inventory levels.

The first analysis performed was to determine how the national inventory of machines was deployed. The split between machines assigned, available (on shelves, not broken), and in repair was determined. The result of this analysis is summarized in Exhibit 3-1 below, which indicates that 85% of all CBMs (including CT-1s and E-1s) are assigned to patrons and that there is a relatively even balance between available and in repair. The corresponding figures for TBMs are 84% assigned, 13% available, and 3% in repair. Excluding the MSC inventories of "C" machines, network agencies have 89% of machines assigned, 5% assignable, and 6% in repair. The study team finds that the percent of CBMs in repair is too high.

Exhibit 3-1

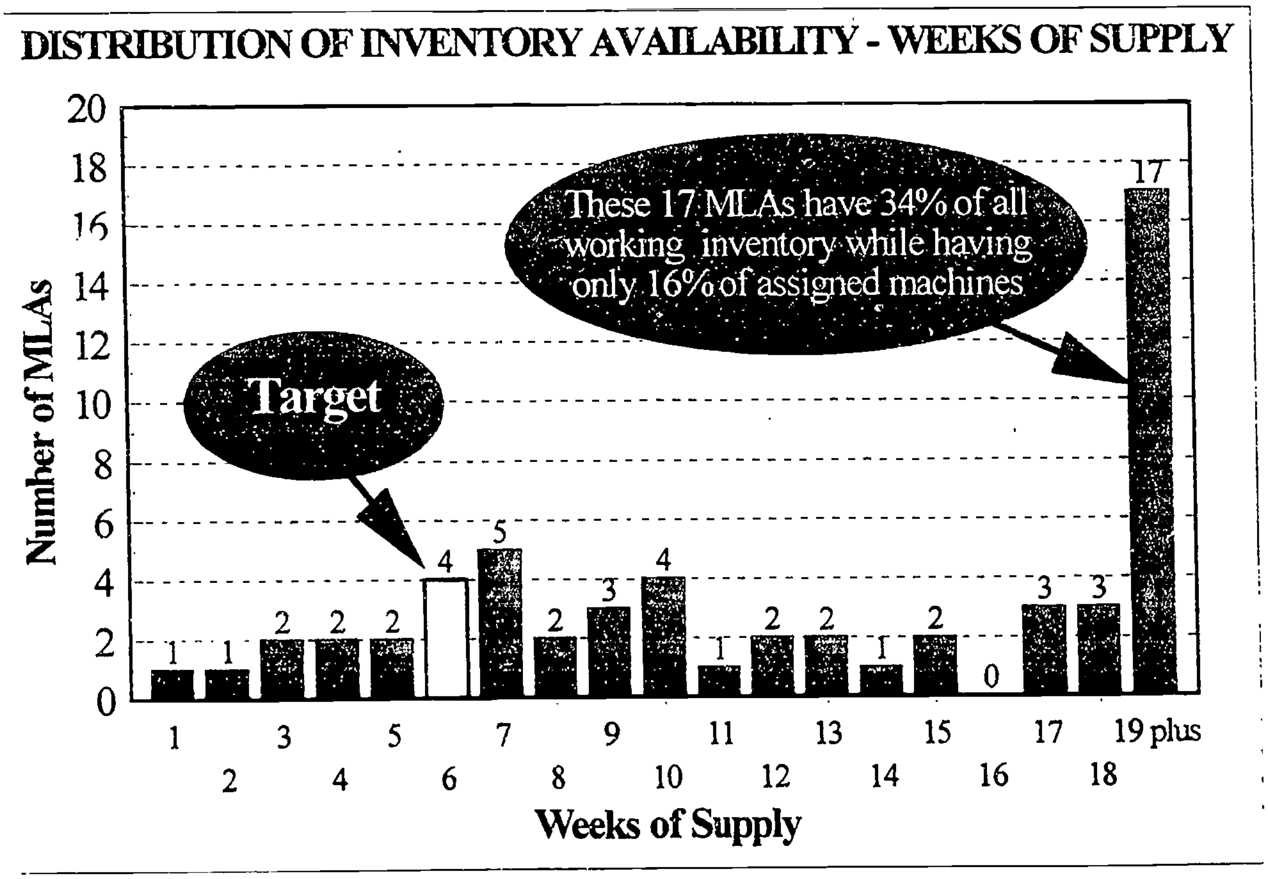
MACHINE INVENTORY DEPLOYMENT
Percentage Distribution by Major Category



The study team also prepared an analysis to determine the "working" inventory at each MLA, and to make an assessment as to the distribution of the national working inventory of machines. In this context, we determined that "working" would be defined as assignable (i.e. available) machines plus machines in repair. Further, it was determined that once the repair problem is corrected, a three-to-five week turnaround standard (which varies depending upon whether repair groups are on or offsite, and mail service) on repaired machines would be established. This would result in a target inventory level of 5.75-to-6.4 weeks, respectively, in terms of *pure patron demand*, of working inventory (in terms of either average repair activity, or new production allotments, this quantity exceeds the "3-month" supply currently specified by the NLS as a storage requirement at lending agencies).

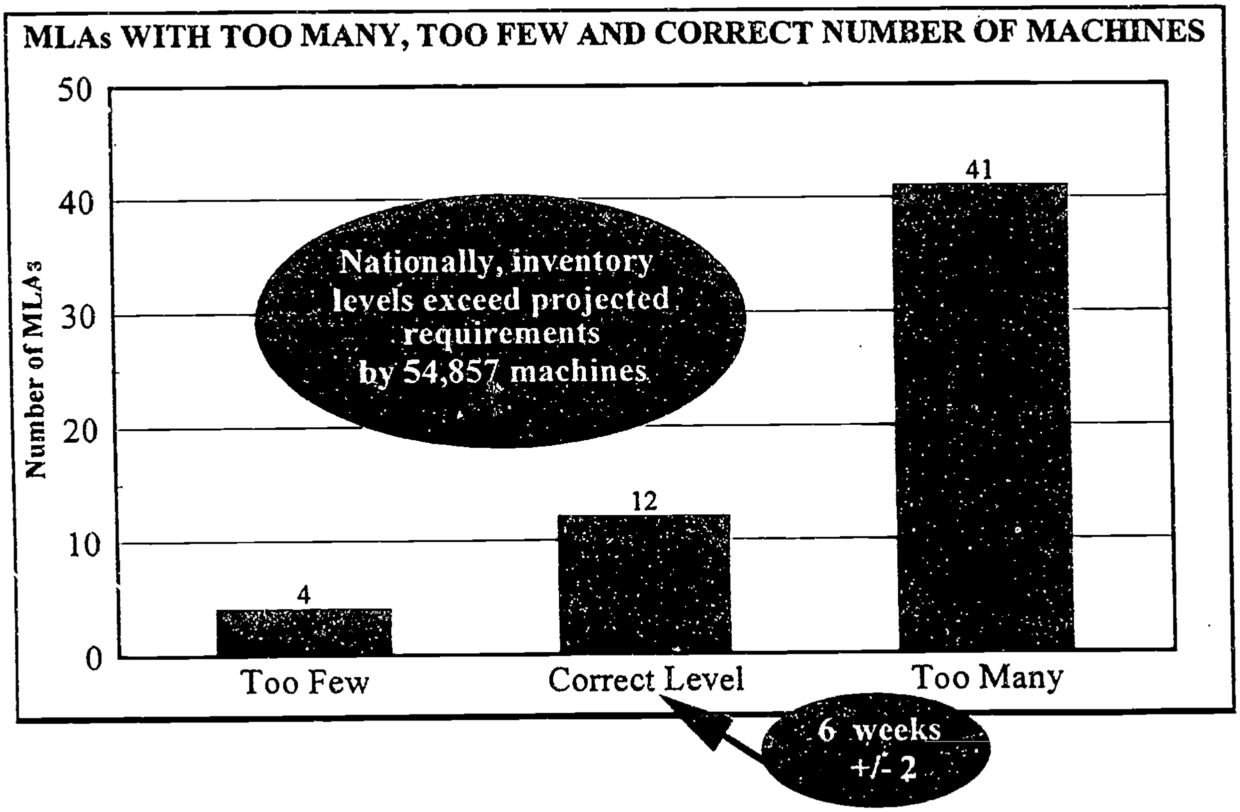
In one analysis, a frequency distribution of MLA's and the weeks of working inventory was prepared. This analysis shows that there is wide variation in the number of weeks of supply of machines that the MLAs keep, and that numerous MLAs have far more machines than they would need if the problems in the system were rectified. Exhibit 3-2 displays the results of this analysis.

Exhibit 3-2



This analysis shows that a relatively small number of MLAs possess a significant portion of the national working inventory pool. The analysis also shows that most MLAs are over the target goal of 6 weeks supply. This last finding is further documented in Exhibit 3-3 below; it is noted that the national inventory level includes all "C" machines, i.e. standard CBMs, CT-1s and E-1s, in both network agencies and MSCs.

Exhibit 3-3



However, true working inventory is insufficient at a significant number of network MLAs. The *alleged* factors that contribute to MLA machine availability problems include:

- positive net readership growth,
- new machine production quantities insufficient and/or not targeted for correct models,
- premature machine disposal,
- machines unrecoverable from patrons,
- growing machine repair queues and/or poor repair quality, and
- staff shortages at lending agencies.

Given the current and future *modus operandi* of the free national library program with respect to audio equipment operations, i.e. that MLAs do and will possess, manage and distribute portions of the national inventory for which they alone have official custody, problems will occur on a regional, and not necessarily national, basis. This is especially true with regard to staff shortages. However, the more MLAs that develop machine availability problems, the more the problem becomes national in nature and extent.

Because 10-year historical data on national machine inventories was not available for use in the project, specific trends cannot be cited with regard to the growth of machine inventories (in all three major categories) as can be cited for both repairs and patron growth (Reference Exhibit 2-1). Appendix 3-1, however, shows a 6-year profile of network inventory; a clear trend in increasing assigned machines and declining net inventory is apparent on a national basis. Machine availability is clearly a major problem in current operations on a regional basis, it is expected to become worse, and the improvement of this condition, via scrutiny of the repair, disposal, inventory control, and production allocation/distribution has been the primary focus of the project.

It has been generally assumed in all analyses that fiscal constraints imposed on the NLS will constrain new CBM production to approximately current levels (i.e. 45,000 to 48,000 C-1 machines per year), and that net readership growth (of approximately 15,000 patrons per year) is uncontrollable. New production information recently furnished to the study team, shown in Appendix 2-1, indicates that higher levels of CBM production are planned for the next few years, and this will help to offset availability problems. However, it is unknown if this higher level can be sustained, and for how long; for this reason, the implementation of several other major recommendations address the availability problem from "other angles". However, as mentioned above, recommendations are made both with respect to new production distribution and allocation, and with respect to the counting and tracking of patrons.

Important to project objective: Extremely
Relevant to repair options: No, all repair options have increased machine availability as a goal

TOPIC: AVAILABILITY

Problem 2: The definition of "assignable" varies

The study team found that some MLAs/SLAs will not assign, or are reluctant to assign, older or repaired machines. These sites stock-pile old and repaired machines with no intention of distributing them to patrons. These locations maintain that old machines break too often and are significantly less reliable than new machines. There is no statistically significant evidence of this phenomenon, but there is some anecdotal evidence to support the claim. These locations also maintain that repaired machines do not work right, and there is both statistical and anecdotal evidence to support this claim. Given the current levels of repair quality, it is difficult to criticize these practices.

However, the national inventory of machines is already poorly distributed, and additional constraints merely serve to exacerbate the problem. These practices have contributed to the surplus inventories documented for some of the MLAs. Unfortunately, at some of these very sites, the machines in repair queues are so large, and/or the machine repair quality is so poor that, in reality, a shortage of assignable machines effectively exists. Once the repair quality is improved, the MLAs and SLAs should be monitored for their assignment policies and should be very strongly encouraged to circulate older and repaired machines.

Important to project objective: Yes
Relevant to repair options: No

TOPIC: AVAILABILITY

Problem 3: There are shortcomings to the current method and formula for machine allocation

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The monthly shipment of new CBM production to each MLA was mentioned as a potential problem. The logic being that if an MLA receives one month's supply of new C-1 production on a single calendar day, there is a good likelihood of a stockout of CBMs occurring just prior to receipt of the next shipment. However, none of the MLAs visited in the study cited the monthly frequency scheme as posing a problem, although some wanted more CBM machines (which are production and allocation issues, not distribution-shipping).

The current distribution-shipping scheme is not a problem in itself given the current working inventory level of the network. First, the current working inventory of standard CBMs in MLAs/SLAs is approximately 56,000 machines (24,000 assignable and 32,000 in repair), which exceeds FY93 production and equals FY94 production, and with a stock of this magnitude, monthly shipment frequency is more than adequate to fulfill stocks prior to stockouts except in instances of extraordinary demand, assuming demand is normally distributed and working inventory is uniformly distributed among MLAs (which it is not). Second, based upon an analysis of receiving logs for new production from Florida (the only site where such data was available), it was determined that in some months indeed all allocated production arrived on a single calendar day; however, in other months the shipment arrived in several pieces, often scattered over approximately two weeks. Therefore, even in the current scheme, the distribution is not always purely once per month. It can be concluded that, if an MLA is stocking out of CBMs prior to the receipt of the next month's shipment, it is for reasons other than the current distribution scheme.

Another problem arises with the allocation of new production to MLAs. On face value, the current allocation scheme seems very logical and equitable. It relies on the sole criterion of the percentage of reported CB patrons of the MLA to total national reported CB patrons, the source data being annual circulation readership reports, and the assumption being made of four patrons per institution. There are several possible shortcomings, however, with this scheme that is effectively entirely based on merit, but not on need.

1. Readership Growth - If one MLA's readership is growing over a several year period, and another MLA's is flat or shrinking, the current scheme relatively benefits the shrinking MLA.

2. Existing Size - The current allocation scheme does not consider in any way the current normalized net inventory of MLAs, i.e. a relative measurement in terms of CBMs per patron. Appendix 3-2, CBMs per Patron by MLA, shows the wide variation in existing relative inventories (total net inventory of CBMs) among MLAs in the network. Both statistics used, i.e. readership and inventory, are reported by the MLAs. This value ranges from a low of 0.71 CBMs/patron to a high of 2.68 CBMs/patron (excluding the NLS's inventory and readership for the overseas program, which was 3.27 CBMs/patron).

3. Age of Inventory - The average age of an MLA's inventory is not considered in the allocation process. There is merit to considering average age of inventory. There may be no choice but to use the older machines and keep repairing them, but the distribution of the national inventory, by age, should be relatively uniform, in order to be equitable.

4. Patron Count Used - The assumption of four readers per institution, used in the current allocation process, introduces some error into the calculation because of variation in the true count of individuals utilizing the service within institutions. Some MLAs report a markedly greater number of institutions, even in relative terms, than other MLAs, which may indeed be valid due to a different emphasis of service. This allocation process should be replaced.

Important to project objective: Yes
Relevant to repair option: No

TOPIC: AVAILABILITY

Problem 4: Allocations of machines to institutions by MLAs/SLAs, and from NLS to MLAs on the basis of number of institutions, may be overly generous

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Assignment of multiple machines to institutions is an area for scrutiny by MLAs for two reasons. First, institutions account for a disproportionate share of attrition of equipment. Second, an accurate patron count within institutions must be known in order for MLAs to make equitable allocations of machines among all patrons in their service areas, both individual and institutional. We have a good fix on the number of machines assigned to institutions from North Carolina, Kentucky and Texas, including a surprising number of institutions that have no machines at all; this data is shown in Appendix 3-3. The average number of CBMs per institution is approximately two, not four or six. Therefore, allocation of four machines per institution inequitably favors MLAs with relatively more reported institutions.

As a side note, many individual patrons have both a TBM and CBM, which is both allowed and necessary in order to use both disc and tape books and magazines. However, one instance of multiple assignment of machines to patrons deserves special mention. Assignment of more than one CBM to an individual patron is an exception some MLAs make on a case-by-case basis that is technically not allowed per NLS policy, but is apparently not widely abused by MLAs, who must "live within" their new production allocations, repair capacity, repair quality, and attrition constraints. Assignment of more than one TBM to an individual is currently virtually non-existent.

Important to project objective: Somewhat
Relevant to repair options: No

TOPIC: REPAIR

Problem 5: The absence of triage at some MLAs reduces the availability of machines and burdens the repair network

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One problem with the total number of machines in an in-repair status is that some MLAs are not performing triage. That is, at some MLAs, virtually all machines returned from patrons are logged into the ADP system as being in-repair and then put into a repair queue. No attempt at performing the most simple diagnoses of the defects, or basic machine functionality, is made. Machines that simply require overall cleaning, head cleaning, and/or changing or charging of batteries should not be put into these repair queues, but rather turned around by in-house staff. Performing triage both maximizes the utility of repairers, and increases available inventory for patron issues.

The non-performance of triage also significantly inflates repair statistics of the network. Some MLAs automatically put returning machines in repair status, and count all that come out as having been repaired, which inflates the repair statistics. The entry should be made after triage, which will reduce the number of machines in repair status at those MLAs by 50%, and possibly as much as 60%.

Several analyses were performed to quantify the number of triage repairs being counted among the approximately 130,000 reported CBM repairs (excluding warranty and commercial) per year in FY93 and FY94, respectively. These estimates varied depending upon whether readership, circulation of CBs, or assigned CBMs was used as the basis for extrapolation to the national level. The estimates ranged from approximately 10,000-to-30,000 units; a planning figure of 20,000 was determined to be the most robust value to use in subsequent analyses. With FY94 reported repairs estimated at 130,000 (based upon an 85% submission by Dec. 94), the underlying number of reported non-triage repairs is approximately 110,000.

Important to study objective: Extremely
Relevant to repair option: No, triage would be the same no matter how the machines are repaired

TOPIC: REPAIR

Problem 6: The quality of volunteer repair varies considerably and is generally very poor

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In the March, 1994 draft report, the study team made the observation that repair quality was purported by several MLAs to be poor. This statement generated significant debate that could only be resolved through more rigorous analysis. The results of this analysis are presented herein.

QUALITY OF REPAIR SURVEY

Overview. The study team conducted a survey to determine the quality of repairs performed by both volunteer groups and in-house staff. The survey of machine repair quality was conducted because:

- There is no data collected or reported network-wide on this topic
- The design of the three alternative approaches to solving the various problems in the network cannot be adequately addressed with repair quality as an unknown
- There are considerable differences in opinion as to existing quality

Working with NLS staff, the study team designed a quality survey that:

- Included site visits to 20 randomly selected MLAs (providing for a range in MLA size and geographic location)
- Provided for a statistically significant number (at 95% confidence and 5% error of estimation) of freshly repaired machines to inspect (40 at each site, at least 800 in all)
- Applied a standardized method for machine inspection by qualified NLS and study team staff working from a pre-tested checklist that reflected the network-accepted standard of repaired machine performance
- Determined whether a machine passed or failed inspection using a tested and unambiguous scoring system that weighed the relative significance of each inspection check point

Sites Visited. A total of twenty sites were visited during a two-month period. Each site visit lasted approximately one day, during which the study team attempted to inspect at least 40 (if available) freshly repaired machines. The volunteer repair groups were also visited, time and other factors permitting. The twenty sites were:

1. Sacramento, CA
2. Indianapolis, IN
3. Lansing, MI
4. Pittsburgh, PA
5. New York , NY
6. Philadelphia, PA
7. Raleigh, NC
8. Nashville, TN
9. Milwaukee, WI
10. Richmond, VA
11. Albany, NY
12. Watertown, MA
13. Columbus, OH
14. Phoenix, AZ

15. Los Angeles, CA
16. Salt Lake City, UT
17. Salem, OR
18. Columbia, SC
19. Jefferson City, MO
20. Daytona Beach, FL

Inspection Checklist. The study team adopted the repair standard recently agreed upon by the network and participating repair locations. A series of tests were conducted at NLS workshops to develop a standard procedure for testing the machines against the standard and for documenting the results. Experienced NLS engineering staff supervised these efforts. The objective and result of this effort was to have the tests repeated exactly at all twenty locations.

Testing included numerous items and whether or not the machine would operate at all (some would not.) Most of the tests were functionally based and did not require special test equipment. Several other of the tests (torque, frequency response, speed) involved the use of electronic test equipment and test tapes. A total of 47 items were judged on a pass or fail basis. The pass/fail thresholds for individual inspection checkpoints were predetermined and based on reasonable expectations for machines in the field (standards for new machines are higher.) Checklists were completed for every machine inspected, and these were later input into a computer database for analysis. Samples of the machine checklists and corresponding standards are provided in Appendix 3-4.

Pass - Fail Adjudication. It was agreed that a machine would not need to pass all of the checklist items for it to pass inspection as a whole, and it was also agreed that the items inspected had variable importance, (e.g. missing rubber feet are not as important as the machine being totally inoperable.) With these factors in mind, the study team prepared a methodology for adjudicating the results of the inspections. This methodology reflects two guiding principles.

1. the system should be quantifiable
2. the system should reflect (weigh) the relative importance of inspection checkpoints with one another

A stratified forced choice method for assigning weights to the inspection checkpoints was thus used. Stratification was accomplished in two passes. In the first pass, each item was assigned a priority of high, medium or low as it related to all other items on the checklist (note that the frequency response tests are not included in the scoring.) The choice is forced because the priority groups had to contain approximately the same number of items. In the second pass, a secondary priority (high or low) was assigned to each item as it related to the items in its primary priority group. Again the choice is forced in that the two subgroups had to have roughly the same number of items.

The result of this stratification of items is six priority groups:

1. High High

2. High Low
3. Medium High
4. Medium Low
5. Low High
6. Low Low

In the next step the relative values of the priority groups were established.

First, it was established that if any High High category item failed inspection, the entire machine should fail (this to reflect the fact that some problems are so egregious that no patron should receive a machine with them.) It was then established that each step decrease in priority should be accompanied by a step increase in the number of failures required to fail a machine. Consequently, two High Low items must fail to fail the whole machine, three Medium High items must fail to fail the whole machine, and so on. Then, items in the High High category were assigned a value of 20 deduction points (thereby establishing the fact that the accumulation of 20 or more total deduction points is failure for a machine.) The lower categories were then assigned deduction points that reflected the number of item failures required to generate a failing score of at least twenty total points. This scoring plan is summarized in the exhibit below.

Exhibit 3-4
SCORING PLAN

GROUP	No. OF FAILED ITEMS REQUIRED TO FAIL MACHINE	DEDUCT POINTS PER ITEM FAILURE
HH	1	20
HL	2	10
MH	3	7
ML	4	5
LH	5	4
LL	6	3.5

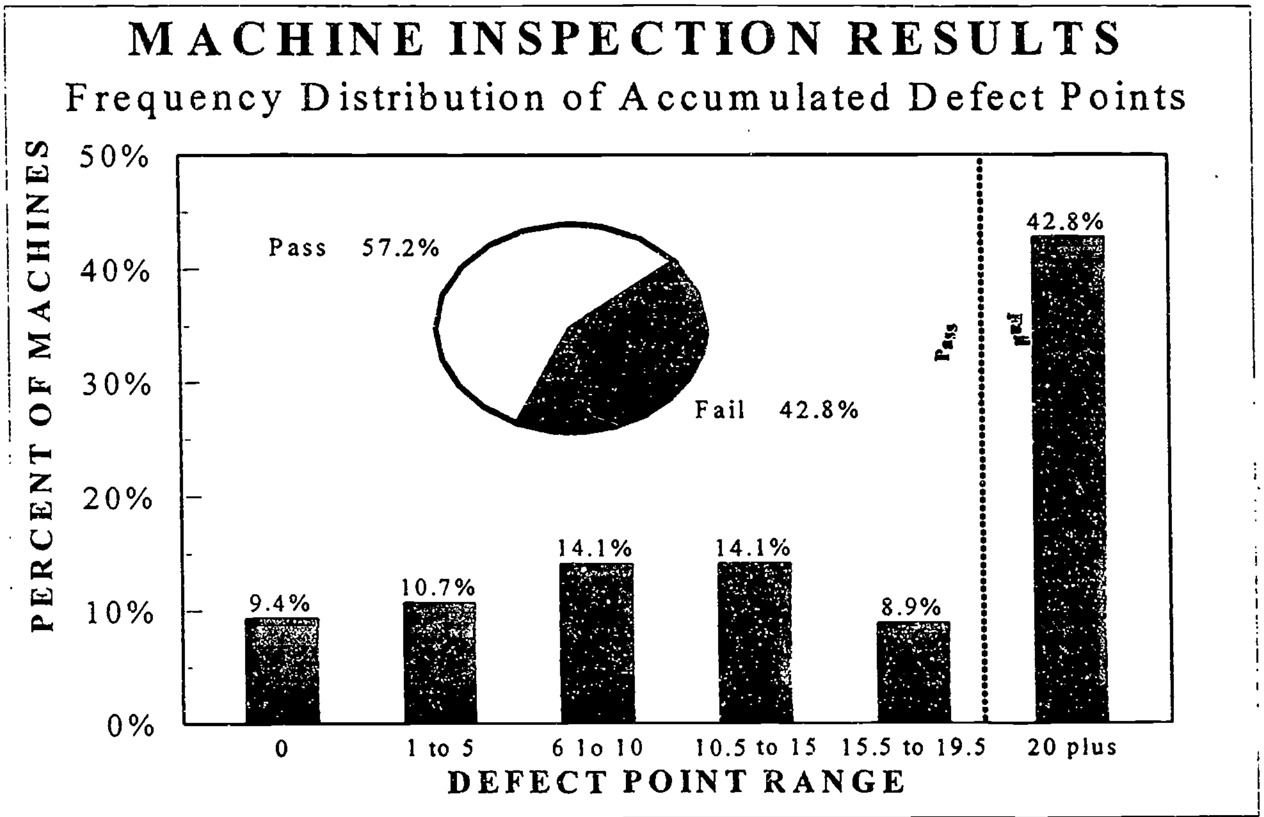
A meeting at NLS was held to discuss the draft scoring plan prepared by the study team. The meeting was attended by senior project, technical and engineering personnel. The relative priority of each inspection item was thoroughly discussed and a consensus was arrived at as to where each item should be placed. Point scoring was tested with two sample sites to determine if there was any bias or imbalance in the application of the system.

Database Mechanics. All of the inspection checklists were input into a computer database designed for the purpose of adjudicating the results of the inspections and for analyzing data in other ways. The study team maintained control of the data throughout the entire process.

Results. The results of the inspections reveal that the quality of machine repair in the network is quite poor. Of the 822 machines inspected, over 42% failed (Exhibit 3-5 on the following page summarizes this finding.) There is a dramatic variation between the sites. A number of sites received high quality repair where over 85% of their machines passed inspection, whereas other sites received dreadful service. Site by site results are summarized below and detailed in Appendix 3-5 (The sites are coded to retain confidentiality.)

Site	Percent Passing
A	83
B	24
C	28
D	33
E	93
F	23
G	48
H	70
I	88
J	54
K	53
L	49
M	88
N	68
O	77
P	53
Q	74
R	65
S	14
T	61

Exhibit 3-5



Why did the machines fail? Exhibit 3-6 on the following page shows the frequency distribution for failed items. The chart reveals that cleanliness, head adjust screw seals, head alignment, tape running smoothly, torque, high frequencies, and speed were the items that contributed most significantly to failure. These items failed frequently and some of them were considered important to the overall performance of the machines and thus carried a high point value. An unfortunate note is that 3% of the machines inspected were found to be totally inoperable, suggesting poor quality control at the point of repair.

OTHER

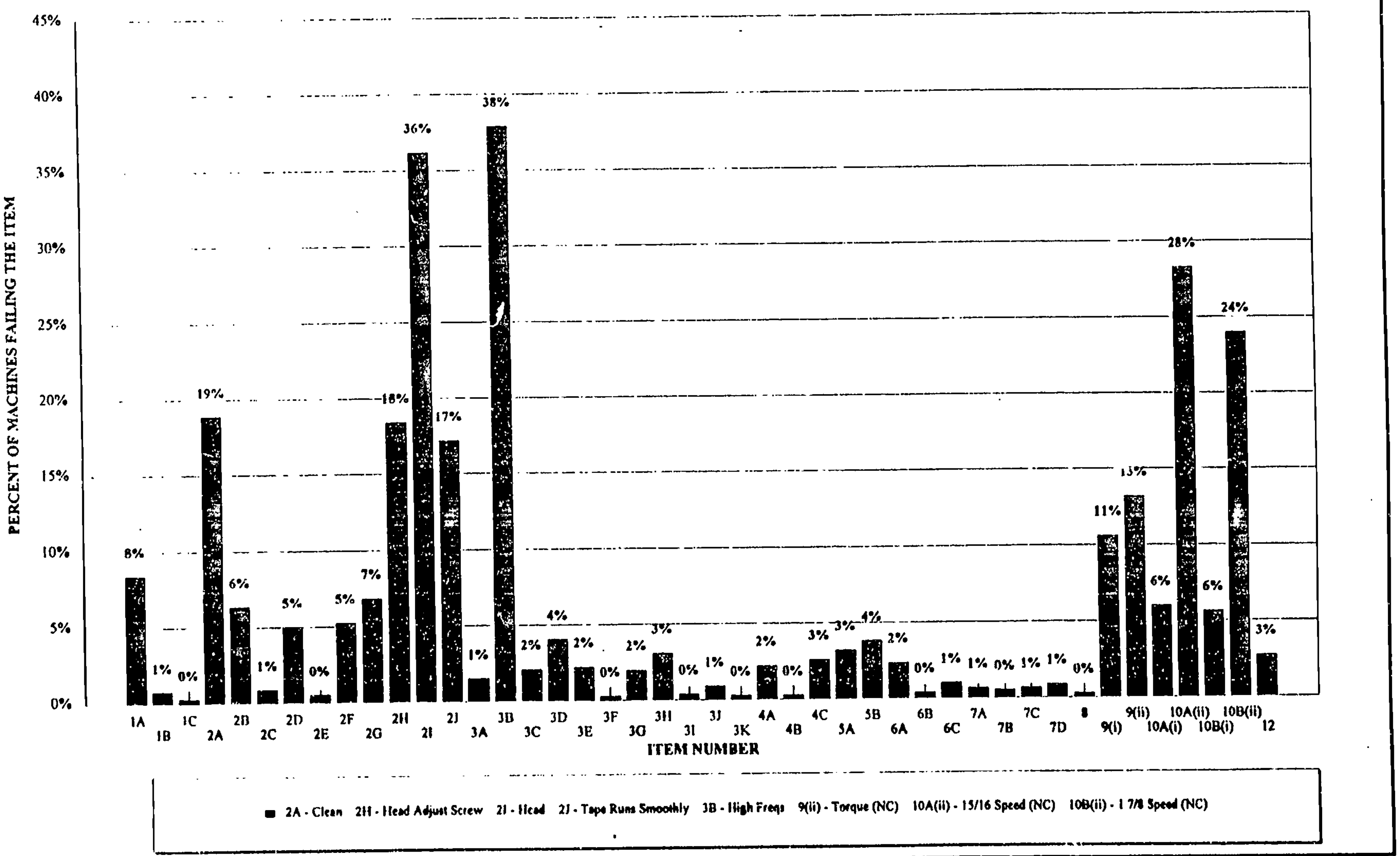
The Texas MLA experiences about a 37%-to-40% rejection rate for machines coming back to them from repair, which are all inspected for functionality prior to issue.

Important to project objective: Extremely
Relevant to repair option: Very

Exhibit 3-6

FREQUENCY DISTRIBUTION OF ITEM FAILURES

All Sites, All Machines



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TOPIC: REPAIR

Problem 7: The repair practices of the volunteer groups vary

The study team performed an analysis of the repair practices (as distinct from the repair quality survey) of the volunteer repair (and one in-house repair) groups. Data was gathered in two ways. First, ten repair sites were requested to complete a repair card every time a machine was repaired. The cards provided a standardized method for coding repairs. Second, the ELFUN repair group in Cincinnati, Ohio provided almost two years of repair data (12,000 repaired machines) in a database format that the study team was able to use.

The purpose of the analysis was originally to identify why machines went into repair (what broke), but as the analysis unfolded, it become evident from the data and from discussions with the groups that the data was more indicative of what the groups did to the machines when they got them, and not necessarily what was wrong with the machine. That is, a number of the groups performed work above and beyond what was required to "fix the immediate problem." Thus at least some of the groups fix specific problems and then go on to take maintenance and rehabilitative actions that tended to mask pure defect data.

So, although the original intent of the repair card survey could not be fulfilled, an equally important analysis could be performed. The study team analyzed the data to compare and contrast the practices of the repair groups to determine if there was any uniformity in the way machines are treated nationally. First, the ELFUN data will be discussed. Second, the nine site repair card data will be presented. Lastly, our findings and conclusions will be shown.

ELFUN Repair Statistics

The ELFUN group in Cincinnati provided the study team with repair statistics for 1993 and 1994 to date (approximately October). The data covered all machines repaired during those time periods and identified the actions taken to repair them. The ELFUNs use a coding system different than that used on the study team's repair cards, but a cross-walk between the two was developed. Over 12,000 records were provided in a machine-readable format.

The data clearly shows that the ELFUNS essentially recondition the machines in a program that combines routine maintenance actions as well as defect repair. In both years over 84% of all machines received for repair were given new drive kits. Additionally, over 74% of all machines had their heads changed and over 77% received new batteries. Two other areas of concentration included the capstan bearings and the pressure rollers. Exhibit 3-7 on the following page shows the two-year result for ELFUN repair actions, by ELFUN repair category. A year-by-year break-out and other ELFUN related data is provided in Appendix 3-6.

The study team constructed a cross-walk between the ELFUN repair categories and those on the repair cards sent to the ten sites. This result, for 1994, is depicted in Exhibit 3-8.

Exhibit 3-7

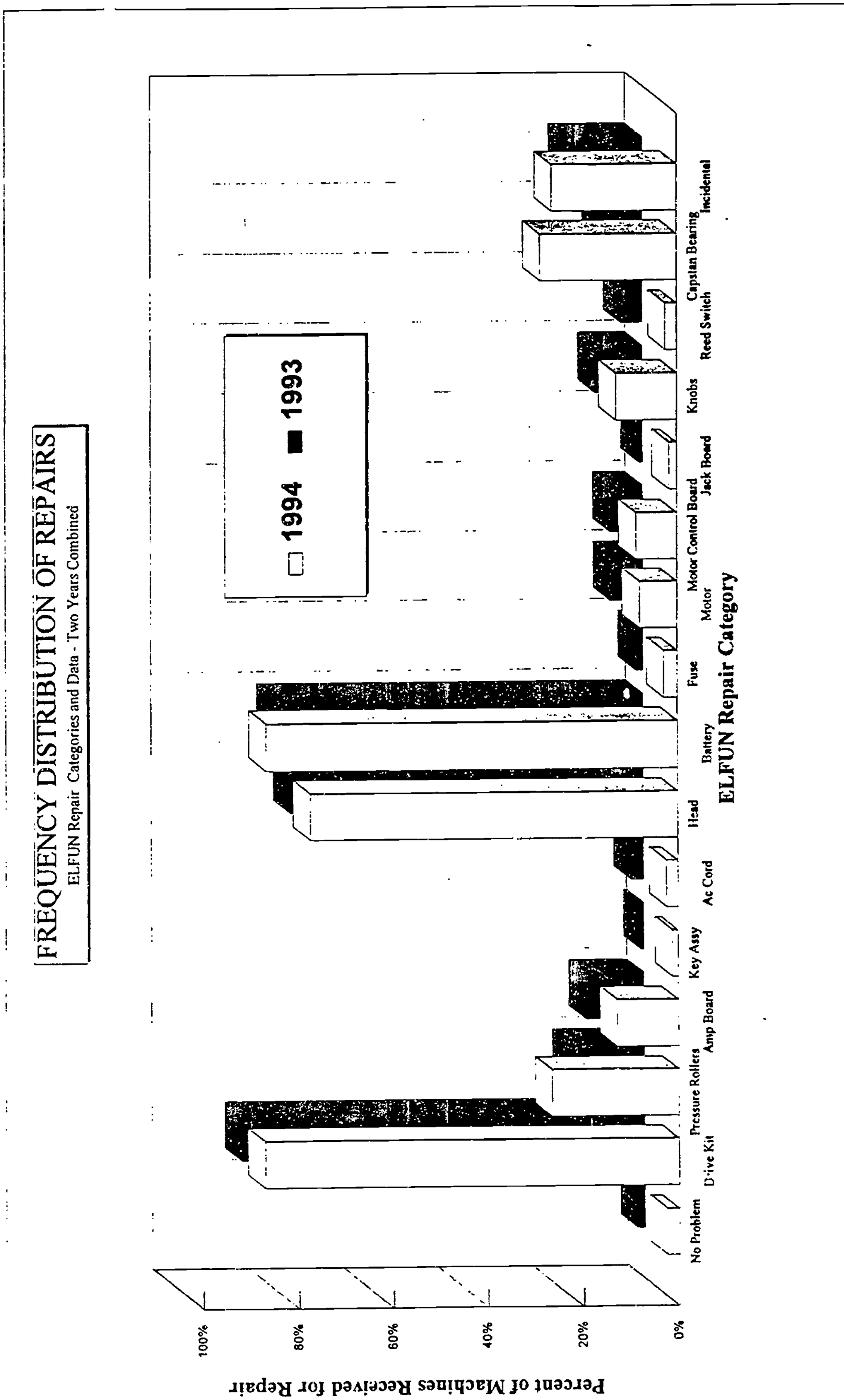

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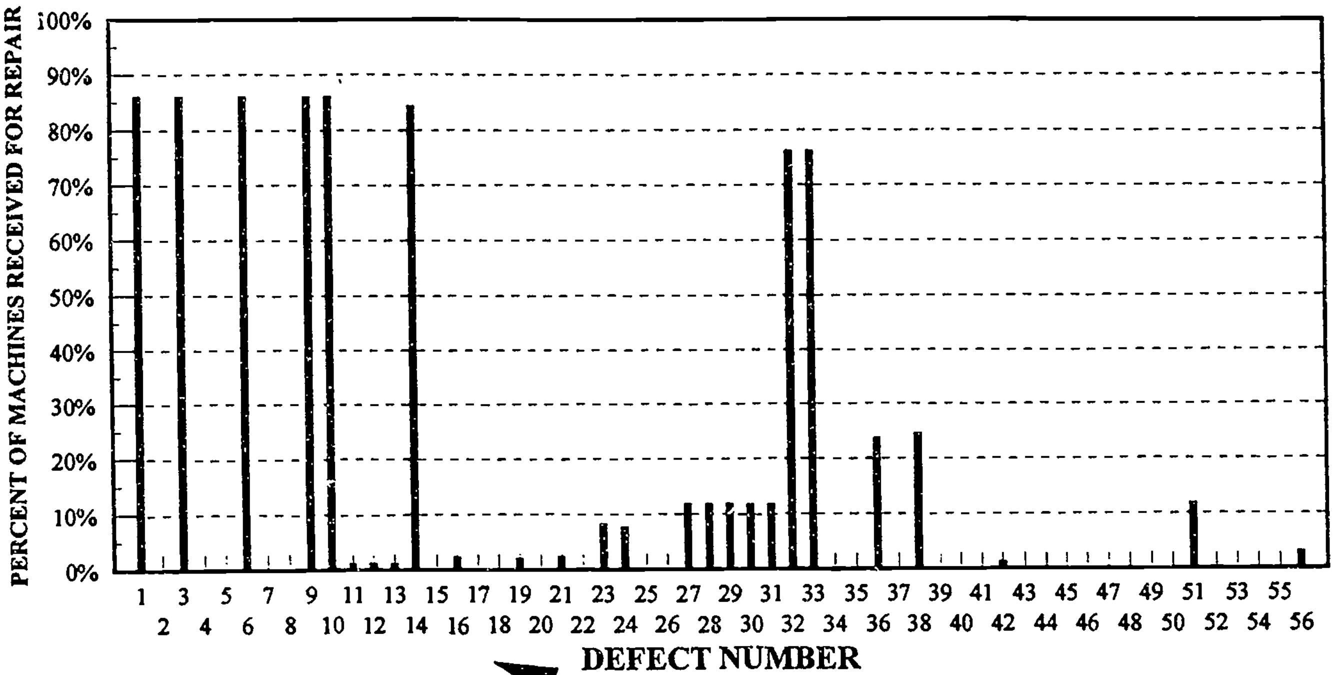
Exhibit 3-8

ELFUN REPAIR DATA - 1994

Percentage Distribution of Defects to Machines Repaired



...correspond to these defect numbers

These defect numbers...

CASSETTE MACHINE DEFECT CARD

Model/Serial Number: C

Repair Group:

(Defects Sorted in Logical/Like Groupings)

1	Fast frwrd idler	15	Battery contacts	29	Tone control	43	Speaker
2	Fast frwrd idler arm	16	Power cord	30	Track switch	44	Deck corroded/bent
3	Rewind idler	17	Transformer	31	Speed switch	45	Loose object
4	Friction lever	18	Charging circuit	32	Head alignment	46	Internal spill/vermin
5	Reel assy's	19	Fuse	33	Head worn	47	Case
6	Reel table tire	20	EOT mechanism	34	Head slide	48	Handle
7	Rewind spring	21	Reed switch bd	35	Tape guide	49	Key ID plate
8	Friction lever spring	22	Wire harness/conntrs	36	Pressure roller	50	Switch ID plate
9	Drive belt	23	Motor control bd	37	Flywheel	51	Knobs
10	EOT belt	24	Motor	38	Capstan bearing	52	Battery door
11	Pushbutton assy	25	Leaf switch	39	Thrust button	53	Cassette door
12	Latch bars	26	Trim pots	40	Amplifier board	54	Rubber feet
13	Keys scratched/brkn	27	Var. speed control	41	Jack panel board	55	Replace screw/washer
14	Battery	28	Volume control	42	Jacks	56	NO TROUBLE

It is interesting to consider the ELFUN repair program in light of our findings regarding the quality of repair. The ELFUNS routinely replace items that are significant contributors to machines failing the quality test. Both the ELFUN repair data and the quality of repair data suggest that routine replacement of heads and drive kits would significantly improve the quality of the machines.

Nine Site Repair Card Data

Repair cards were sent to ten repair sites. Nine of these sites responded by completing at least some of the potential 400 cards provided to them; the tenth also completed and submitted data, but it was not received in time for publication of this report. Site-by-site results are provided in Appendix 3-7.

The study team found significant variation in the practices of the groups. We found that some groups engage in machine reconditioning, while others merely fix what is broken. We found that some groups repair drive kit items and heads on a routine basis, while others only do so infrequently. Exhibit 3-9 summarizes this finding. The study team selected seven major repair items from the repair cards and plotted the frequency at which each of the nine responding sites completed a relevant repair action. The chart shows significant variation in three important areas:

- Fast forward idler (drive kit item)
- Rewind idler (drive kit item)
- Head worn

The frequency with which the fast forward idler was replaced ranged from a high of 100% of the time to a low of under 20%. A similar degree of variation exists with regard to the rewind idler. Similarly, one of the groups identified worn heads in almost 90% of all machines, while a few other groups found worn heads less than 10% of the time. Appendix 3-8 details this analysis for all 56 defect items.

The study team believes that these differences in approaches are significant contributors to the overall condition of the machines and that the groups that approach repair as an opportunity to recondition machines are moving in the correct direction. This approach is, furthermore, not incompatible with the application of triage, nor incompatible with a *modus operandi* whereby the defects related to the reported symptom are tackled first.

Summary Comparison

To illustrate the range of activity, the chart entitled "COMPARISON OF 9 SITE DATA TO ELFUN DATA" was prepared (Exhibit 3-10). For the nine sites that provided repair card data, the highest rate of activity for each defect item was found, as were the lowest and the average. These points were plotted along with the ELFUN data. The chart clearly demonstrates:

- A significant range from high to low (some items for some groups are programmatic, while the same item at another group is an exception)

- The average rate of activity is low for important items such as drive kits and heads (suggesting that there could be greater emphasis network-wide on head and drive kit replacement.)

Important to project objective: Yes
Relevant to repair options: Yes and no, repairs should be performed in the same way regardless of the option. The degree to which standardization can be achieved is the problem.

Exhibit 3-9

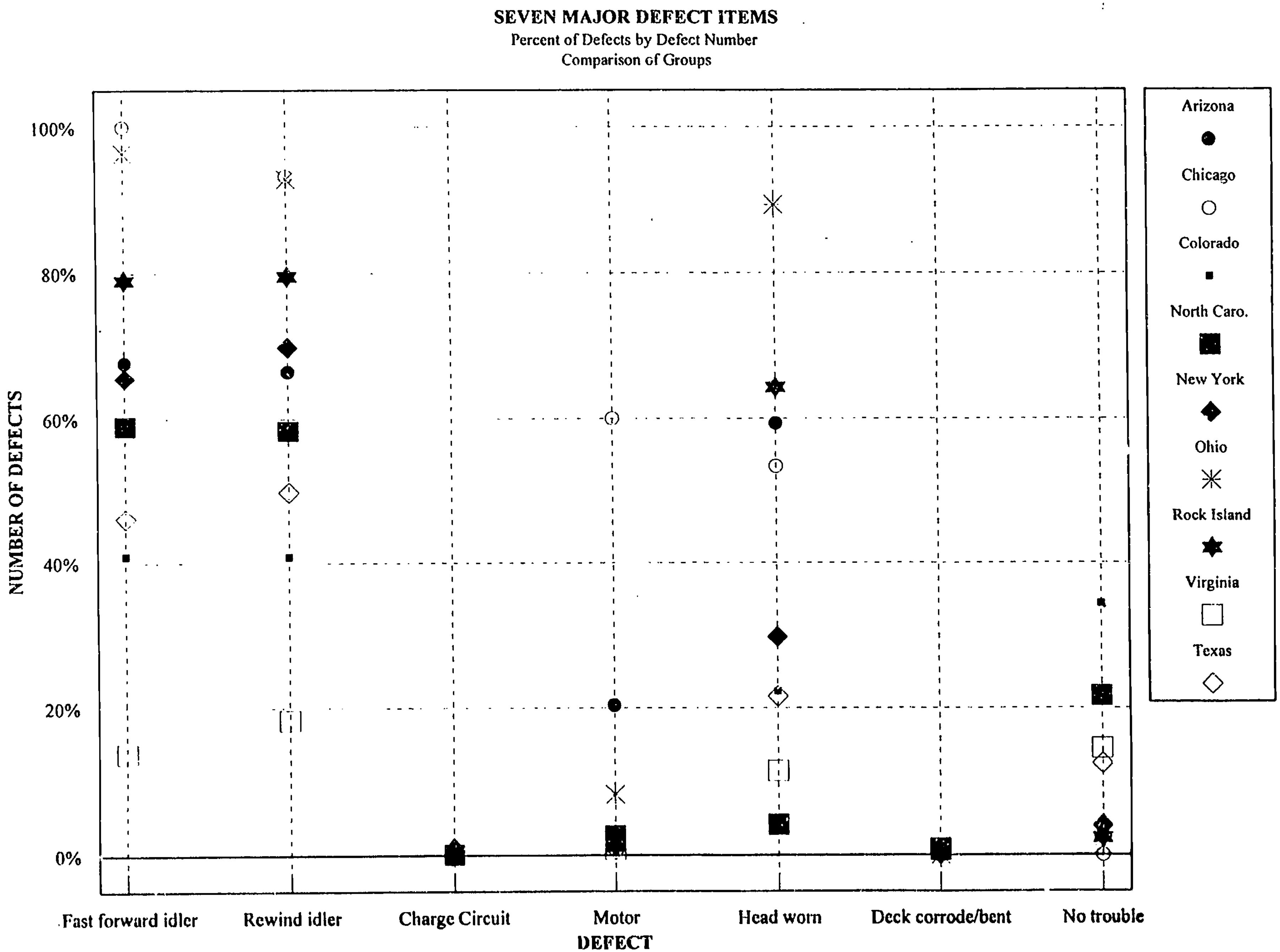
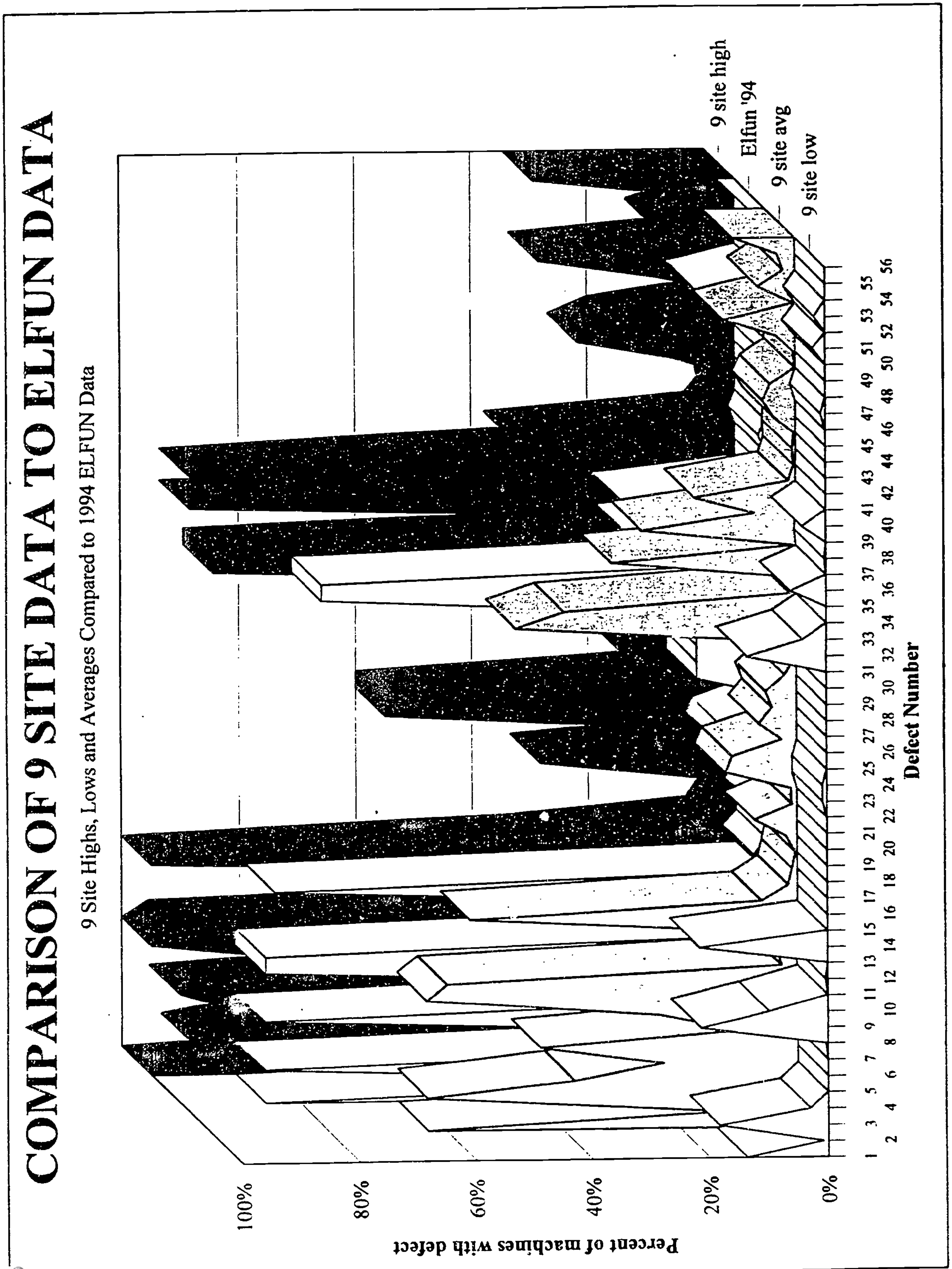

SEVEN MAJOR DEFECT ITEMS
Percent of Defects by Defect Number
Comparison of Groups
NUMBER OF DEFECTS
100%
80%
60%
40%
20%
0%
Fast forward idler
Rewind idler
Charge Circuit
Motor
Head worn
Deck corrode/bent
No trouble
DEFECT
Arizona
Chicago
Colorado
North Caro.
New York
Ohio
Rock Island
Virginia
Texas

Exhibit 3-10



COMPARISON OF 9 SITE DATA TO ELFUN DATA
9 Site Highs, Lows and Averages Compared to 1994 ELFUN Data
Percent of machines with defect
100%
80%
60%
40%
20%
0%
Defect Number
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56
9 site high
Elfun '94
9 site avg
9 site low

TOPIC: REPAIR

Problem 8: Unstandardized repair coding prevents compilation of national repair profile

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A diversity of repair codes are used by repairers of all types, i.e. warranty repairers, commercial non-warranty repairers, MLA in-house staff, and volunteer repairers. Repair codes used by the machine manufacturer for warranty repairs are shown in Appendix 2-16, and those for a large volunteer group in Appendix 2-17, which are both still different from Form 73-20. This lack of standardization of the way in which repairs are described makes the job of compiling an accurate national profile of repairs, both in-total and all non-warranty, difficult or impossible even given the staff-time to perform the data entry required.

Important to project objective: No
Relevant to repair option: Yes, because the central repair source could easily standardize repair reporting.

TOPIC: REPAIR

Problem 9: Communication and coordination with the repair groups is poor

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The study team found that communication, coordination, and organization between MLAs/SLAs, NLS and the repair groups was poor. We found this manifest in several ways:

- NLS did not have an up-to-date listing of groups
- No one knew how many groups existed
- Not all groups are provided feedback by the MLAs regarding their work
- The profile of the current volunteer effort does not provide a good foundation for communication and coordination

PROFILE OF VOLUNTEERS

Working with the NLS, the study team developed a profile of volunteer repair groups across the country. As of early January, 1995, the effort identified 174 groups, and these provided numerous pieces of information regarding their location, operating hours, points of contact, MLAs supported, etc., for use in subsequent analyses. Between late January and late February, 1995, an additional 114 groups were identified, for a grand total of 288 groups; this grand total represents the known universe of repair groups at the time of publication of this report. However, data is still being collected for the last 114 groups by the NLS, so the profiles presented on the following four pages are based upon the first 174 sites compiled (which is over a 60% sample).

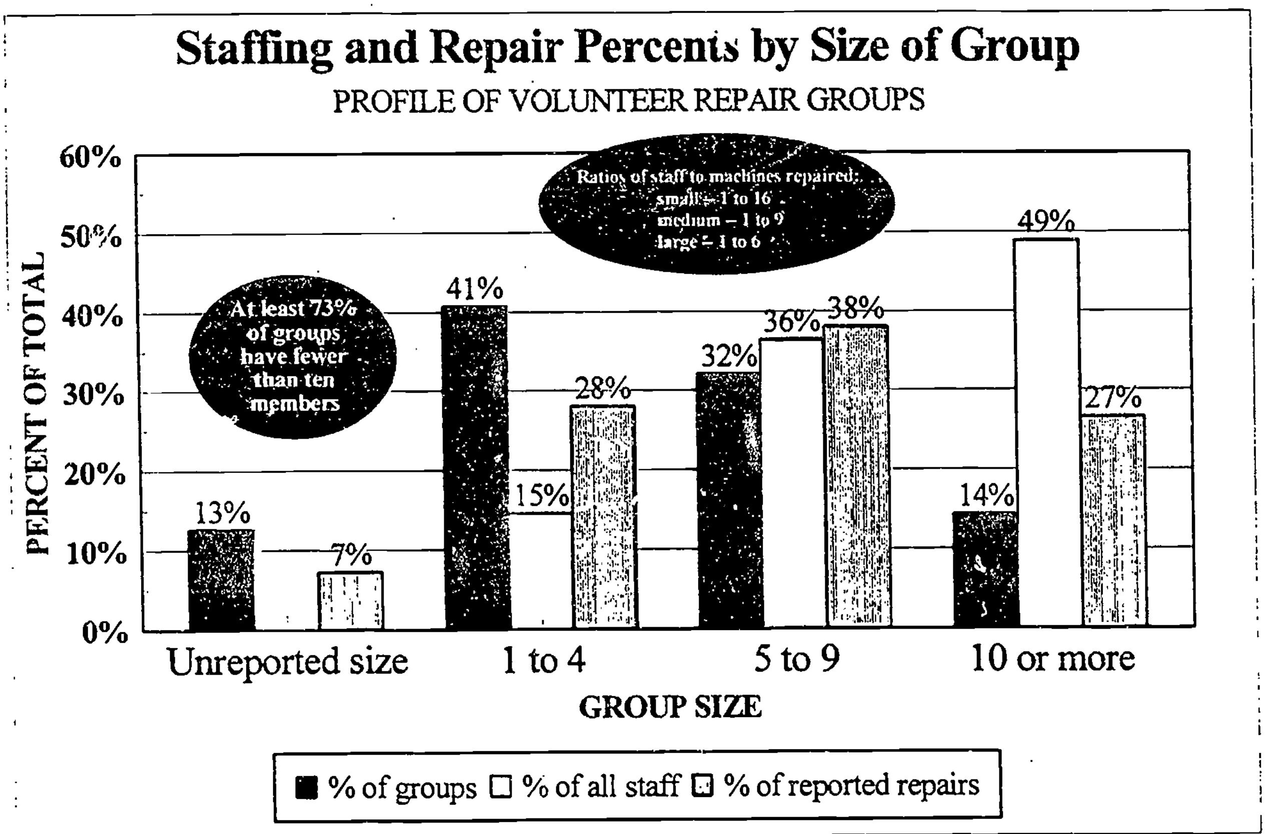
Group Size. Perhaps the most noteworthy piece of information coming from this profile is that most repair groups are very small. Only 14% of the groups report having ten or more technicians on their staff. Seventeen percent of the groups report having only one staff member (it's hard to leave a message when the entire workforce is away from its desk) and at least 73% of the groups have fewer than 10 members. The large (over ten members) groups have 49% of all volunteers repairing playback machines, but even this workforce is spread over 25 sites in 17 states. The national volunteer repair workforce is obviously greatly fragmented. Appendix 3-9 is a map that shows the location and staffing of the largest repair groups among the first 174 identified.

Repair Volumes. Groups with ten or more staff report performing the same number of CBM/TBM repairs as the smallest groups (1 to 4 members), while being about 1/3 as numerous. However, at least 66% of reported machine repair is performed by groups with less than ten members. Thus, the majority of repair work is widely distributed.

It is interesting to note that the ratio of staff to machines repaired favors the small groups. According to the data reported, small groups repair almost three times as many machines per person as do the large groups. On the surface this suggests that smaller groups are more efficient, but at least three other factors may also explain this fact. First, the larger groups have staff for quality control, parts ordering and shipping and receiving; these staff do not repair any machines. Second, the larger groups also support other causes and thus their staff time is not entirely dedicated to machines; whereas the one person operations are probably 100% NLS machine oriented. Third, the larger groups may spend more time rehabilitating machines, while the smaller groups merely fix the immediate problem.

The exhibit below summarizes the staffing and repair findings of the initial survey (i.e. the first 174 sites).

Exhibit 3-11



There is also other evidence to suggest that the repair capacity provided to the MLAs by volunteers varies. Appendix 2-8, cited earlier in the report, contains a profile of repairs delineated by both TP/non-TP repairs and by TBM/CBM repairs; as this exhibit shows, the absolute number of repairs performed ranges considerably across the network.

Appendix 3-10, Repairs per 1,000 Patrons, presents the number of CBM repairs performed per 1,000 patrons by MLA for FY92 sorted in ascending order for this statistic. This value ranges from a low of 66 to a high of 885, indicating a considerable variance in relative machine repair capacity (rather than need) among MLAs. Additionally, such variance cannot be explained by differences in relative circulation of books (which creates additional wear on machines, thus generating the need for relatively more repairs), which is also shown in this exhibit side-by-side with repairs per 1,000 patrons.

Repair Backlogs. Appendix 3-11, CBM Repairs by MLA, June 1993, contains an example of a management report used by the NLS to assess the relative status of repair backlogs at individual MLAs. The source data for the number of machine repairs are the annual reports submitted by MLAs, and the source data for the number of machines in repair are submitted by MLAs on MMRs. As this exhibit indicates, machine repair backlogs ranged from a low of zero months to a high of 27 months, which is indicative of repair capacity problems on a local, rather than a national basis (average national backlog was 2.33 months, or 10.0 weeks, which is not ideal, but is far from critical given the current system ... this figure is, of course, much larger than the target envisioned for future operations). However, because there is no formal mechanism to facilitate the transfer of machines requiring repair from MLAs with a deficiency of repair capacity to areas with surplus capacity, it can be concluded that repair capacity is a problem at some MLAs.

Operating Schedules. Another part of the profile was to determine when the volunteer groups meet and for how long. In aggregate, 76% of the groups meet for 1 or 2 days a week. Only 16% of the groups meet for four or more days each week. When meetings do occur, they are usually for less than a full day. Fifty percent of the groups meet for less than 6 hours at a time. This data suggests that the groups neither meet very often, nor for very long. The two exhibits on the following page graphically depict these findings.

Conclusions. Repair is highly diffuse. A large number of groups are performing repairs and are doing so on an irregular basis. This fragmented system is difficult to control. The repair capacity provided to some MLAs is inadequate. Communication and coordination are hampered. Standardizing repair practices will be difficult and relatively expensive (mailing flyers and bulletins, *per se*, will not improve things).

On the other hand, there is potential in the large groups. Their number, staffing and geographic location suggest the possibility for leaning on them for more effort. It would be less expensive to manage the activities of these fewer large groups than it would be all 288 groups.

Important to project objective: Yes
Relevant to repair options: Yes, not a problem under centralized and regionalized approaches where schedules and communications are more formal.

Exhibit 3-12

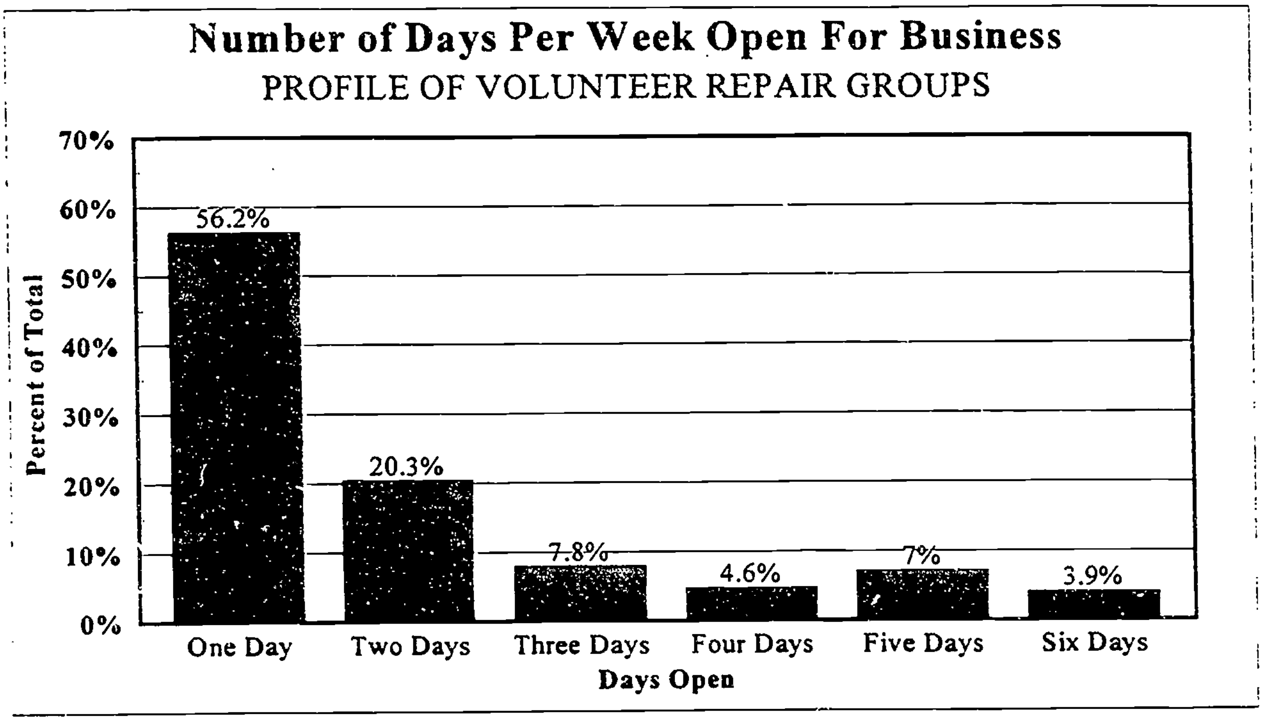
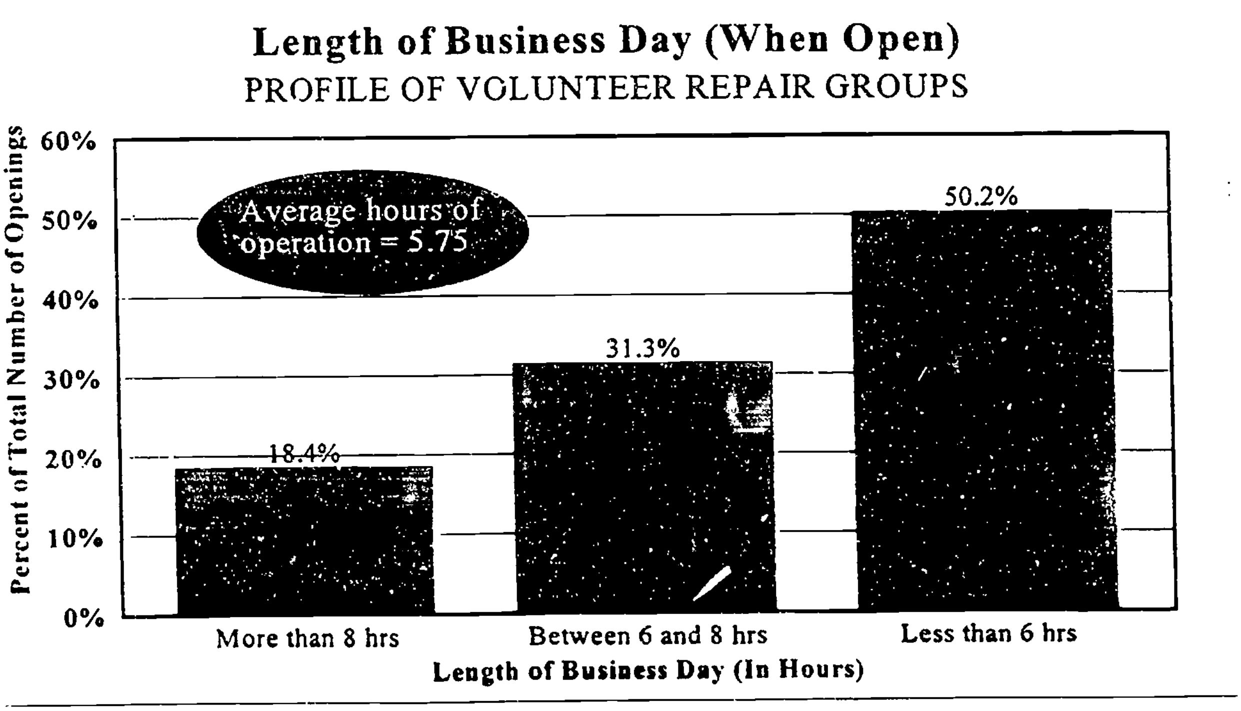


Exhibit 3-13



TOPIC: REPAIR

Problem 10: There are several problems with the administration of the warranty program

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The subject of warranty repairs has been discussed at length with the NLS prior to the generation of this report. The advantages of the warranty repair arrangement as currently structured are as follows:

- It motivates the manufacturer to build reliability into the product by having to warranty the work,
- It educates the manufacturer re. design and/or manufacturing defects, thus improving the product,
- It provides additional repair capacity to the network (approximately 3,000 repairs annually), and
- It provides NLS with information pertaining to required repairs on warranty machines (Ref. Appendix 2-16), thus facilitating more accurate parts forecasting.

The NLS views the costs of warranty repair as effectively consisting of three components: 1) costs for parts and labor involved in actual repairs; 2) costs for the collection of defect data and education of the manufacturer; and, 3) costs for the payment of an "insurance premium" to warranty all machines in a lot against defects that evade both manufacturer QA and NLS QC.

However, there are several cons regarding the current warranty arrangement with the manufacturer:

- The annual cost for warranty repairs is approximately $550,000 (45,000 machines x $12.50 per machine per 3-year warranty); given an annual average warranty repair workload of 2,877 C-1s repaired (most recent 5-year average), on face value the unit cost of a warranty repair is $191 per machine, which exceeds the purchase price of a new machine by approximately 12%.
- The total cost of commercial, non-warranty repair is unknown because the parts usage is unknown. However, the labor cost is $28/CBM repaired. Even if the parts consumption is twice that of the labor, which is a hypothetical assumption, this would yield a cost of $84/repair.
- The machine is of a very mature design, has been manufactured for the NLS by the same manufacturer for over a dozen years, and comprehensive QA and QC are performed on new production by the manufacturer and NLS, respectively.

- Using the warranty money for new machines would increase availability by approximately 3,200 new machines per year.

- A machine is out of service for an average of approximately 3 months when sent for warranty repair, which includes processing time for output and input at network agencies, mailing time to and from the repairer, "waiting time" at the repairer, and actual time in the repair pipeline at the repairer.

- Approximately 15 minutes of MLA staff time is required for processing inputs and outputs for warranty repairs.

- The utilization of the warranty repair option by MLAs is not universal, as evidenced by Appendix 2-12; some MLAs simply do not consider it worthwhile.

- The usefulness of the defect frequency data is questionable given the trend of the past 12 months, i.e. when unnecessary returns (no problem, battery, dead/low battery, dirty head) are factored out of this distribution, the majority of all defects are concentrated in the top two items (idler assembly and reel assembly).

Several other warranty related findings deserve mention, although they are not as important.

- The NLS requires all agencies that submit machines for warranty repairs to submit a copy of the warranty repair form to the NLS. However, no direct use of this copy of the form is made by the NLS, although the information on the forms (MLA/SLA, model, S/N, and symptoms) arrives indirectly via the manufacturer on the monthly electronic spreadsheet files containing data on warranty repairs performed during the period. Therefore, the submission of the copies by the network agencies is not required for both of the above reasons.

- The base period used in the frequency defect reports is too long; specifically, if statistics for all C-1s ever repaired are to be shown, so should statistics for the most recent 12 months. Figures for the latest 12 months are much more relevant for decision making.

- The number of machines repaired is not shown in the summary presentation of the frequency distribution (but is in the backups).

- MLAs send back too many machines that should not have been sent in for warranty repair, specifically low battery, no problem and dirty head defects that are not covered under the warranty; these units accounted for approximately 15% of all returns.

- There have been some, but few, reports from MLAs of non-return of machines submitted for warranty repairs. Other MLAs have cited periods longer than 3 months for the time a machine is out of service for warranty repairs.

- The manufacturer does not log-in receipts when actually received from the USPS, but rather when the repair process commences; this "waiting time" could be as little as two weeks, or as much as two or more months based upon statistics reported for the past year.

Important to project objective: Somewhat
Relevant to repair option: Yes, decisions regarding warranty actions can be centralized or perhaps even regionalized.

TOPIC: REPAIR

Problem 11: More data from the commercial repair source should be obtained

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Data pertaining to the repair profile of the NLS commercial repairer of standard CBMs, both in terms of consumption of repair parts and frequency distributions of machine defects, were requested both from the NLS and the contractor, but were never made available during the project (this generated the machine defect card mailing discussed elsewhere in this section.) However, the contract for the repairs requires the submission of such data by the contractor, and it is ostensibly submitted by the repairer. No reported use is being made of the data by the NLS equipment staff, if it is indeed submitted. Given the current situation previously described, the need to examine this data is all the more important in order to develop some type of national quantitative profile of non-warranty repairs. However, current commercial repair data will be skewed because the contractor is sent the oldest machines and those in most need of repair.

Important to project objective: No
Relevant to repair option: Yes, because the central repair source could be required to generate this.

TOPIC: REPAIR

Problem 12: The machines are hard to clean

Only one observation is made with regard to the design of the C-1 machine, design not being in the mainstream of the study. All MLA, volunteer, commercial and even manufacturer warranty repair staff wish the machines were easier to clean. Specifically, the exterior ribs, the bead connecting the top and bottom case, and the siides make cleaning a time-consuming job. It is noted that the rounded ribs on the newer C-1s have been welcomed by all repair personnel.

Important to project objective: Somewhat
Relevant to repair option: Centralized repair operation will utilize cleaning equipment

TOPIC: INVENTORY MANAGEMENT

Problem 13: The degree to which the inventory of machines is to be controlled is an open question

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Significant differences in opinion exist as to the level of control required to manage the machine inventory. There are also significantly different perspectives as to what inventory management means in this context. Is it just reconciling balances each month? Is it everyone knowing the exact location of every machine? Is it such a burden that its control objective is far outweighed by its administrative burden? What is the role of each component of the system?

The study team was provided the opportunity to attack the problem *carte blanche*. We examined each facet of the inventory management question from the ground-up with no strings attached. This effort resulted in the development of a complete set of functional requirements with well-stated goals. Section 4 of this report presents the results of this work.

Several specific inventory management problems are presented in the pages that follow.

Important to project objective: Yes, improved management of the inventory will greatly increase its availability.

Relevant to repair option: No, only the execution would change, the philosophy and goals would remain unchanged. The responsibilities of the two primary agents (NLS and the MLAs/SLAs) would remain unchanged regardless of the option.

TOPIC: INVENTORY MANAGEMENT

Problem 14: The disposition of the national inventory of machines and parts could be much more efficient

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MACHINES

The current allocation *modus operandi* is for the NLS to distribute new machines to the MLAs using a quota system based on reported readership. The MLAs may, in turn, further distribute them to SLAs. A fundamental constraint imposed upon the development of any recommendations in the project was that MLAs must possess inventories suitably sized for both walk-in and mail-order distribution to patrons in their service regions.

However, Appendix 3-12, Variation of Required Machine Inventory with Number of Sites, contains a calculation of the aggregate size of the required national inventory of CBMs in an on-hand status if the inventory were consolidated at one location; this analysis is shown for illustrative purposes only. This calculation assumes that the inventory on-hand consists of both machines available for issue, and machines in-repair, and that one-half the sum of this combined stock represents safety-stock, while one-half represents working stock.

As this appendix shows, the combined necessary inventory on-hand nationwide could theoretically be reduced from the FY93 level of approximately 65,300 machines to approximately 37,000 available machines if all stock were consolidated in one available location; this saving is one-time, and is possible because of the attenuation of random demand when such demand is pooled. It furthermore assumes that all other aspects of operations remain unchanged. However, although distributed inventories are inherently inefficient in this regard, the trade-off is a strong local service element provided by the MLAs. To reiterate, this calculation was performed only to illustrate the concept of the economies of inventory pooling; it is as true at the local level, i.e. MLAs to SLAs, as it is at the national level.

PARTS

As of August, 1993, the NLS listed 258 active locations to which repair parts were shipped by the NLS parts operation in Washington, D.C. Furthermore, an unknown number of redistributions of these parts shipments also takes place at the MLA (and possibly SLA) level. It is estimated that a minimum of 288 repair locations nationwide are performing repairs on NLS machines for network agencies; the exact number is still being refined.

Given the current value of volunteer labor directed towards the repair of defective machines, the distribution of parts to, and the storage of repair parts in, so many sites can be justified. Unfortunately, due to the lack of an automated inventory control system for repair parts distribution from the NLS to repair sites, a precise economic analysis could not be performed because parts consumption data by repair site is unavailable. It can be assumed that the value of the free labor currently provided exceeds the incremental costs of storing parts in so many locations, although this hypothesis cannot be rigorously accepted or rejected. The distribution to, and storage of parts in, so many locations is, *per se*, inherently inefficient in terms of both distribution workload (which is more line-item dependent than item quantity dependent) and inventory holding costs (which is greater for distributed inventories than for centralized inventories).

Appendix 3-13, Variation of Required Parts Inventory at Repair Sites with Number of Sites, shows the differences between scenarios wherein repairs are performed, and parts are stocked at, 400, 57 or one repair site(s). The calculations are based upon the "square root law", which states that the required safety stock at a consolidated site is equal to the average safety stock at a distributed site times the square-root of the number of sites to be theoretically consolidated.

This analysis yields a requirement of $2,000,000 in aggregate field inventory if performed at 400 sites, $1,377,000 if performed at 57 sites, and $1,050,000 if performed at one site (shown for illustrative purposes); these calculations are predicated upon both six-month safety stock and working stock targets at repair sites. Therefore, theoretical one-time savings of approximately $650,000 could be gained upon consolidation of repairs at 57 sites, and approximately $950,000 if performed at a single site (these savings can also be viewed as annual savings equal to a perpetuity of the one-time savings). However, as previously noted, distributed parts inventories facilitate volunteer repairs at these multiple sites that conceivably equate to the theoretical savings in only one annual period.

Important to project objective: Yes, pooling reduces the total number of machines and parts required to meet demand.

Relevant to repair options: Yes, parts will be stored at the repair locations under the regional and central approaches.

TOPIC: INVENTORY MANAGEMENT

Problem 15: The extent to which the ADP systems should control machine transactions is uncertain

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A key question that has existed throughout this study has been "what degree of accountability is required in order to maintain control of the CBMs/TBMs inventory". This same question applies to the ADP segment of this effort, i.e., what degree of accountability should the ADP systems possess in order to properly account for the machines. The ADP aspects of this question remain with or without the serial number issue.

For example, should the system be a "closed-loop concept" whereby every machine transaction opened/initiated must be required to have a corresponding closing/confirming transaction to complete the process, such as a financial accounting system (double entry). Or, should the system rather be "open-ended" whereby transactions are opened/initiated and there need not be a corresponding transaction to complete the action; the latter is currently the method being used by the network. It should be noted that a manual confirmation process does exist, and this process is accomplished on an "exception only" basis, i.e. no response from the initiating or gaining agency confirms/completes the transaction.

Based upon the BPHICS System Description Manual, BPHICS was defined as "an automated inventory accountability and reporting system". The BPHICS was originally designed as a "closed-loop" system that required an opening and closing transaction in order to confirm movement or verify acceptance of a machine transaction. Over the years, these control/edit checks have been turned off or inactivated so electronic confirmation would not be required. For example, transactions with an SM code (Sent from Manufacturer) required a corresponding RM code (Received from Manufacturer) to confirm receipt of the machine. The RM code is not currently being used, and SM codes are automatically converted to CO codes (Confirmation) during the BPHICS edit/update cycle. A list of the BPHICS codes is contained in Appendix 3-14, BPHICS Transaction & Status Codes. These modifications were ostensibly implemented to expedite the processing of machine transactions. It is noted that integrating Telex and Cintrex into the network would resolve many of the closed loop lapses. The repair centers are another matter - most of them are too small to be integrated into the ADP network.

BPHICS also has the capability to perform a data record reconciliation routine that matches/mismatches the MLA's machine records against the entire BPHICS master inventory. This routine produces a BPHICS Audit Report, Reconciliation and Match Results. A sample of this report is shown in Appendix 3-15. At present, this capability is only used when an MLA requests it. A few MLAs have requested this reconciliation report and found it beneficial to both the MLA and BPHICS.

Machines that become lost, stolen or location unknown are placed in a hold file named XX1. The purpose of this XX1 file is to place unknown machines in a hold status with the possibility that these machines may resurface in the future. There are no set policies, procedures, or plans for maintaining or controlling the growth of this file; the file simply continues to grow.

Whether the above situations have a significant impact upon tracking NLS machine-related data depends upon the degree of accountability the NLS requires of its automated network. As indicated above, the NLS has instituted conflicting levels of control throughout the network. This type of situation does not provide for clear direction to the agencies or BPHICS contractor when dealing with system accountability or recommending possible enhancements to the overall ADP process.

Important to project objective: Somewhat
Relevant to repair option: No, independent of repair option implemented

TOPIC: INVENTORY MANAGEMENT

Problem 16: Machines transferred from some MLAs to their SLAs are accounted for as "assigned"

When an MLA transfers a machine out of its inventory to that of an SLA, the transaction is sometimes counted as an assignment in the MLA's ADP system. This procedure has the effect of overstating demand activity because two assignment transactions will be recorded before a patron receives the machine. Additionally, this procedure understates the number of machines in working inventory status in the MMR report because some of the machines in the custody of the SLAs have not been assigned to patrons, and are rather assignable, or in repair, but are not being counted as such.

Important to project objective: Somewhat
Relevant to repair options: No

TOPIC: MANAGEMENT AND STRUCTURE

Problem 17: The current structure and organization for managing machines is fractured

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There are 57 MLAs, over 300 SLAs, a minimum of 288 known repair groups, two repair contractors, two MSCs, and the NLS involved in basically three functions: procurement, distribution and repair. The 600 plus organizations in this system, with the exception of the repair contractors and MSCs, participate "cooperatively" and/or "voluntarily." Discretionary power is exercised frequently and local *ad hoc* policy and decision making that has national impact is common. Control is diffuse so that the ability of any one organization or individual to impose their will, no matter how worthy and benign, on the entire system is severely restricted. Delivery of a nationally standard product and service to the patron is only a goal.

Thus noted, the study team recognizes that much of the current system stands as a given under the scope of this project (no recommendations regarding the fundamental MLA - patron relationship are made in this report.) However, it is our belief that the fractured nature of the current system should be recognized by the readers of this report.

Important to project objective: Very
Relevant to repair options: Yes

TOPIC: MANAGEMENT AND STRUCTURE

Problem 18: The level of machine service provided to the patrons by the MLAs/SLAs varies

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There is considerable variation among MLAs in the level of service they provide to patrons. Differences in the levels of machine-related services fall into three general categories:

- Differing fiscal and facility resources of network agencies, i.e. some are simply better financed and housed than others,
- Differing levels of emphasis (financial, managerial, attitudinal) on the machine portion of the program, i.e. equipment operations compete for staff-time with book circulation, outreach, radio programs, etc.,
- Differing levels of information support, particularly in the SLAs, and
- Differing volunteer resources of network agencies, i.e. some agencies simply have better access to, or make better use of, pools of volunteer labor than other agencies; in the case of equipment operations, volunteer repair capacity and quality is typically a critical component.

All four of the above factors determine the levels of service provided by a given agency to patrons of the program.

Important to project objective: Yes, but project constraints make it uncontrollable.
Relevant to repair option: Yes and no, improved repair will help, but some variation will always exist.

TOPIC: MANAGEMENT AND STRUCTURE

Problem 19: The activities of patrons are largely uncontrollable

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It is the study team's observation that the issue of retrieving machines from patrons has been exhaustively pursued by the network, and that there is no real solution to the "problem" of lost, stolen and location unknown machines; recommendations are made with regard to facilitating retrieval efforts, and with regard to the appropriate elapsed time period before write-off should occur, but neither are fundamental resolutions to the problem. There is a wide degree of client behavior that will be accepted by a network desirous of maintaining its patronage. Additionally, there are far too many patrons to practically provide them with any type of "personal" service. The value of a single machine constrains the options, and precludes face-to-face interaction, from a cost/benefit perspective.

However, the study team does believe that the follow-up letter process should be fully automated, and that the time period used by some MLAs for write-offs should be increased given the surprisingly high recovery rates. For example, the Utah regional library realizes a recovery rate of approximately 20%.

Important to project objective: Slightly
Relevant to repair options: No

TOPIC: MANAGEMENT AND STRUCTURE

Problem 20: The NLS repair parts operation lacks modern management techniques

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The study team observed that the NLS parts operation could benefit from the application of modern management techniques. The issues we observed centered around three primary areas:

- Automated systems support and decision making - An off-the-shelf inventory control program should be purchased, installed, and implemented at the NLS parts operation in Washington, DC, to both aid in procurement decisions, and to analyze parts consumption behavior to possibly gain new insights.

- Parts control and issue - Bar coding of bin locations should be employed to expedite distribution functions, as should pre-packaging of some items not currently stored and issued in this manner.

- Storage space costs - Consideration should be given to storing the inventory in less expensive facility space than in NLS headquarters.

Important to project objective: Somewhat
Relevant to repair option: Yes, the more centralized that the repairs become, the less NLS has to worry about parts.

TOPIC: MANAGEMENT AND STRUCTURE

Problem 21: Security of machines does not meet lending agreement requirements

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One basic requirement of the machine lending agreement between the NLS and an MLA (and an MLA and SLA) is the secure storage of equipment within the network agency, specifically with only personnel involved in distribution or repair of equipment having access to that equipment. In reality, the current situation of most MLAs/SLAs does not permit this and varies considerably, with some MLAs/SLAs not even having a dedicated machine manager.

The configuration and capacity of agency facilities also vary considerably, with some buildings having individual rooms that can be locked and whose access can be controlled, while others have none. One MLA visited took advantage of a room which they could lock and whose access could be limited to store new production receipts, while another MLA used such a room to bulk store machines needing repair. Ideally, the entire distribution area should be secured, not just the machine area; the dock area is particularly vulnerable to theft. However, the reality of the situation is that the predominant security (custody) problem is machines on assignment, not working inventory, and agency-level equipment security is currently not a problem with regard to attrition of machines.

Important to project objective: No
Relevant to repair options: No

TOPIC: AUTOMATION

Problem 22: The number of different ADP systems in the network results in communication and redundancy problems

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There are a variety of ADP systems in the network used for processing machine data. Approximately 37% of the MLAs are using the READS system, 24% are using DRA, 9% are using the Consortium of User Libraries, and 3% are using Keystone; these four systems support 73% of the network MLAs. The independents, i.e. the agencies operating their own system design, represent 17% of the total, with the remaining 10% using manual systems (Reference Appendix 2-22, Automated Systems at Agencies).

Since there are several different machine database structures operating in the NLS network, database incompatibility becomes a major issue when these systems attempt to transmit machine data to BPHICS. NLS has attempted to aid this process by providing the MLAs with NLSNET. However, in order for most MLAs to use NLSNET, they must first print the report from their system, verify that the information is correct, and then re-key the data into the NLSNET program. This data is then transmitted to BPHICS via a modem.

This process requires more effort than most MLAs have time to commit, resulting in 70% of the MLAs mailing their BPHICS transactions and 49% mailing their Monthly Machine Reports to BPHICS in paper form (Reference Appendix 2-18, Method of Reporting Machine Data by Agency Code). The mailing of these reports transfers the task of re-keying data from the MLAs to the BPHICS contractor. The re-keying of data in a network where approximately 90% of the data is already stored in an electronic data format is a significant unnecessary manual effort and, furthermore, increases the chance of error.

Although not all of the ADP systems in the network were examined, the degree of incompatibility when transmitting machine data to BPHICS may not be as vastly different as originally believed. READS users have a utility that converts their data to a BPHICS machine-readable format and copies the data to diskette. The BPHICS contractor has developed a routine that loads this data automatically, and this process would eliminate 37% of the data transfer problem if all of the READS users utilized the READS-BPHICS utility. Currently, 55% of the READS users submit data on diskette. DRA and the Consortium of User Libraries both operate in a DEC/VMS environment, and placing their machine data in a standard VMS machine language format would account for 33% of the MLAs. Approximately six of the 11 independent ADP system MLAs are operating in an IBM environment, which is the same or similar to the environment used by the BPHICS contractor.

There are currently five (i.e., MVS, DOS, VMS, UNIX, and AIX) different operating systems in the network, and a sixth will soon be added (ALPHA, for the DRA systems). Currently, the conversion of machine data into a BPHICS machine-readable format is performed under a decentralized approach; each MLA is responsible for converting their data or mailing the information to BPHICS.

MLAs and the NLS would be better served if data conversion occurred at a central location, for example, at the BPHICS contractor. How practical this application might be would depend upon the actual number of different systems that are operating in the network, and how many conversion routines that would have to be developed by the BPHICS contractor.

Important to project objective: Yes, potential solutions exist, but are limited due to constraints
Relevant to repair option: No

TOPIC: AUTOMATION

Problem 23: The NLS does not have a master ADP plan

During the site visits, many of the MLAs expressed an interest in wanting to expand/enhance the capability of their automated systems. One of the reasons for this interest was that many of the MLAs are experiencing resource reductions as a result of state budget cutbacks, and they are attempting to identify cost saving by increasing their automation capability. However, the MLAs were not sure what direction to take, being concerned that they may become even more disconnected or incompatible with the NLS network.

At present, the NLS does not have a published ADP Planning Document that would give the MLAs an indication of what direction the NLS is going in terms of planned future enhancements for the NLS network. Although most of the MLAs do not currently have their own automation plan, an NLS ADP Planning Document would provide the MLAs with a basic plan from which they could establish their own. Many of the MLAs have progressed or advanced on their own without any NLS direction, which has contributed to MLAs growing even further apart with regards to ADP system compatibility among themselves and with any NLS systems.

Important to project objective: No
Relevant to repair option: No

TOPIC: AUTOMATION

Problem 24: The machine custody data provided through BPHICS is not timely

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Regarding the handling of BPHICS transactions, if data is submitted on time, the processing cycle for updating the BPHICS master inventory and providing this information back to the agencies is somewhat long. For example, if December was the reporting month, the agencies would have to submit their data to BPHICS by the tenth of January. BPHICS takes approximately ten workdays to edit and process the transactions, and produce the final reports. Allowing five days for delivery of reports to the agencies places the documents in their hands by the last week in January. Many of the MLAs have a difficult time reconciling transactions that may have occurred in the first week of December against a document received two months later.

Important to project objective: Somewhat, from MLA perspective a problem, but not an inventory management problem at national level since BPHICS is custody only system
Relevant to repair option: No

TOPIC: DISTRIBUTION

Problem 25: Delivery of machines to patrons through the mail sometimes takes too long

Several of the MLAs visited cited recent problems with the delivery times of equipment mailed to patrons by the MLAs, and with the return times of defective equipment from the patrons to the MLAs. The pick-up, processing, transporting and delivery of free-matter is entirely handled by the USPS in the bulk mail system with a parcel post priority, and the specifics of this function are completely outside the control of NLS and the network, and outside the scope of this study. However, the following three observations are made with regard to the expediting of postal deliveries:

- Network agencies, MSCs, and repairers do not employ bar-coding of destination and return postal zip-codes, which the USPS is implementing and encouraging shippers to use, and which will expedite delivery of parcels relative to those not zip-coded via automated sorting processes;
- Some MLAs pre-sort machines (and other outgoing mail) by destination zip-code, while others do not; whether or not this is necessary, or will expedite parcel delivery, varies on a regional basis. Pre-sorting may conceivably improve delivery times in some MLA service areas where it is currently not being performed; MLAs must coordinate directly with their local USPS office to determine if such an effort is advantageous or not.
- Some MLAs use large, easy-to-read (for USPS purposes) MLA return address labels, while others do not.

Important to project objective: No
Relevant to repair option: No

TOPIC: DISTRIBUTION

Problem 26: There are several carton related problems

Although the design of CBMs and associated supplies was not in the mainstream of the project, the following findings are relevant to the extent that they impact, or may potentially impact, other functions and aspects of machine services.

The removal of a standard CBM machine from its packaging is somewhat cumbersome because of the top over bottom styrofoam inserts that completely envelope the unit within the carton. Granted that the existing packaging is properly designed to withstand shock and vibration loads during shipments, and that compatibility with existing carton size, and overall package size, is a consideration, some alternatives may at least be worth examining to simplify extraction by the patron.

The present styrofoam is easily breakable, requiring replacement. For example, the styrofoam of 9 of 48 returning machines at the Texas MLA had to be replaced.

Accessibility of the bar code, which should be on the front of the machine next to the name plate, is also an issue. This problem could be resolved with a 2-piece styrofoam end cap design.

The practice varies widely among MLAs with regard to the labeling of machine cartons, with a variety of pressure sensitive and card-stock labels used, serial numbers of machines handwritten on cartons and later scratched over, some using plastic label holders and others not.

Although not an immediate concern, the biodegradability of machine cartons and inserts may become a relevant issue sometime in the near future given current trends of public waste disposal requirements. Consideration of any packaging design alternative, or possibly "reusable" alternative, i.e. a long-lived mailing container of some type, would have to be weighed against higher cost. Also, the use of mailing containers is about once every 2 1/2 years, which is not much activity for a long-lived mailing container.

Important to project objective: No
Relevant to repair option: No

TOPIC: MISCELLANEOUS

Problem 27: Machine disposal operations have several shortcomings

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The following are shortcomings with respect to the current machine disposal function, most of which are attributable to the MLAs, but some to the NLS as well.

1. Batteries are not always removed by some MLAs, and machines arrive in Landover, Maryland and the Phoenix reclamation site with batteries that must be removed and separated for hazardous material disposal; an estimate of the magnitude of this problem is approximately 20%. This could be indicative of batteries not being removed for locally authorized machine disposal as well.

2. Some machines still eligible for warranty repair occasionally arrive for disposal in Landover, rather than being forwarded to the manufacturer (who will dispose of them, with NLS authorization, if they are truly beyond repair).

3. TBMs are often mailed in for disposal (an estimated 50% of those observed during the site visit) with no boxes, but simply with a label attached to them. The USPS will process them, but the cords from these machines, if not removed or securely tied down, can dangle and catch in the mail processing equipment to the ire of the USPS. Given the special relationship the USPS has to the program, this procedure is not at all advisable, i.e. TBMs should be shipped boxed.

4. Good packaging supplies (both cartons and styrofoam inserts) are used by some MLAs to ship machines to be disposed to Landover; these items are recovered by the NLS, but should never have been used by the MLAs (only old boxes should be used for this purpose).

5. The capability of network personnel to make cogent repair/scrap decisions varies, and NLS does not have information upon which to support or countermand the decision making process. As a result, some good machines are being disposed of, at Landover, and locally. However, the severity of this problem is unknown.

Across the network are individuals with a wide variety of talent and motivation making scrap or repair decisions, some who believe in the 2-hour rule, others who don't, some who would repair obsolete defective machines (although directed not to do so by NLS), and still others who would scrap machines immediately once declared obsolete (which MLAs also should not do until they becomes defective).

6. The disposal transactions are not verified by the NLS. That is to say, although the model/serial number information of machines shipped to Landover for disposal are reported to NLS for forwarding to BPHICS, the NLS does not record and report the model and serial

numbers of those machines actually physically received and disposed to BPHICS to verify the disposal transaction. Also, the study team witnessed MLA operations that retained possession of machines that had been "disposed." These were machines that had been completely processed in the ADP system, i.e. purged from both MLA and BPHICS net inventory, but not in the physical world, where they remained on shelves theoretically available to whomever, for whatever. The system of disposal needs to be tightened to eliminate this practice.

Important to project objective: Yes, could be meaningful percentage of annual production.
Relevant to repair options: Yes, under central and regional options, the source of repair would make scrap decisions.

TOPIC: MISCELLANEOUS

Problem 28: Machine operations should be supported with better documentation

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BPHICS

The BPHICS manuals were examined to gain an understanding of how BPHICS interfaces with all elements of machine operations. The BPHICS manuals consist of two volumes; Volume I, BPHICS Clerical Procedures Manual (Updated August 1990) and Volume II, BPHICS System Description Manual (Updated June 1992). As indicated by the revision dates of these manuals, these documents are outdated. How relevant these revision dates are depends upon the purpose of these documents.

It was assumed that the BPHICS Clerical Procedures Manual was designed for the NLS staff, and the BPHICS System Description Manual was developed for the contractor; there are no statements in these documents that confirm these assumptions one way or the other. The BPHICS documents mention the Monthly Machine Report (MMR), yet there is no correlation between BPHICS and the MMR. Both documents are produced independently of one another.

Additionally, both documents are constructed similarly and to some degree read verbatim, and both of these manuals are maintained by the BPHICS contractor. It should be noted that the contractor is in the process of updating these manuals; however, the revision was not completed in time for inclusion in this report.

MLA Manuals

MLA manuals were reviewed to gain an understanding of how procedures are promulgated to the MLAs by the NLS, and how well operations are documented at the MLA level. The MLA manuals referred to consist of the Machine-Lending Agency Inventory Procedures Manual (Updated June 1991) produced by the NLS, and ADP systems and procedures manuals at the MLAs.

As indicated by the revision date of the Machine-Lending Agency Inventory Procedures Manual, this document was outmoded, and some procedures in the manual were not currently being performed in the stated manner. For example, the manual requires that the Certificate of Mailing be annotated with the date a machine was received; at present, MLAs are circling the serial numbers of the machines not received. Machine delete transactions are currently a manual process only; however, the procedures manual does not indicate this restriction. It is not clear how this document is revised, updated or distributed to the MLAs.

In order to gain an understanding of the MLA ADP systems, the MLA's user and system manuals and the BPHICS manual were examined when available. During the site visits to the MLAs, one of the questions asked was "How would you rate your User and System documentation" on a scale of 1 to 10. No MLA rated their documentation higher than a 4, with the average rating being 2.6

among the sites. Four of the five sites questioned represented the four major software packages being used by the network, while the fifth site was an independent system.

The explanation given by the MLAs was that processing and maintaining the machine database has been a secondary priority in comparison to perfecting the patron and recorded book collection databases. Although the modules to handle the machine databases have been developed, or are in the process of being revised, the documentation supporting these modules has been generally insufficient.

There appears to be no established guidelines or procedures for updating or revising ADP system documentation in the network. This type of deficiency has hindered the process of defining and understanding the automation activities associated with processing machine-related data.

For most of the MLAs, the documentation was so detailed that it either confused the reader, or was difficult and time-consuming to find the answer to a specific question. Although a system should be explained in detail, it appeared that the user manuals were telling the user more than they really wanted to know. The format of the documents also appeared to be an obstacle; User Manuals should be kept concise, and more does not necessarily mean better.

Network Library Manual and Repair Manual

The only significant observation with regards to the Network Library Manual and Repair Manual is that they should be updated. For example, an obsolete machine allocation scheme is described in the library manual that has not been in use for several years. These and other outdated items should be replaced with correct information.

Important to project objective: No
Relevant to repair option: No

TOPIC: MISCELLANEOUS

Problem 29: Data reported to the NLS on the MMR is incomplete and inaccurate

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The NLS has an automated inventory accountability and reporting system used for controlling the assignment of machines to agencies in the NLS network. To control the machine inventory, the NLS has two primary sources of data available to them: the information stored in the BPHICS master inventory; and the Monthly Machine Report (MMR).

In order for this reporting system to meet its objectives, *all* of the agencies in the network must participate and submit *accurate* data in a *timely* manner. However, this is not being done for the MMR.

The BPHICS Monthly Machine Report Logs for FY94 were examined to determine a participation rate. As shown in Appendix 3-16, BPHICS Monthly Machine Report Log Recap, on average 89% of the agencies are submitting data to BPHICS in any given month, although in recent months, participation has increased to over 95%, on average. In examining an MMR, it was noted that some of the agencies submitting data were not submitting the current month, for example, 7/93 data submitted for the 9/93 reporting period. The BPHICS contractor was instructed by the NLS to place outdated data in the MMR as opposed to leaving the data for those MLAs blank for that reporting period. Each MLA section is rolled-up to a grand total recap page that should represent the total activity and machine status for that reporting period, but does not. Although the MMR provides a broad estimate of the machine inventory, this document does not meet its objective of being a management tool for accurately controlling the inventory. Activity data in this report is effectively not used by the NLS for inventory management, although inventory status data is used. With a 3-month inventory standard for the MLAs (which is too high, if what is meant by 3 months is 3 months of patron demand) only status data is required for macro-management of the network inventory.

Important to project objective: Yes
Relevant to repair option: No

TOPIC: MISCELLANEOUS

Problem 30: The MMR report and BPHICS do not reconcile

The study team found that there is a 63,000 machine (9%) variance between the MMR report and BPHICS (Ref. Appendix 3-17) for machine models tracked by both systems, and an additional 37,500 older machines in MLA inventory, still being tracked by the MMR reports, have been removed from the BPHICS master file. It is understood that the two sources of data involved at the national level of compilation are different, and that an absolute reconciliation between the MMR and BPHICS is neither plausible, nor necessary. However, an error of this order of magnitude is a significant impediment to understanding network activity and the deployment of the national inventory. Furthermore, although the data sources are different at the national level, the source data for both inputs at the local level are, hopefully, the same, i.e. transaction journal records. This raises further questions regarding the accuracy of data in some of the agency ADP systems, and/or in the accuracy of both data entry and data processing by the BPHICS contractor.

Important to project objective: Somewhat
Relevant to repair options: No

Section 4
Inventory Management & Other Recommendations

Section 4

INVENTORY MANAGEMENT AND OTHER RECOMMENDATIONS

This section of the report presents recommendations not specifically discussed under the three repair option scenarios: decentralization, regionalization, and centralization. Recommendations in this section have been organized into two areas: inventory management, and other recommendations that are not specific to the three options. Inventory management recommendations are formulated with the objectives, principles and procedures associated with managing the national supply of machines taken into account.

4.1 INVENTORY MANAGEMENT AND REPORTING

The NLS, MSCs and the lending agencies (MLAs and SLAs) maintain accountability and control of machines and accessories throughout the network. This section of the report first identifies the fundamental objectives and principles upon which accountability and control should be based. From these objectives and principles, operating procedures and guidelines have been recommended. These recommendations will provide the network with control and accountability, while streamlining reporting requirements for all participating network agencies. These recommendations will also provide the means of positioning the correct number and type of machines, at the right locations, at the right times.

4.1.1 Inventory Management Objectives

Based upon an analysis of equipment operations throughout the network, the following objectives have been identified:

1. *To ensure the availability of working machines to patrons.* This will be accomplished by;

- *seeing that MLAs have the proper number and types of machines in their inventories*

- *seeing that the correct number and types of new machines are manufactured to meet demand*

- *seeing that the inventories of machines in-repair and assignable (i.e. available) are in proper balance*

2. *To ensure that the custody control of cassette book machines, talking book machines, and accessories is based on prescribed NLS policy.*

3. *To define accountability and responsibility for nonexpendable inventory.*

4.1.2 Inventory Management Principles

Inventory management principles provide the fundamental guidelines concerning the item to be controlled. The following principles apply to audio playback equipment:

1. *TBMs, CBMs, and certain accessories are considered Nonexpendable Property. Nonexpendable Property are long-lived assets, not immediately consumed in use, that retain their original identity during use. The rules governing property accountability vary, but usually control increases with the value of the item.*

2. *Nonexpendable property requires formal accountability throughout the life of the item. To establish the item's life cycle, it should be aged. Therefore, TBMs, CBMs, and certain accessories should be aged, probably through identification of model type and/or serial number as necessary.*

3. *Product demand must be known to NLS both at the national and lending agency level.*

4. *Reporting must be conducted to ensure property control, or custody. Custody identifies the possessor of a specific item.*

5. *Reserves will be used to replenish supply levels. The status of reserves can either be "available (assignable)" or "in-repair", i.e. "unassigned."*

6. *The existing sources of ADP-based data will be used to the maximum extent possible. Any design will accept MLA formatted data and convert it. There will, however, need to be standards for record layout and content that the MLAs will need to adopt.*

4.1.3 Inventory Management System Components

Tracking inventory status and activity are the two basic requirements of any inventory management system. To satisfy these requirements, two components to the inventory management system are recommended. One component, the **Machine Inventory Management System (MIMS)**, has been conceptualized to track ongoing machine status and the changes in overall inventory levels between reporting dates. The second component, the **Custody Accounting System (CAS)**, has been conceptualized to identify the custodians of machines, but necessarily contains activity information as well that brings about changes in custody.

The design of these two inventory management components is presented in terms of functional requirements. The study team has not attempted to discuss how particular requirements should be implemented (which is a transition issue), but rather on defining functions that need to be fulfilled. For presentation purposes, the system requirements are also discussed as if none of the current systems exist. If the determination is made that the requirements should be implemented, then the applicability of existing ADP systems can be addressed. The reader will most likely note that some of the requirements are currently being fulfilled.

4.1.4 Machine Inventory Management System (MIMS)

The Machine Inventory Management System (MIMS) is intended to be a national-level inventory management system for ensuring machine availability to all network lending agencies and, in turn, patrons. The NLS will be the primary user, with other participants providing data input to the system (lending agency-level recommendations are included in Addendum A, Profile of the Typical MLA).

4.1.4.1 National-Level Inventory Management Database

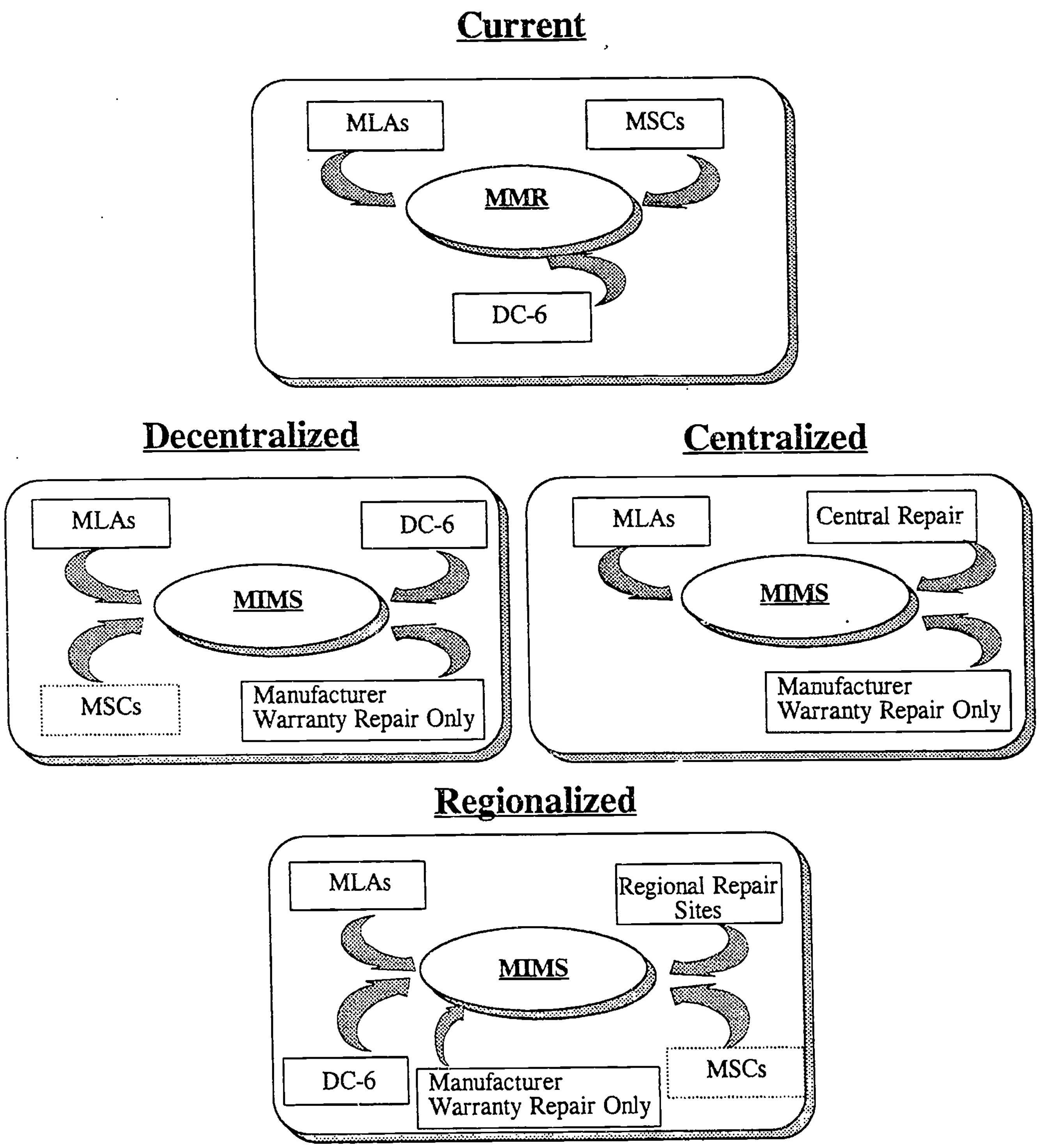
The individual agency inputs will be telecommunicated to the NLS, converted to a standard format and coding, and then automatically entered into the MIMS database. These data will be retained in the database for at least five years. We recommend that access to the MIMS database be restricted, so that executive inventory management decision making is not compromised.

The individual agency inputs will be utilized by the NLS for direct referral, and for producing a family of analytical reports that addresses all issues of machine availability requiring central monitoring and control. These deliberations will not ordinarily entail the printing of hardcopy reports, but a "what-if" inquiry capability will be needed.

Providing compatible data inputs to MIMS will be required for all MLAs, MSCs, machine manufacturers (for warranty), a central repairer, and regionalized volunteer repairers. All participants must have approved agency status, and the present qualification specification for the MLAs should be expanded to cover the minimum ADP support required of all parties. There must be: a standard chart of inventory accounts (or a way of converting different accounts to a single set); MIMS compatible file formats for data transmission; automatic preparation of periodic machine status reports; and telecommunication of these reports to the NLS. Exhibit 4-1 displays the MIMS concept in graphical form.

Exhibit 4-1

INVENTORY MANAGEMENT REQUIRED AGENCY STATUS REPORTING



MSCs Handles Only Specialty Machines (CT1, E1,etc.)

4.1.4.2 Inventory Status Reporting

A periodic inventory status report must be prepared by all agencies, to provide the data needed for inventory management analysis and decision making by the NLS. The status report will be totally independent of the current BPHICS system, and will replace the present Monthly Machine Report (MMR) in its entirety.

The reports will depict inventory status as of the close of business on the last day of the calendar month. A report will always be prepared as of March 31 and September 30, but not necessarily at the end of every other calendar month after the first full year of operation.

All source data for reporting inventory status will reside in the agency machine records, and no reporting of receipts, recoveries, inter-agency transfers, disposals or write-offs will be required. The report will also exclude all inter-agency in-transit inventory, as there will be no corresponding entries in agency machine records. These exclusions will greatly simplify the automation of report preparation by the agencies, and will have little if any adverse effect on executive decision making. Exhibit 4-2 provides a comparison of the MIMS versus the MMR.

A tabulation of the inventory status codes now utilized by the four multi-agency ADP systems is shown in Appendix 2-25. In short, most of the codes that are needed to classify the inventory, and to prepare the status report, are now available. However, we have found that some changes in nomenclature, and in definition of accounts, will be needed to insure the compatibility of status reporting. (Alternatively, MIMS could be designed to convert other codes to its own, the only requirement being that the different codes must have a one-to-one relationship).

The inventory status report will also contain as an adjunct, for the decentralized and regionalized repair options, the committed repair capacity of each reporting agency. This information will be utilized by the NLS in managing the inventory of machines in repair, regardless of which of these two repair options is eventually implemented.

Exhibit 4-2

Comparison of MIMS and the MMR

MIMS (Proposed)	MMR (Current)
1. By Type (CBM/TBM) (Same as MMR #1)	1. By Type (CBM/TBM)
2. By Model (Same as MMR #2)	2. By Model
3. Age Year	3. Agency Code
4. Agency Code (Same as MMR #3)	4. Last Month Total Inventory
5. Agency Name	5. Qty Rec'd from Producer
6. Total Prior Report (Same as MMR #4)	6. Qty Rec'd from MSC/NLS
7. Total This Report (Same as MMR #11)	7. Transfers In
8. Net Change	8. Transfers Out
9. Total Assigned (Same as MMR #13)	9. Damaged/Obsolete
10. Total Available (Same as MMR #12 & #14)	10. L/S/U
11. Assignable (Same as MMR #12)	11. Total Inventory
12. Repairable (Same as MMR #14)	12. Available for Assignment
13. Repair Capacity	13. Machines Assigned
14. Patron Active (Optional)	14. In Repair
15. Recall (Optional)	15. Net Inventory

4.1.4.3 Proposed Status Report Format

The proposed format of the agency machine inventory status report is presented in Exhibit 4-3, and the narrative descriptions that follow are referenced to the fields designated in the report.

Machine Model and Year of Manufacture (1) and (2). There will be a separate subheading for each machine model (TBM, CT-1, CBM (i.e. "standard" CBMs), E-1), and separate subtotals will be drawn for each model (1). A separate report could also be prepared for serially numbered accessories. Separate entries should be made for each year of manufacture (2), but no reporting of individual serial numbers is required.

To stratify the inventory, the blocks of serial numbers assigned to each year's production should be incorporated into the agency database. One possible way that this can be accomplished is by replacing the -1 in the present A- and C- prefixes with a 2-digit year of manufacture (Exhibit 4-4), thus producing a serial number compatible with the prefix coding used for older machines. While a 9-digit data field is shown, it should be noted that there is a 10-digit machine ID field in READS.

Exhibit 4-4

POSSIBLE CONVERSION OF SERIAL NUMBER DATA FIELDS TO REFLECT MACHINE AGE

Machine Model	Prefix	Serial No. Range
	1 2 3	4 5 6 7 8 9
C-80 and prior	C 80	N/A
C-1 in 1990	C 90	123456-173456
C-1 in 1991	C 91	173457-223456

Exhibit 4-5

MACHINE AVAILABILITY ANALYSIS
(Date)

Model	Agency Code	Agency Name	Assigned	Rank	Unassigned	Standard	Var. from STD	Avail.	In-Repair	Weeks Supply	Rank	Avg. Age
(1)	(2)	(3)	(4)	(4A)	(5)	(6)	(7)	(8)	(9)	(10)	(10A)	(11)
											1 2 3 4 5 etc	
(12)	Total Machines											
(13)	Average Age (Yrs)											

The year of manufacture could be either the calendar or fiscal year.

These stratified inventory figures will be utilized to calculate the average age of machines in each agency and the network *in toto*. The NLS will then use this information to equalize the average age of machines in all lending agencies, and to formalize and implement a coherent national program to obsolete and terminate the oldest machines. Although the BPHICS database can be used for this purpose rather than MLA ADP systems, the completeness and accuracy of BPHICS is a limiting factor.

Agency Code and Name (3) and (4). The agency code and name will identify the reporting agency in the central database.

Total Prior Report (5). There was a cumulative activity-based discrepancy of 5,971 CBMs, and 13,911 TBMs in the year-end balances of the national MMR report for FY94. The machine counts in (5) have therefore been introduced to insure the integrity of period-to-period reporting. The reported figures must always be identical to the machine counts reported in (6) of the previous status report. Both the agency, and the NLS ADP systems, should be programmed to make this matchup.

Total This Report (6). These entries represent the total number of machines in agency custody as recorded in the inventory record, including machines issued to patrons-of-record. These patrons-of-record will include the agency proper and off-site repair facilities (in the decentralized option, whereas regional and central repair facilities will be reporting agencies in the other two scenarios). The totals reported in (6) must always equal the sum of the machine counts entered in (8) and (9) of the status report.

Net Change (7). These calculated data provide a glimpse of the net changes in agency custody that have occurred since the previous reporting date, for whatever reasons, and can be either plus or minus. The entries should be calculated by subtracting the machine counts in (5) from the machine counts in (6), rather than by summing the individual inventory transactions involved, i.e. the calculation is based upon the change in status between two reporting dates, and not by the accumulation of transactions.

Total Assigned Machines (8). The number of machines assigned to patrons will be reported only by the MLAs, as no other agencies will have this assignment authority. *These reported figures will be the most current, most accurate, and most readily obtainable numerator of patron demand, and will be the keystone of informed inventory management decision making in the MIMS system.*

Total Unassigned Machines (9). We propose that the definition of unassigned machines include machines available and in need of repair, as all machines will be promptly triaged, repaired or replaced and returned to service within three-to-five weeks under all repair options.

These reported figures will be the most current, most accurate and most readily obtainable numerator of the pool of machines available to fulfill patron demand. Strategic utilization of this limited resource is the principal mission of centralized inventory management.

Both available and in-repair machines will be reported by all agencies, but their monitoring by the NLS will be decidedly different. Separate figures will, therefore, be reported for available and in-repair machines, as described below.

Available Machines (10). A machine with a condition status of available, can be immediately assigned to a patron, provided the machine is in an MLA. However, these machines will be in the custody of other agencies as well, such as a centralized disposal site, regional repair centers, the manufacturer (for warranty repairs, if there is any accumulation of these machines), or a central depository/repair center. These machines must be directed to the locations where they are most needed, so that every MLA has its full allotment of working inventory. Making these distributions is a primary responsibility of the NLS.

In-Repair Machines (11). A machine with a condition status of in-repair can be assigned to a patron once the machine is repaired. However, there will be few, if any, machines in-repair in the MLAs under the regionalized and centralized repair options (as they will leave the lending agency net inventory for repair).

To monitor the repair backlog of all reporting agencies, the NLS must first know the repair capacity of each agency. This information will be provided by the agencies in (12) of the status report.

Machine Repair Capacity (12). This field in the status report will contain the committed repair capacity of the agency, exclusive of triage, and will be expressed as the number of machines that can be repaired per month, based upon an annual average. This entry will appear on the line designated Age Year 1 and on line (13) of the report.

Only the lending agencies will report repair capacity under the decentralized repair option, and this capacity will include all in-house and volunteer repair facilities utilized, plus the *pro rata* capacity of all repair facilities serving more than one agency. Only authorized repair centers will report repair capacity under the regionalized repair option, and only the central depository/repair center will report repair capacity under the centralized repair option.

Total Machines (13) and Average Age (14). Lines (13) and (14) of the report will summarize the number of machines, and the average age of machines, in each inventory category. These summary figures will be utilized in all inventory analysis and decision making where the year of manufacture is not relevant.

4.1.4.4 Inventory Analysis and Control

The following analytical reports are recommended for use by the NLS. The reports can be generated solely from data provided in the agency status reports. To initiate the preparation of a report, the NLS should be able to query for:

- Type of report requested;
- Code of the agency, or agencies, to be reported. The code "all" should be used if all agencies are to be included;
- The machine model to be reported...the code "all" should be used if all models are to be included;
- Most recent month to be reported; and,
- Number of months to be reported...the system will be programmed to reject the entry if there is no report on file for the oldest month requested.

A full summary of all status data will be displayed if the requested number of months is 1. Only the net changes in inventory status will be reported if the number of months requested is >1.

4.1.4.5 Machine Aging Analysis

These reports will give the NLS an age-related perspective of inventory deployment throughout the network, and can best be used in making year-to-year macro-comparisons. The aging analysis should, therefore, be made at the end of each fiscal year, for fiscal reporting, and as of March 31 for production planning and budgeting use. There should be a summary analysis for all machine models, as well as an analysis for each model. Bar graphs comparing actuals to standards should be automatically generated to assist in decision making.

Summary Report for All Models. The format of this report is similar to that of the proposed agency status report (Exhibit 4-3).

Period-to-period comparisons will then tell the NLS how greatly the number of assigned and available machines has changed, whether the average age of machines on assignment is increasing or decreasing, and how many machines could possibly be terminated solely because of age. In addition to aiding in short-term inventory management, such information will be of strategic importance in long-range planning and budgeting for new machine production.

Summary Report by Model. The format of this analytical report is identical to that of the summary aging report for all models, except that the report will be model-specific. Informed decisions can then be made on the number of machines to terminate, and the database can be queried to find out what agencies have the machines and how many they have. Under the centralized repair option, substantially all of the machines to be terminated will be in depository storage.

4.1.4.6 Machine Availability Analysis

This spreadsheet will be prepared every reporting date, and its purpose is to identify those lending agencies having a shortfall or surplus of working inventory, so that action can be taken to redistribute machines more equitably throughout the network. The machine availability analysis is prepared from the column totals on the individual agency status reports, and the availability standard for each MLA is calculated each time a report is prepared. The proposed spreadsheet format is shown in Exhibit 4-5, and supporting bar charts are shown in Exhibit 4-6.

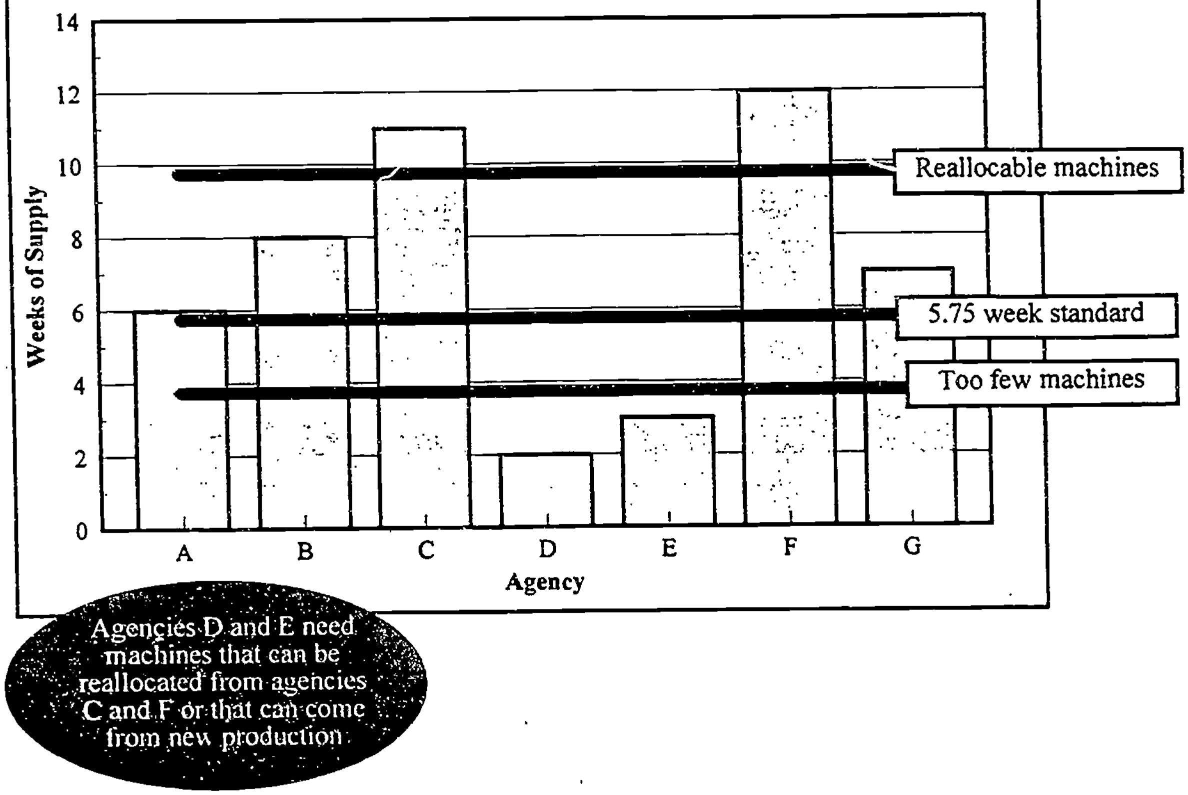
Exhibit 4-5

MACHINE AVAILABILITY ANALYSIS
(Date)

Model	Agency Code	Agency Name	Assigned	Rank	Unassigned	Standard	Var. from STD	Avail.	In-Repair	Weeks Supply	Rank	Avg. Age
(1)	(2)	(3)	(4)	(4A)	(5)	(6)	(7)	(8)	(9)	(10)	(10A)	(11)
											1 2 3 4 5 etc	
(12)	Total Machines											
(13)	Average Age (Yrs)											

Exhibit 4-6

Sample Decision Support Bar Chart



The working inventory standard used in making these determinations is in terms of pure patron demand (as earlier noted in Section 3, this target is more than the currently specified three months supply on hand agency storage requirement, if supply is considered to be either the quantity of machines repaired or produced). Agencies other than MLAs/SLAs, having no machine assignment responsibilities, will not be rated, but their inventory of machines must be included in the report.

Machine Allocations to the MLAs. Inventory adjustments required to balance an over/under supply of machines in specific MLAs will vary by repair option, but after an initial period of re-stabilization, it should seldom be necessary to transfer machines between MLAs. These allocations by the NLS will be based solely on the need for machines by MLAs with an under-supply of working inventory. *It is recommended that the present quota system of new CBM machine allocation, which is based on estimates of the readership in each MLA, independent of need, should* *no longer be used and should be replaced with this needs-based system.* A machine allocation will be made at the end of each reporting period, and once-per-year allocation of machine production should be abandoned. It is noted that the NLS, and some agencies, recognize the practicality of such a recommendation, and are also legitimately concerned with "rewarding MLAs that are not shouldering their share of machine repairs". A logical compromise would be to constitute such "make-up" adjustments as combinations of some new production and some older machines from agencies with free inventory.

4.1.4.7 Machine Repair Backlog Analysis

This report will be prepared every reporting date for each machine model. Its purpose is to identify those agencies having a larger than acceptable backlog of machines in repair, so that remedial action can be taken. The backlog standard used in making these determinations will vary by repair option, as described below.

> **Decentralized Repair** - A 3-to-5 week backlog will be the standard (including repair and transit times). This proposed backlog standard assumes that all machine repair is done off premises, whereas MLAs with on-site repair should operate with only a 1-week backlog.
>
> **Regionalized Repair** - The backlog standard should be a 2-week supply since machines will be exchanged on a one-for-one basis. It should be noted that there will be no record in MIMS of the number of machines in-transit to or from a regionalized repair facility.
>
> **Centralized Repair** - The backlog standard for centralized repair should also be a 2-week supply. However, under the contemplated mode of operation, the central depository/repair facility will store all the free inventory of the oldest repairable machines, and repair these machines only if needed. This repairable backlog could be as much as a 6-month supply, or 40,000 machines.

The repair backlog analysis is prepared from the column totals on the individual agency reports, and the backlog standard for each MLA is re-calculated each time a report is prepared.

The recommended report format is shown in Exhibit 4-7. Armed with this repair backlog and repair capacity information, the NLS can instruct the agencies or repair facilities having chronic excessive backlogs to ship the overflow to repair facilities having surplus capacity. Concurrently, the NLS should also instruct such repair facilities to re-examine their repair capacity commitments.

4.1.4.8 Production Requirements Planning

Keeping national inventory levels within manageable bounds is a primary NLS responsibility. These inventories are depleted by the demands of new patrons and by attrition within the system (both disposals and write-offs), but are replenished only by new production. Influencing the number of machines of each model to be produced, and when they will be produced, is therefore the only effective way that the NLS can manage the aggregate level of the national inventory.

To this end, we recommend that a semi-annual machine requirements forecast be prepared by the NLS. There should be one forecast as of March 31 for production planning and budgeting use, and a second as of September 30 for fiscal reporting and as an interim checkpoint.

A recommended report for making the required deliberations is shown in Exhibit 4-8, and the narrative descriptions that follow are referenced to the numbered headings. This 12-month history will be utilized in making the forecast. It could be generated by the system, or prepared manually.

Machine Model (1). The four basic types (i.e. CT-1, E-1, CBMs and TBMs) of audio equipment are competitive in some ways, which complicates the forecasting process. A separate forecast must, therefore, be prepared for each model, and for all models as a whole.

Exhibit 4-7

MACHINE REPAIR BACKLOG ANALYSIS
(Date)

Model	Agency Code	Agency Name	Assigned Machines	Rank	Machines In-Repair	Backlog Standard	Variation from STD	Weeks Supply	Rank	Repair Capacity
(1)	(2)	(3)	(4)	(4A)	(5)	(6)	(7)	(8)	(8A)	(9)
									1 2 3 4 5 etc	
(13)	Total Machines									
(14)	Average Age									

245

246

Exhibit 4-8

PRODUCTION REQUIREMENTS PLANNING WORKSHEET (Date) TO (Date)					
Machine Model	Net Inventory Change (12-Months)	Past 12 Months Production	Adjusted Net Inventory Change	Ending Free Inventory	Years Supply
(1)	(2)	(3)	(4)	(5)	(6)
TBM CT-1 C-1, etc. E-1					
Total					

Net Inventory Change (2). These entries represent the cumulative change in overall inventory levels in the preceding 12 months, and can be obtained from the totals in (7) of the aging analyses.

Past Production (3). The number of machines produced in the preceding 12 months.

Adjusted Net Inventory Change (4). These figures are derived by subtracting the entries in column (3) from those of column (2), and represent the net change in inventory, exclusive of new production. The NLS at this stage must make a decision as to whether these net changes are to its liking.

Free Inventory (5) and Years Supply (6). The amount of free inventory (i.e. excess working inventory) as of the reporting date is available from (7) of the machine availability analysis, and the number of years supply is obtained by dividing (5) by the absolute value of (4). This ratio shows how fast free inventory is increasing or declining, independent of production. From these figures, the NLS can make informed decisions as to whether planned production quantities should be adjusted. Any proposed changes will then be presented to top management for consideration.

4.1.5 Custody Accounting System (CAS)

The purpose of the Custody Accounting System (CAS) will be to maintain up-to-date machine custody information. The CAS will be structured to accept detailed machine transaction data to include model and serial number. Model and serial number, together, will provide the unique identifier for each inventory item. This custody process will satisfy the previously stated principle of accounting for nonexpendable items throughout their life cycle.

CAS, in theory, would be similar to the current BPHICS process. The fundamental difference would be that there would only be two transaction types, Transfer-In and Transfer-Out. Activity would be recorded by moving (transferring) machines in and out of agencies. This would mean that, besides the current lending agency codes, i.e., KY9, PA8, XX1, etc., codes would be established for all manufacturers, repair agencies (except for the decentralized repair scenario), and disposal that could be coded "DEL". This concept of custody accounting is already being used for the XX1 account.

4.1.5.1 Activity (Transaction) Tracking

The CAS must track all machines in the network. Tracking machines at the model and serial number level, by activity, provides the NLS with information concerning the life-cycle of a particular machine or machine model. Besides determining current custody, this information will allow the NLS to determine machine attrition. Information from the custody account may also be used to help with new machine production planning.

To obtain this information, all machines in agency custody would have to be tracked, including those machines currently categorized as "Obsolete". Although these machines are currently considered deleted from the BPHICS inventory, patrons continue to use these machines and, theoretically, these machines can be used to meet demand. NLS policy states that "Obsolete" machines that are working may be issued to patrons, but should be scrapped if broken. There simply must be 100% accountability for custody tracking to accomplish its objectives.

The custody system must use offsetting transactions (closed-loop processing) to assure the accuracy of the account. This means that two transactions must be submitted to complete an action, one from the losing agency (transfer out) and one from the gaining agency (transfer in).

BPHICS was originally designed with some degree of closed-loop processing. However, a large increase in the number of outstanding transactions forced the NLS to develop overrides in the BPHICS design. The potential for out-of-control growth in outstanding transaction files is great; nevertheless, guidelines and controls must be established in a closed-loop process to prevent this situation from occurring. Close monitoring of this growth, together with educating the users internal (contractor) and external (agencies) to the workings of the system, will help in reducing the extent of this problem. Recommended reports formulated to address this situation are discussed in the CAS Management Reports section.

Offsetting transaction processing would ensure accurate record-keeping. Under BPHICS, certain types of transactions are automatically updated if there is no response after 60 days; this type of processing cannot exist in an accounting system. Without detailed accountability, tracking by model and serial number cannot be recommended. The accuracy of the database would be suspect, as it is now with the BPHICS system.

4.1.5.2 Agency Reporting

All machine activity would have to be reported to CAS in order to update machine custody data. Machine custody will be defined as the possession of a machine by an agency (or a patron of the agency, or a decentralized repair group of the agency). An agency would be any facility, or CAS account (i.e., XX1, DEL), having physical or reporting control of a machine. This would include MLAs, manufacturers, MSCs, disposal activities, regional or centralized repair agencies, and the XX1 account. For a patron, the servicing MLA would be the reporting agency. The XX1 account would be considered as effectively having reporting control of machines listed therein.

Depending upon which repair scenario is eventually implemented, repair agencies may or may not be a custody point. All agencies having custody of machines would be responsible for reporting activity data to a central custody account. Exhibit 4-9, Inventory Management Required Agency Custody Reporting, shows what agencies would be required to report information under the three repair scenarios.

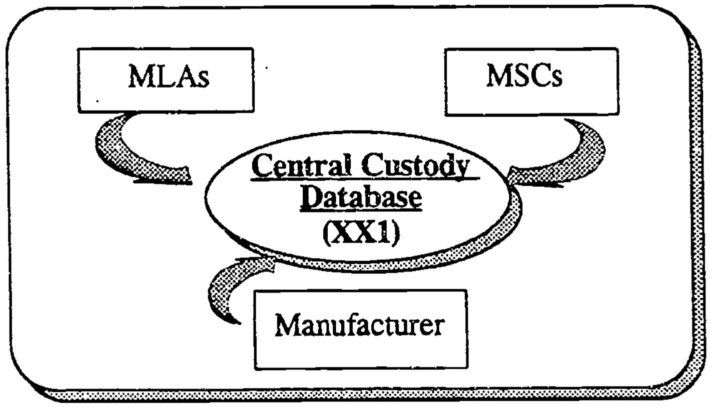
Under the CAS, the number of transactions processed would increase considerably in comparison to the current BPHICS number of transactions (Reference Appendix 2-35, BPHICS Transactions Reported by Agency). The actual extent of the increase would vary depending upon the repair model implemented (Reference Exhibit A-1).

With this volume of transactions, a long-range goal of the CAS would be a totally automated process of electronic transfer of transactions back and forth between lending agencies and the CAS, where practical. Meanwhile, agencies would continue to submit transactions as they normally do under the BPHICS process; all changes or modifications would be designed into the CAS. New users to the CAS, specifically the manufacturers, central or regional repair groups, would adopt an application designed by the NLS, possibly a modified version of the READS machine module.

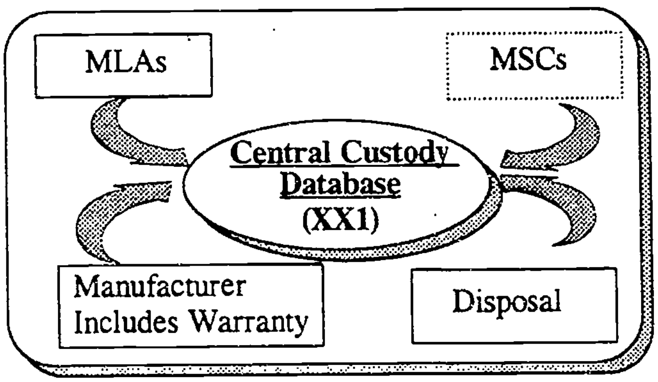
Exhibit 4-9

INVENTORY MANAGEMENT REQUIRED AGENCY CUSTODY REPORTING

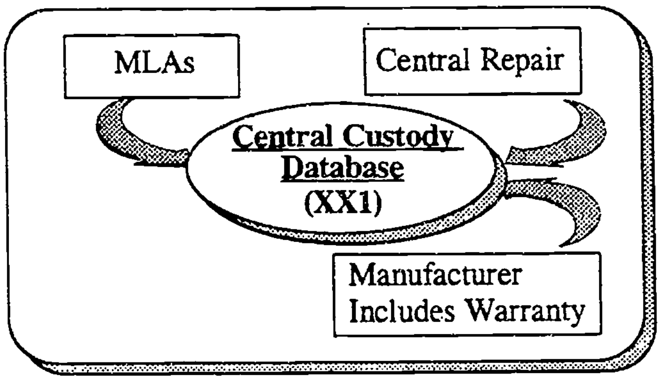
Current



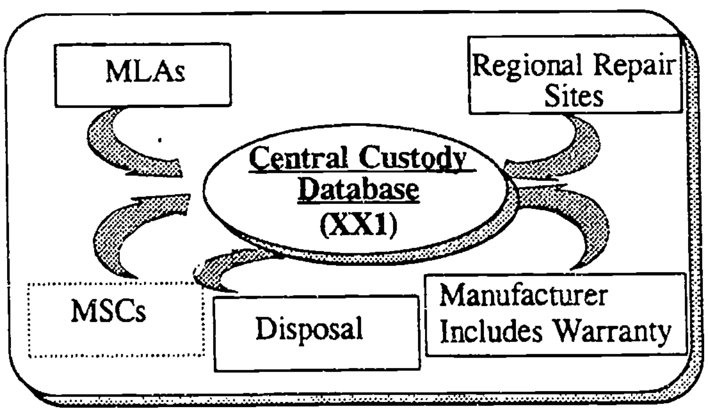
Decentralized



Centralized



Regionalized



MSCs Handles Only Specialty Machines (CT1, E1,etc.)

(XX1) - internal to the accounting system.

4.1.5.3 Activity (Transaction) Reporting

The activity reporting would be prepared monthly, and would show inventory activity as of the last day for that reporting period. A report would always have to be produced at the end of the fiscal year. Activity reporting would identify physical movement of machines between agencies, and thus would form the basis for tracking the gain and loss of machines between inventory locations, and hence identify custody of the equipment.

Physical movement of machines would produce one of the following transaction types: 1) inter-agency transfers; 2) disposal of machines; 3) lost, stolen, and location unknown; and 4) recovered machines. Exhibit 4-10, CAS vs. BPHICS Comparison, contrasts the reporting activities associated with the present and proposed systems.

Exhibit 4-10
COMPARISON OF CAS TO BPHICS

CAS (Proposed)	**BPHICS (Current)**
1. By Type (CBM/TBM) (Same as BPHICS # 1)	1. By Type (CBM/TBM)
2. By Model (Same as BPHICS # 2)	2. By Model
3. Serial Number (Same as BPHICS # 3)	3. Serial Number
4. Agency Code (Same as BPHICS # 4)	4. Agency Code
5. Transfer In (Same as BPHICS # 5,6,9)	5. New Receipt
6. Transfer Out (Same as BPHICS # 7,8,10)	6. Transfer In
	7. Transfer Out
	8. L/S/U (XX1)
	9. Recovered
	10. Deletes (DBR/OBS)

Under the CAS process, inter-agency transfers would record the movement of a machine from a losing agency (transfer-out) to a gaining agency (transfer-in). This transaction type would be used by the manufacturer to report the transfer-out of new machines from their plant (losing agency) to an MLA (gaining agency). Under the regional and centralized repair scenarios, machines sent to a repair agency would also be considered a transfer. Also, machine transfers between agencies would continue to be transfers. The agency code would uniquely determine the type of activity (e.g. a Delete Transaction would consist of a transfer from an agency to the DEL account).

A machine lost, stolen, or location unknown would be transferred to the XX1 account. Under this scenario, the agency reporting the machine activity as Unknown would be the losing agency, and the gaining agency would be the XX1 account. If the machine was located, the activity transaction would be Recovered. The XX1 account would be the losing agency, and the agency that recovered the machine would be the gaining agency. Only machines lost, stolen, or location unknown would be transferred into the XX1 account. Machines being transferred out of the XX1 account to an MLA would be counted as recovered. It is important to track recovered machines to compute recovery rates both on the national and MLA level. This type of accounting would provide the NLS with a more accurate estimate of annual attrition associated with LSU machines.

Given the assumption that all disposals will occur centrally in all three repair scenarios, the following is true of CAS disposal transactions. The agency disposing of a machine would transfer the machine out of their inventory, and the disposal site (DEL) would transfer the machine into its inventory. Both agencies would be required to submit offsetting transactions; however, the disposal site would be the <u>only</u> agency capable of submitting a gaining disposal transaction to the DEL account. This type of control would insure that machines being disposed of would not reappear in the inventory. Based on a two-year analysis of BPHICS (10/92 thru 9/94), 1,275 machines deleted from BPHICS were subsequently re-added; this activity is very difficult to rationalize, but it does indeed occur. Records in the DEL account for scrapped machines (machines found to be repairable will be transferred to the appropriate repair location) would be purged, based on the transaction date, after a reasonable waiting period, possible three years.

4.1.5.4 CAS Management Reports

From the data provided by the reporting agencies monthly, CAS would be used to track machine custody and activity via transaction processing.

- The **Machine Activity Analysis** would be used to identify custody by agency and to measure the degree of activity ongoing in the network. A report would be prepared every reporting date for each machine model, and the data from this analysis would be presented in summary using a graphic format. The graph would be a comparison by reporting agency with the purpose of identifying any peaks or valleys that might suggest an abnormality or problem area. There would also be a report that would present similar information in a cumulative format; this report would be used to identify trends over time. These two reporting formats would be used to detect machine disposal trends and recovery rates by model type.

- The **System Activity Report** would be generated to monitor transaction processing within the system. This report would track open-ended transactions by reporting agency. The information would be presented in a graphic format showing the number of open transactions by type of transaction and reporting agency. There would be control limits, established by the NLS, which would tell the user of the report when an undesirable limit had been reached and what corrective action to take. Scrutiny of this report would eliminate extreme quantities of unreconciled or open-ended transactions.

- The **Agency Activity Report** would be generated to provide the agencies with feedback regarding the volume and types of transactions they submitted for that reporting period. This report would be a summary, and would only show total transactions by activity type. If an agency identified discrepancies between their records and CAS on a "macro" basis for the reporting period, there would be the capability to produce a detailed report for purposes of reconciling any out-of-balance transactions. At the end of the fiscal year, a year-end summary report would be included showing an aggregate by transaction type.

  Part 2 of this report would address open-ended transactions associated with the reporting agency. It would be the reporting agency's responsibility to take the appropriate action to close these transactions. This report would show current period and cumulative open transactions. Cumulative open-ended transactions that exceed a preestablished control limit of open transactions set by the NLS would carry a statement to that effect. Also in this statement would be a request for the agency to take prompt action to close the transactions, or to contact the NLS if there is a problem.

4.2 OTHER (NON-REPAIR OPTION SPECIFIC) RECOMMENDATIONS

This section of the report presents the study team's recommendations, with a few exceptions, that are neither specific to inventory management, nor to any of the three repair options. They are overarching in nature, and general in applicability.

4.2.1 Triage

Machine triage has been determined to be a valuable tool in assessing the working condition of any machine. The purpose of triage is to increase the availability of machines by both reducing the number of machines shipped to a repair group, hence maximizing use of the repairers (perhaps up to 1/4 of all machines currently going to repair groups can be put back in service through triage), and through fewer machines being in the repair queue. Triage is based on the principle of minor service being performed by a nontechnical person. The objective is to place machines back into service in the shortest time possible if they do not require more extensive diagnoses and repairs.

It is recommended that triage at all agencies, at a minimum, consist of head cleaning, replacing batteries, and external cleaning of the machine; those agencies that are willing and able to also perform head alignments and torque tests should do so. All other types of repairs would be sent to a repair agency. Under the decentralized repair scenario, the agency triage person would have to decide if the machine was under warranty, and whether the machine should be returned to the manufacturer. Under the centralized and regionalized repair scenarios, the warranty decision would be made by the repair agency, not the triage person.

4.2.2 Repair Parts Inventory

Under any scenario, the operation should employ an off-the-shelf automated inventory control system to track consumption, speed up distribution, and simplify requirements forecasting and procurement (including EOQ capability). Bar-coding of bins, and pre-packaging of a few items not currently distributed in this manner, would also help to expedite order filling and improve picking efficiency. Lastly, the NLS headquarters is relatively expensive space to house the parts operation, and consideration should be given to relocation of this operation elsewhere.

4.2.3 Warranty Repairs

The current warranty agreement with the manufacturer should be closely scrutinized for reasons enumerated in Section 3, specifically: on face value, it costs too much; the machine design is very mature and reliable, with both the manufacturer and NLS performing QA and QC, respectively; many MLAs are not using the option; the machine is out of service for an average of three months; and MLA staff time is required for input, output and record-keeping functions. However, given both that a new manufacturer is shortly coming "on-line", and that only now are data becoming available on the defect propensity of 3-year C-1 machines in their third year, the NLS should impose a warranty on the new manufacturer and wait on the 3-year machine data before revamping the agreement with the incumbent.

However, the current arrangement should not continue as-is *ad infinitum*; some changes must be made, with the FAR possibly providing other means to ensure reliability other than the current scheme. The following recommendations also apply to warranty repairs: 1) the summary report generated by NLS should show the number of machines repaired (not just the defects), 2) the base period shown should be the last 12 months, or at least show this in addition to all machines, 3) triage at MLAs should also cover warranty machines, 4) machines should be transferred out for warranty repairs, and the manufacturer made a custodian in BPHICS (or CAS), 5) all receipts should be logged-in by the manufacturer into their MAPICS system on the date received from the USPS, and,

6) under the centralized and regionalized repair scenarios, the repair group should make the determination whether or not to send the machine to warranty repair, not the lending agency.

Item (4) above is a recommendation for a "one-for-one" exchange of machines between the lending agencies and the manufacturers. The agency should not have to wait for a specific machine to be repaired; the manufacturer should send the agency a replacement warranted machine upon receipt of the broken one. This process would reduce the average three-month time required for warranty machine repairs to two-to-three weeks. The manufacturer would need to become an inventory location (reporting agency) so that their custody of machines could be known and controlled.

4.2.4 Repair Data

The following recommendations are made regarding repair data collection and compilation: 1) either use, or shortly plan to use (i.e. formally compile and summarize), the data contained on repair-logs, Form 73-20 or equivalent, else end the procedure of requiring submission by repairers; 2) either use, or shortly plan to use (i.e. formally compile and summarize), the data contained on the copies of the warranty repair forms sent to NLS by MLAs/SLAs submitting machines for warranty repairs, else end the procedure of requiring submission of the copy by MLAs/SLAs; 3) either use data submitted by the commercial repairer for repairs on non-warranty CBMs, if it is indeed submitted, or remove the contract clause requiring submission of such data if NLS does not intend to enforce this requirement; 4) promulgate a standardization of repair codes to be used by all repairers be they in-house staff, volunteers, commercial repairers, or warranty repairers (this is true for all repair scenarios); and, 5) consider the use of mark-sense forms to expedite and streamline compilation of the data at NLS.

4.2.5 Current Commercial Repairer

It is recommended that the current commercial machine repair contract with Cintrex be ended under any of the three repair scenarios after repair operations improvements resulting from the implementation of other recommendations in this report have been realized. The current repair output from this contract is approximately 3,600 machines, or less than 3% of all current reported repairs (and approximately 4.5% of true repair workload). The dollar value associated with this level of effort, approximately $75,000 in labor (and an indeterminate amount in parts), could be better used to help fund any of the three repair options.

4.2.6 Machine Design

The only recommendation with respect to machine design is to maximize the ease with which it can be cleaned. It has been suggested that the ribs do not need to wrap entirely around the machine, or that they could be placed on the inside. In addition, sharp corners should be eliminated. Whether the first suggestion would significantly weaken the machine, or whether the second suggestion is possible re. the removal of the case mold, must be discussed with the manufacturer. It may also be possible to join the top and bottom cases with a thickening taper at the interface, rather than a bead; this would also have to be discussed with the manufacturer. It is also recommended that the serial number be larger and the print be darker.

4.2.7 Packaging Design

The use of end-caps should be considered, and discussed with the manufacturer about how this would specifically affect the size of the carton, if at all, and if shock and vibration specs could be met. This design would both enable an easier removal of the machine from the carton, and would make scanning and/or reading of the serial number/bar code label possible without the complete removal of the unit from the carton. A new label holder should be considered. and the mailing label to be used is described in this section of the report. Finally, due to environmental concerns, consideration should at least be given to the use of alternative materials including, possibly, a reusable (longer lived) mailing container for machines. It is recommended that an independent package testing laboratory design and test a container with end-cap inserts.

4.2.8 SLA Machine Inventories

The recommended mode of operation is centralized machine lending within an MLA's service area, i.e. without the use of SLAs, a practice that introduces reporting complexities and inventory usage inefficiencies. The use of SLAs is a local decision, and the inefficiencies of decentralized inventories, both in terms of required stockage levels and accountability, must be weighed against a strong local service element. However, it must be generally recommended that MLAs handle all CBM storage and distribution, or alternatively that any SLA (non-SRLs) inventories be limited to those required to support walk-in and home delivery activities only, with all mail-order distribution being handled exclusively by the MLA.

4.2.9 Machine Attrition and Retrieval

Machine attrition within institutions must be reduced by MLAs/SLAs by maintaining as close a contact as possible with individuals responsible for the machines, and possibly registering individual patrons within institutions for additional points of contact. Fault cannot be placed on the reliability and longevity of the standard CBM machine regarding unnecessary attrition and/or repairs; the machines apparently have MTBFs exceeding the specified 1,000 hours, or the annual repairs would be higher (based upon reported book circulation of approximately 14.5 million, and an average book length of 12.5 hours, annual repairs should be almost 50% higher than reported), and some machines last longer than 10 years. It is recommended that MLAs label their machines with MLA name, address and phone number to simplify returns. It has also been suggested that the same labeling be done by the NLS as well (i.e. label the machines with the NLS address and phone number information, in bold, also stating "Property of Federal Government"); however, it must be ensured that the MLA is identified as the primary contact point. Finally, the NLS should consider sending their own machine retrieval letter, after the MLA has made its three attempts, stating the importance of returning government furnished equipment; or, the MLAs should send a form letter on NLS letterhead. This effort should aid in reducing attrition by increasing machine recovery.

4.2.10 Machine Disposal

An audit of the machine disposal process is defined in Addendum B of this report. It will have the objectives of: 1) determining how well MLAs are making the scrap/repair decision; 2) deciding how many machines can potentially be repaired and reused; and, 3) to better determine the relationship between age and repairability (if any). Besides the audit, it is recommended that all disposals occur centrally, either in the central depository and repair facility, if implemented, or at Landover or another central location otherwise, to ensure proper disposal. The NLS must also reinforce to network agencies to remove all batteries and battery compartment screws before disposal, not use good packaging materials, not scrap warranty machines, and to box TBMs before mailing. It is recommended that the NLS log the model and serial number of all machines disposed at Landover for submission to BPHICS/CAS; this is at least an opportunity for the NLS to verify the final disposition of machines with a confirming transaction, which is currently not done. Finally, the practice of *physically* retaining machines in agencies after *accounting* disposals of the machines must be immediately terminated.

4.2.11 Frequency of New Production Shipments

Given current national working inventory levels of standard CBMs, the monthly shipments of new machines, on a national basis, is theoretically not even close to being a problem. Rather, machine availability is a problem due to one or several regional deficiencies. However, it would require no major change on the manufacturer's part to ship machines to given MLAs on a semimonthly rather than monthly basis.

4.2.12 New Machine Allocation

The potential deficiencies cited regarding the current allocation method for new CBM production were that: it considers only merit, not need; it does not consider readership growth; it does not consider existing relative size of inventory; it does not consider average age of inventory; and the assumption of four readers per institution introduces error. It is recommended that two (not four) patrons per institution be used if, indeed, readership continues to be used as the basis for allocation. However, based on further analysis, ManTech has determined that the number of machines assigned is a better predictor of demand than readership. It is, therefore, recommended that the number of machines assigned be used for production allocation. However, ideally, new production allocation should be dynamic rather than static in order to help fill shortfalls identified by the inventory analysis presented as Exhibit 4-5.

Finally, there is merit in implementing a monthly allocation of machines that are both new and used (and refurbished) within the context of the inventory management recommendations previously cited. If NLS and the Advisory Committee believe some or all of the above factors should be impounded into the allocation process, the study team will develop such an allocation algorithm in the Specifications phase of the project for the operational scenario selected for further detailing and possible implementation.

4.2.13 BPHICS/CAS

Given that the NLS must track GFE at a model/serial number level to the custodian agency, and given the plethora of ADP systems currently in the network, the need for BPHICS much as it stands today, in terms of basic functionality, will continue to exist (CAS has been recommended); this is true even though BPHICS is *not* used on an operational basis as an inventory management system by the NLS (the MMR is used instead). It is recommended: that hardcopy submission of data be reduced; that what hardcopy data is furnished be submitted directly to the contractor and not pass through NLS (this recommendation is being implemented to expedite input and improve timeliness); that as much data be sent via telecommunications from agency ADP systems as possible; and that the contractor develop the utilities to centrally convert such data as necessary to the input formats required for BPHICS (CAS). It is furthermore recommended that the "turning-off" of most of the in-transit accounts in BPHICS be reevaluated (and, in CAS, used), if electronic submission of data is maximized. Finally, all lending agencies should periodically reconcile their entire inventories with BPHICS, not just the few MLAs who are, so far, the only ones to do so.

4.2.14 Non-Reporting

Continued non-reporting by MLAs of MMR submissions should not be tolerated; the NLS requires this information for the management of the national inventory. In reality, nine out of ten MLAs are reporting with sufficient frequency so that they are at least within the spirit, if not the letter, of the machine lending agency agreement. However, there are the 11% that represent a problem because of their non-reporting, and after several (e.g. 3) months of non-reporting, their administering agencies should be contacted, if necessary, to rectify the situation. Exhibit 4-11 shows participation rates for FY94.

4.2.15 Patrons with Multiple Machines

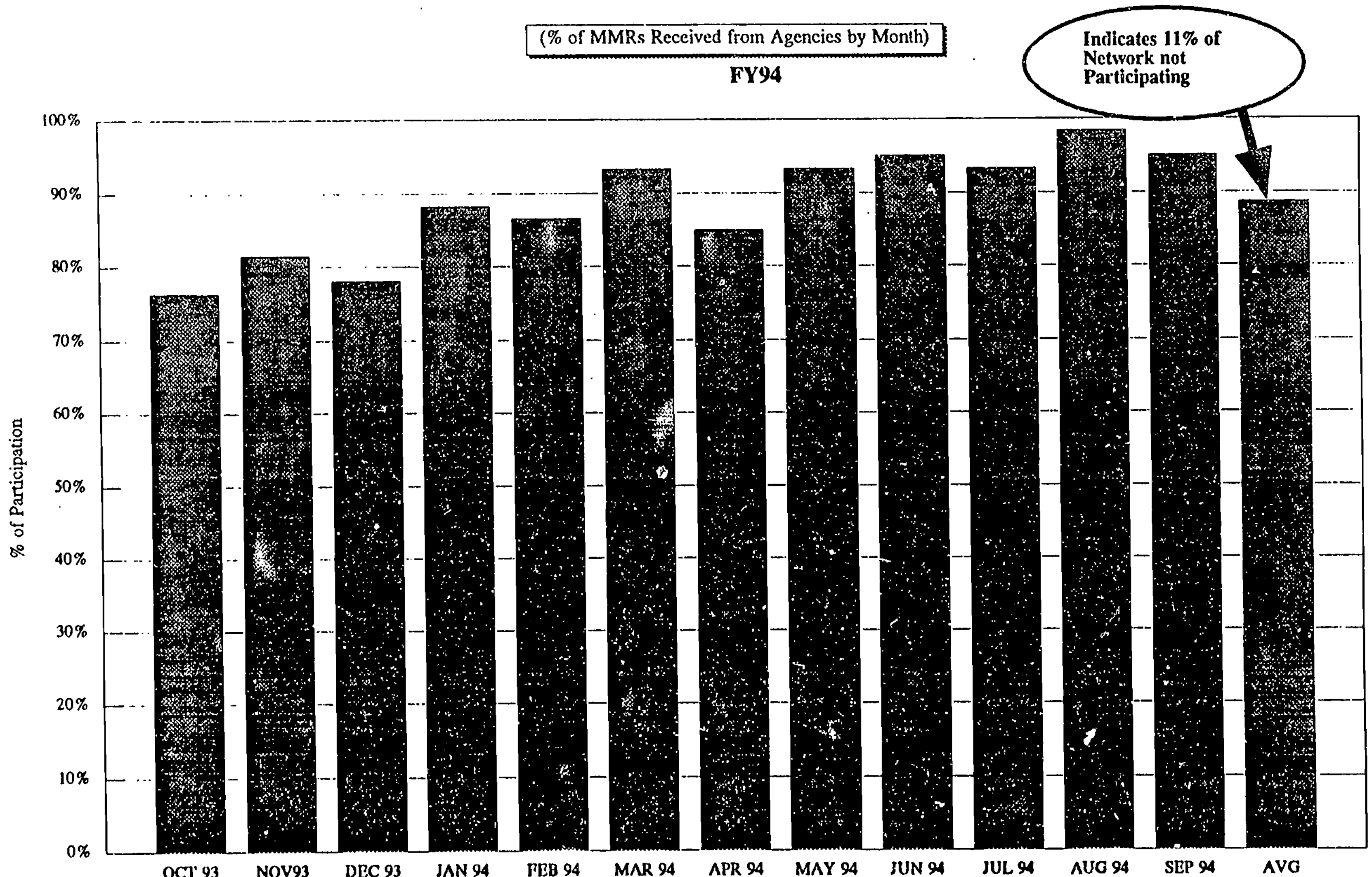
MLAs/SLAs should not make assignments of two CBMs to individual patrons given the national ratio of machines to readers, the reality of limited supplies in some MLA service areas, and NLS policy. However, NLS should consider the possibility of having agencies report the number of machines assigned to institutions within their service regions along with individual and institutional readership statistics annually to the NLS for possible use in the machine allocation process. This information could also be used by the MLAs/SLAs to ensure equitable distribution within their own service areas.

Exhibit 4-11

BPHICS MMR REPORTING TREND

(% of MMRs Received from Agencies by Month)

FY94



Based on 59 MLAs

Source: BPHICS Monthly Machine Report Logs (Oct 93 thru Sep 94)

mmr_rec.wk4

263

261

4.2.16 Mailing Periods

It is recommended that all agencies, NLS parts shipments, MSCs, manufacturers, warranty repairers, commercial repairers, and other repairers, wherever possible, should use bar-coding of both addressee and return address zip-codes to expedite delivery and returns, respectively, by the USPS via automated processing. This enhancement has the potential of expediting mailings by approximately one-to-three days. Entities that do not implement this capability should consult with their local USPS office to determine if pre-sorting will expedite deliveries and, if so, perform this function. Similarly, all such entities should also request twice per day service from the USPS, if possible, with deliveries in the morning and pick-up in the afternoon. Finally, lending agencies should use large, easy-to-read return address labels on the cartons in the event the 3x5 mailing card is lost in transport or processing.

4.2.17 Documentation

In general, the documentation of all MLA ADP systems needs improvements in the form of both updates and clean-up. With regard to NLS produced documentation, the MLA procedures manual, repair manual, and network library manual also need to be updated in several areas.

Section 5
Decentralized Repair Option

Section 5

DECENTRALIZED REPAIR OPTION

This section of the report presents the study team's recommendations for improving network machine operations through maximum utilization of existing repair capabilities, especially the existing volunteer repair network, which is estimated to perform 90% of current machine repairs. These recommendations are designed to achieve the goal of having 95% of the repaired machines pass the quality control standard recently adopted by the NLS and network. The discussion in this section, therefore, focuses on volunteer and lending agency level repair operations. All other recommendations applicable to both this and the two other repair scenarios are presented in Section 4 and the addenda of the report.

5.1 INTRODUCTION

Section 3 of the report identified significant system-wide problems witn current repair practices and with the current quality of repair. In other environments where there is much greater control over the organization and the workforce, the identification of problems is usually quickly followed by successful problem resolution. But control is not what the decentralized repair option is primarily concerned with. The decentralized option is fundamentally concerned with pulling a fragmented and voluntary workforce together through persuasion and education.

Under more traditional hierarchical relationships where there is an employer and an employee, positive financial and other incentives, close supervision, performance measurement, and the possible loss of employment are tools that can be used to persuade a workforce to exhibit desired behaviors. None of the formal relationships that provide for these controls are present with respect to the volunteers -- they are not part of a traditional organization with a hierarchy of management, and they are not employees whose income is dependent upon their performance. Rather, cooperation is provided at their discretion, and is based solely upon good will.

Under the decentralized repair option, this lack of control must be recognized as a constraint, and the informal nature of the relationship with the volunteers must be accepted. To the study team, this means that both the network lending agencies and NLS must change the manner in which they deal with the volunteers and become more persuasive about what is needed from them, because the current practices are not producing desired or satisfactory results. Thus, we believe that the most viable recommendation to make for achieving the stated quality objective within the current decentralized framework is for the creation of a single, but strong, voice for quality volunteer repair. Additionally, this entity must assist lending agencies within this framework, as necessary, in the coordination of movement of equipment needing repair from regions of deficient capacity to those of excess capacity, although it will still be the primary responsibility of the network lending agencies to directly foster participation, and coordinate with, their supporting repair groups.

The study team also believes that every patron in the network deserves the chance to use a high-quality machine, and that the total costs for maintaining the local service component of the program should be recognized (getting a good working machine is a fundamental service element.) A nation-wide commitment to the standard of repair is required. Consequently, the study team believes that the recommendations in the decentralized repair option should apply to all repair groups, regardless of their size, location, or the cost efficiency of the incremental effort required to effect the necessary, required improvements in operations.

Based on the above premise, the study team has developed a set of recommendations designed to succeed in reaching the 95% quality goal for decentralized repair operations. There are several important elements to our recommendations. These elements are itemized below, and discussed in more detail in the numbered subsections:

- NLS must become a stronger presence, bringing a national perspective to repair
- NLS must interact with the groups face-to-face on behalf of the MLAs
- Groups need to become aware of their impact and potential
- MLAs/SLAs need to provide formal feedback to groups and to the NLS
- NLS needs to fund equipment purchases for the groups
- The equipment manufacturers should be used as a source of education and information

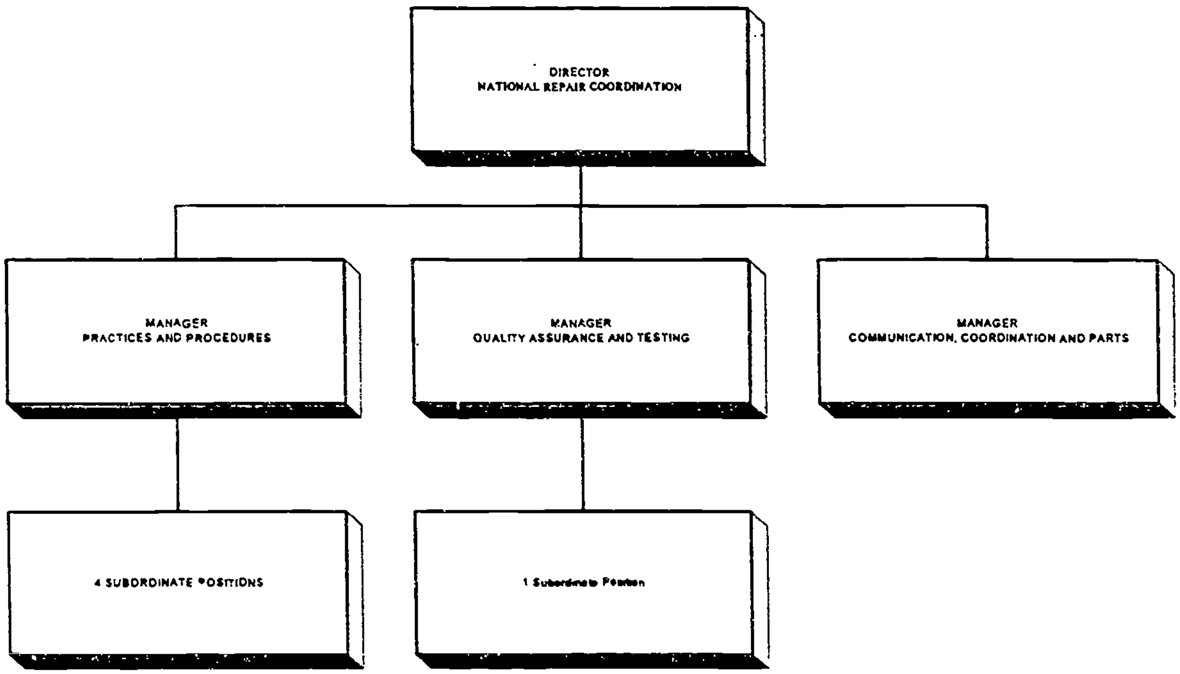
- The NLS needs to establish, and maintain, several information sources pertaining to these operations
- Repair sites should be subject to losing accreditation if they do not bring their quality of repair up to the established standard

5.2 NLS NATIONAL REPAIR COORDINATION CENTER

The study team recommends that NLS establish and staff a National Repair Coordination Center, which will be located at NLS headquarters. The purpose of this center is to provide a focus to the network-wide repair operations, to establish standards and policies, to continuously monitor the quality of repair, to provide training and information to the groups, and to provide repair and test equipment to those groups that require it. The center must be a strong on-site presence with the groups and act as the proponent for the 95% quality standard. Face-to-face communication, training and quality control with all sources of repair (to include the one-person operations) will be mandatory. Exhibit 5-1 summarizes the envisioned organization, staffing, and labor costs for the center, which will be incremental to current NLS operations.

Exhibit 5-1

DECENTRALIZED REPAIR OPTION
ORGANIZATION AND STAFFING FOR NLS
NATIONAL REPAIR COORDINATION CENTER



POSITION	NUMBER	SALARY	TOTAL
Director	1	$60,000	$60,000
Manager, P&P	1	$48,000	$48,000
Manager, QA & Test	1	$40,000	$40,000
Manager, CC&P	1	$40,000	$40,000
Subordinates	5	$32,000	$160,000
Totals	9		**$348,000**

Note that this organization does not include the NLS equipment control officer, who is required under all repair scenarios, whose labor cost is not incremental to any individual option, and whose fundamental operational responsibility is inventory management, not machine repair.

5.2.1 Organizational Structure

The NLS National Repair Coordination Center will be organized around three principal activities: repair practices and procedures; quality assurance; and communication, coordination and parts. There will be managers for all three functions who will report to the director of the center. Only one of the managers will have a staff. There will be two subordinate positions to the Manager of Practices and Procedures.

5.2.2 Mission and Functions

The Director will look outward to the network to work with all participants to solve the equipment repair problems documented in this report. The Director will be the NLS representative for machine operations, and will have the authority to obligate NLS to standards and policies for machine operations (obviously, existing NLS financial checks and balances to remain). This position will also control the internal operations of the center.

The Manager for Practices and Procedures will design machine maintenance and repair programs and manuals, will develop training materials and programs, and will deliver on-site training to all volunteer groups regardless of size, and to in-house repair staff working within lending agencies. At least initially, there will be two one-day training visits to each group, per year. The site training visits will be performed by the manager and by his/her two subordinate positions. The objective of the training is to get all repair groups to perform both consistently and at a high quality level.

The Manager for Quality Assurance and Testing will establish machine repair QA tests and testing procedures and will apply these to measure compliance with the network accepted standard of quality and will provide formal feedback of QA measurement results. The manager will conduct on-site QA test and measurement visits at every volunteer group, and in-house repair operation, at least once per year. This information will be used to develop training materials, to provide feedback, to counsel groups and to identify problem areas. This effort will be performed continuously.

Some of the functions of the Manager for Communication, Coordination and Parts are performed currently, specifically the parts management operations portion of the job including procurement, distribution and inventory management. Some communication in the form of training will be provided by the Practices and Procedures group, and by the Quality Assurance group in the form of monitoring, as described above.

However, the Manager for Communication, Coordination and Parts will be responsible for both general communications with volunteer groups and in-house repair operations, and specific coordination with lending agencies as an intermediary to facilitate the movement of machines needing repair from locations of deficient repair capacity to locations of surplus repair capacity in the decentralized mode of operations. This individual will also be responsible for maintaining the NLS database of repair locations, which is being developed as an adjunct to this study. The database will contain fundamental information required to fulfill this responsibility, and will require constant maintenance. Lastly, in concert with the NLS equipment control officer, who will initially prompt action in this regard, this individual will review the monthly management reports of repair backlog and reported repair capacities previously described in Section 4, and take appropriate corrective action by issuing shipping instructions to agencies and notification to repair groups when out-of-agency-service-area repairs are required.

5.3 PROGRAM ELEMENTS

5.3.1 National Awareness Campaign

The first task to be undertaken by the center will be to wage a national awareness campaign citing the results of this study. The volunteer groups (and in-house repairers) need to be persuaded that the *status quo* can no longer be accepted, and must change. The groups need to come to accept that better machine repair, for the benefit of the patron, is needed. If this campaign is successful, the groups will be much more receptive to the training and monitoring efforts that are planned to follow.

5.3.2 Codification of Maintenance Program

The NLS should reexamine the repair standards for playback machines in light of the findings of this study. Any changes believed necessary should then be drafted and distributed for comment if different from those standards used for the purposes of this study. Once the program is accepted, the final version should be codified and promulgated as the standard for repair.

5.3.3 Training

Training programs should be designed to assist the repairers in implementing the codified repair and maintenance program, and to give the groups the best chance at improving the quality of machine repairs. Training session design recommendations to be considered include:

- training will be performed at the repairer(s) location,
- training will be of relatively short, but sufficient, duration (one-day visits),
- not all groups will have the same problems, and
- not all groups will have a variety of machines to use as examples.

5.3.4 Quality Assurance

The formal QA program can get started prior to training. The foundation for it has been established through this study's quality of repair survey. The public relations component of the program will be an important early consideration, and gaining the trust and cooperation of the groups will be essential. The groups need to understand that *everyone* is being measured, and that the good of the patron is at the heart of the program.

A PC-based computer database for QA applications will need to be established using an off-the-shelf database program. Confidentiality of information will be an issue. Mechanisms for providing feedback to the groups, to the lending agencies, and to NLS management will need to be established. Integrating the QA program results with the training program will become ever more important as time passes, and specific trends or problem areas are identified.

5.3.5 Equipment Provision

NLS should procure test and repair equipment for indefinite loan to the volunteer groups for as long as they are directly supporting the program with machine repairs. It is known that not all groups possess the equipment necessary for doing the job to the new standards. The study team has budgeted \$288,000 (\$1,000 per group, on average) for a three-year purchase of equipment. This value may be low, but is based upon the best information available at this writing with regard to the number of individual repair locations, and will be further refined with better knowledge of the number of groups, their sizes, and their existing resources.

5.3.6 Manufacturer Workshop Trips

A biennial trip to the equipment manufacturers for one member of each volunteer repair group is envisioned. The purpose of the trips is for the manufacturers to prepare and deliver engineering, repair and maintenance workshops for the C-1 and later, the C-2 (and additionally the

E-1 and CT-1 for some select individuals). These trips are estimated to be two days in duration. NLS can also provide workshops/panel discussions/presentations, and the groups should also prepare materials for presentation. The study team believes that these trips, besides their educational benefit, will help establish an atmosphere of professionalism and responsibility among the volunteers. It will also provide them an opportunity to meet in a manner that they do not currently enjoy. Annual travel costs are budgeted at $100,040, and the annual cost to the manufacturers' contracts are estimated to be $25,000.

5.3.7 Accreditation

The fundamental assumption of the decentralized repair option is that all groups currently repairing playback machines will continue to do so, including any in-house repair being performed directly by network agencies. The groups are currently accredited to perform repairs merely by the fact that they are now doing so. However, once the recommended training and QA efforts are in place, it is recommended that a method for removing accreditation, where necessary, be developed. This procedure could take several different forms, but the objective is to remove groups from the program that are not willing and/or able to meet the required quality standard (the question of meeting capacity requirements is a completely separate issue, and is to be handled by the Manager for Parts, Communications and Coordination, as previously described). Counseling sessions for poor performance should be included in the program. Methods for transferring the repair workload away from groups that lose their accreditation will need to be developed.

5.3.8 MLA/SLA Roles

The MLAs/SLAs need to become more proactive in the envisioned decentralized repair scenario. The personnel who will be performing triage in the lending agencies should also perform QA on samples of machines returned from their supporting decentralized repair groups. This will provide valuable information both to NLS, and to the groups, with a frequency that the NLS QA program will, from a practical standpoint, not be able to match.

5.3.9 Other Issues

The study team also recommends that methods for mass communication of program information be developed. Items such as training videos and newsletters, although secondary in importance to the steps mentioned above, can be developed in support of the repair goals. NLS must take the initiative in this area, but should solicit input from network agencies and the repair groups as necessary.

5.4 SUMMARY OF DECENTRALIZED OPERATIONS

Because recommendations with regard tc decentralized operations are contained in this section of the report, in Section 4 of the report, and the Addenda, a summary of the salient aspects of this envisioned scenario with respect to machine repair operations are listed below.

- o The network will make maximum use of its existing decentralized repair capacity consisting of both volunteer and in-house repair; all repairs except warranty repairs are to be performed by this structure, and are estimated to be 80,000 per year (approximately 1,000 CT-1s, 3,000 E-1s, and virtually all of the balance being standard CBM repairs given the phase-out of TBMs) once triage is implemented at all agencies, and once repair quality is improved to the target level.

- o Lending agencies will have the primary responsibility of directly fostering and coordinating the repair efforts with their supporting repair groups, as they do currently.

- o The NLS will play a much more active role in these operations via the creation and funding of a formal organization and operations for training, monitoring, coordinating and supporting decentralized repair groups.

- o Network lending agencies will implement, to the maximum extent possible, the recommended operating procedures detailed in Addendum A of this report.

- o Movement of machines to and from repair groups will be treated as conventional intra-agency transactions by the lending agencies, not transfers, with all off-site repair locations being patrons-of-record, as is currently the case.

o Network lending agencies will implement, to the maximum extent possible, the inventory management and other recommendations that apply to their operations detailed in Section 4 of this report.

o The MSCs will continue to support agencies and repair groups with equipment-related supplies, parts, new CT-1s and E-1s (and A-1s, while there is still a demand for them), and as a passthrough and staging area for CT-1s and E-1s needing repair (in all likelihood, decentralized repair groups will not have the storage space locally for these machines even if they have the capacity and ability to fix them). However, the MSCs will cease to receive, store and issue standard CBMs, in any condition, and will neither store nor issue refurbished E-1s and CT-1s, which will be directly shipped by the repairers to specific lending agencies at NLS direction.

o Given the implementation of the recommendations in this section, i.e. close NLS coordination, a database of repair operations, etc., and given the implementation of the automated parts inventory management system recommended in Section 4, shipment of parts directly to the repair groups from the NLS parts operation is recommended, and storage of parts in MLAs/SLAs for the purpose of supporting offsite decentralized repair groups will be discontinued.

o Any free-inventory of standard CBMs will be distributed equitably among lending agencies in this operational scenario; some portion of the free inventory (all new E-1s and CT-1s, and those in need of repair), and new TBMs (A-1s, to the extent that they will be used) will be stored in the MSCs.

Section 6
Regionalized Repair Option

Section 6
REGIONALIZED REPAIR OPTION

This section of the report presents the study team's recommendations for improving machine operations through a consolidation of the existing repair network. This regionalized repair approach is based on the assumption that a number of volunteer sites have both the willingness and the future capacity to perform repairs for the entire network. As is the case with the other repair options, the goal of the regional design is to have 95% of the repaired machines pass the quality control standard recently adopted by the NLS and network. The discussion herein pertains to the consolidation and coordination of volunteer repair operations. Other recommendations applicable to both this and the other repair options are presented in Section 4 and the addenda of this report.

6.1 INTRODUCTION

The regional repair approach presumes that a significantly reduced number of volunteer sites is a viable cost and service alternative to the status quo and the other options. The regional concept exists as a hybrid between the decentralized and fully centralized approaches. It merges features from the other two options (free volunteer labor coupled with better control) in an attempt to find a compromise in terms of cost and the resolution of the current quality of repair and other problems.

It is important to note that the regional concept exists only on paper, and is completely hypothetical. There has been no attempt to assess whether or not there are enough groups of sufficient size both *willing and able* to participate in the regional approach and provide the necessary repair capacity required. This assessment will require direct contact with the potential existing groups in order to specifically ascertain the answers to both of these questions. Regionalized groups will be making a much greater commitment to the NLS and the network than they are now (perhaps at the expense of these groups' other good works.) The effort will become more production-oriented, and this may not be suitable to some, or all, of the volunteers. Further analysis will need to be performed with regard to this option before a commitment to proceed can be made.

6.2 BASELINE FEASIBILITY ASSESSMENT

The study team conducted an analysis in order to determine if there was enough manpower available in sufficiently few volunteer repair groups to render the regional concept feasible. The output of the analysis was a size range of groups that might be required to support the regionalized repair option. These ranges were: 15 groups (400 total members), 20 groups (457 total members) and 25 groups (507 total members).

It was assumed that 80,000 repairs per year would be performed after the implementation of triage at all lending agencies, and after quality of repair improvement initiatives are successfully implemented . Manpower estimates were made using three different assumptions regarding how long it takes to perform the average CBM repair. The repair times were: 1 hour, 1.5 hours and 2 hours. A calculation was then made to determine the average number of hours per week that each volunteer would need to work under each of the various scenarios. Exhibit 6-1 below shows the results of this analysis.

Exhibit 6-1

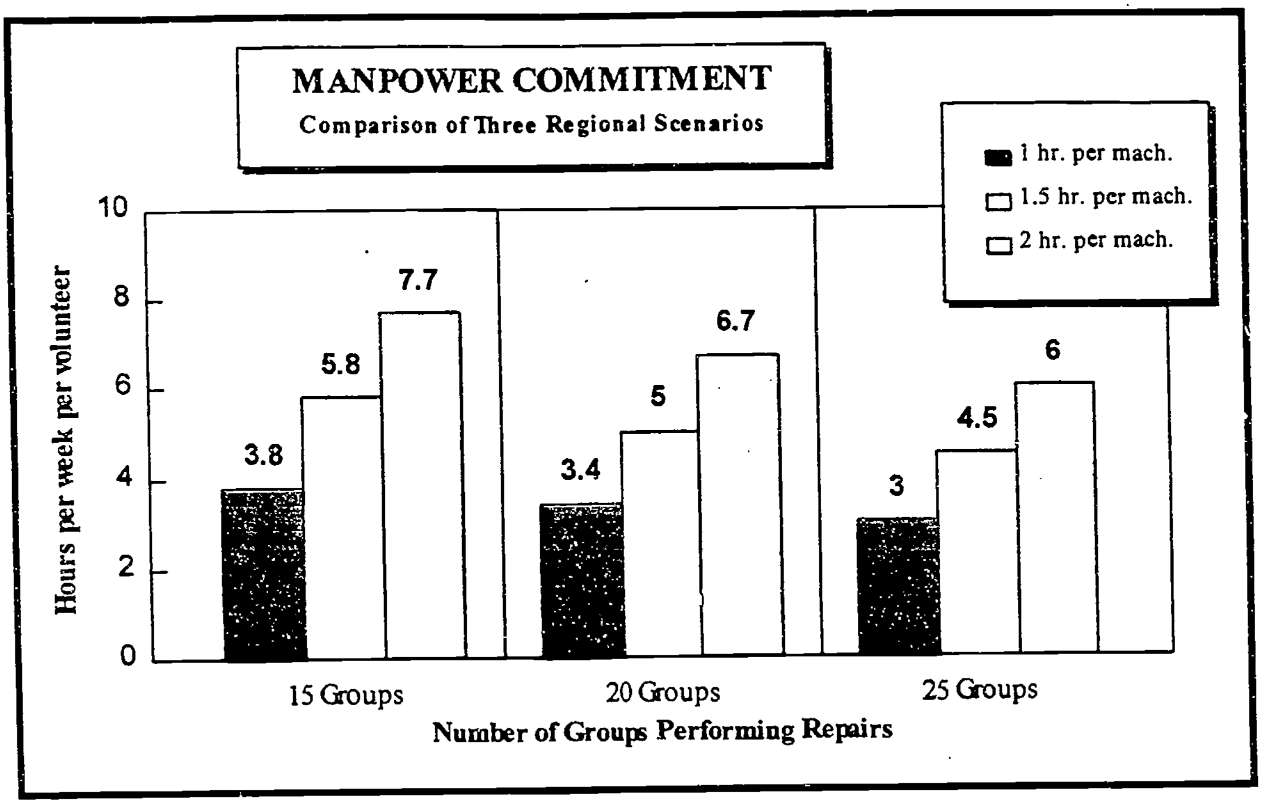


Exhibit 6-1 shows that the 15-group scenario is probably not feasible. A range of 3.8 to 7.7 hours per week per volunteer would be required to sustain 80,000 repairs per year. The study team believes that this level of commitment would most likely *not* be forthcoming. However, it appears that both of the two other scenarios are viable. The 20-group scenario probably could work if the average time to repair a machine is 1.5 hours or less, while the 25-group scenario might be viable under any of three average time-to-repair assumptions.

Based upon the above, the study team has developed a set of recommendations designed to succeed in reaching the 95% quality goal via implementation of a regionalized repair approach whereby a minimum of 20, but no more than 25, groups would be performing repairs. As was the case for the decentralized option, there are several important elements to our recommendations. These elements are itemized below, and are exactly the same as those for the decentralized option.

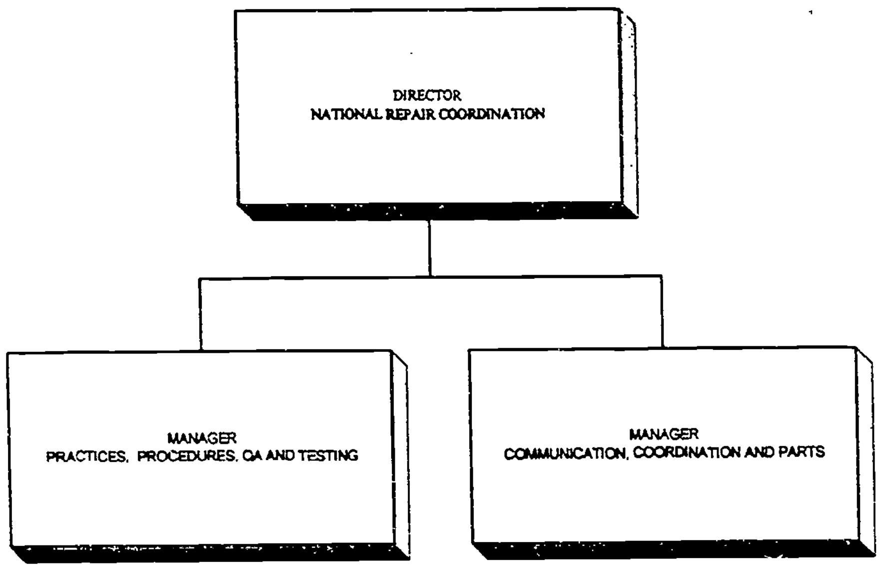
- The NLS must become a stronger presence, bringing a national perspective to repair
- The NLS must interact with the groups face-to-face
- Groups need to become aware of their impact and potential
- MLAs/SLAs need to provide formal feedback to groups and to the NLS
- The NLS needs to fund equipment purchases for the groups
- The equipment manufacturers should be used as a source of education and information
- The NLS needs to establish, and maintain, several information sources pertaining to these operations
- Repair sites should be subject to losing accreditation if they do not bring their repair work up to the established standard

6.3 NLS NATIONAL REPAIR COORDINATION CENTER

As was done for the decentralized repair option, the study team recommends that the NLS establish and staff a National Repair Coordination Center. The purpose of this center is to provide a focus to the network-wide repair operations, to establish standards and policies, to continuously monitor the quality of repair, to provide training and information to the groups, and to provide repair and test equipment to those groups that require it. The center must be a strong on-site presence with the groups and act as the proponent for the 95% quality standard. Face-to-face communication, training and quality control with all groups will be mandatory. Exhibit 6-2 summarizes the organization, staffing and salary costs for the center, which will be incremental to current NLS operations. Note that these costs are significantly less under this option than they are under the decentralized option.

Exhibit 6-2

**REGIONALIZED REPAIR OPTION
ORGANIZATION AND STAFFING FOR NLS
NATIONAL REPAIR COORDINATION CENTER**



POSITION	NUMBER	SALARY	TOTAL
Director	1	$54,000	$54,000
Manager, P,P,QA & Test	1	$43,000	$43,000
Manager, CC&P	1	$40,000	$40,000
Totals	3		**$137,000**

6.3.1 Organizational Structure

In the regionalized repair option, the NLS National Repair Coordination Center will be organized around two principal activities; 1) repair practices/procedures and quality assurance, and

2) communication, coordination and parts. There will be managers for these two functions who will report to the director of the center. Neither of the managers will have a staff.

6.3.2 Mission and Functions

The Director will look outward to the network to work with all participants to solve the equipment repair problems documented in this report. The Director will be the NLS representative for machine operations and will have the authority to obligate NLS to standards and policies for machine operations (obviously, existing NLS financial checks and balances to remain). This position will also control the internal operations of the center.

The Manager for Practices, Procedures, QA and Testing will design machine maintenance and repair programs and manuals, will develop training materials and programs, and will deliver on-site training to all repair groups. At least initially, there will be two one-day training visits to each group per year. The objective of the training will be to get all repair groups to perform consistently and at a high quality level.

This position will also perform all QA and testing-related work. The position will establish QA measurement tests and procedures, apply these to monitor compliance with the network accepted standard of repair quality, and provide formal feedback of QA measurement results. The manager will conduct on-site QA test and measurement visits at every regional group at least once per year. This information will be used to develop training, to provide feedback, to counsel groups, and to identify problem areas. This effort will be performed continuously.

Some of the functions of the Manager for Communication, Coordination and Parts are performed currently, specifically the parts management operation portion of the job including procurement, distribution and inventory management. Some communication in the form of training and monitoring will be provided by the Practices, Procedures, Quality Assurance and Testing group, as described above.

However, the Manager for Communication, Coordination and Parts will be responsible for both general communications with volunteer groups and in-house repair operations, and specific coordination with lending agencies as an intermediary to facilitate the movement of machines needing repair from agencies to specific regional repair facilities. This individual will also be responsible for maintaining the NLS database of repair locations, which will contain fundamental information required to fulfill this responsibility, and will require periodic maintenance. Lastly, in concert with the NLS equipment control officer, who will initially prompt the action in this regard, this individual will review the monthly management reports of repair backlog and reported regional group repair capacities, previously described in Section 4, and take appropriate corrective action by issuing instructions to agencies and notification to repair groups as necessary.

6.4 PROGRAM ELEMENTS

6.4.1 National Awareness Campaign

The first task to be undertaken by the center will be to wage a national awareness campaign citing the results of this study. The groups need to be persuaded that the *status quo* can no longer be accepted, and must change. The groups need to come to accept that better machine repairs, for the benefit of the patron, are needed. If this campaign is successful, the groups will be much more receptive to the training and QA efforts that are to follow

6.4.2 Codification of Maintenance Program

The NLS should reexamine the repair standards for playback machines in light of the findings of this study. Any changes believed necessary should then be drafted and distributed for comment if different from those standards used for the purposes of this study. Once the program is accepted, the final version should be codified and promulgated as the standard for repair.

6.4.3 Training

Training programs should be designed to assist the volunteers in implementing the codified repair and maintenance program, and to give the groups the best chance at improving the quality of machine repairs. Training session design recommendations to be considered include:

- training will be performed at the group location,
- training will be for relatively short durations, but of sufficient duration (one-day visits), and
- not all groups will have the same problems.

6.4.4 Quality Assurance

The formal QA program can get started prior to training, and the foundation for it has been established through this study's quality of repair survey. The public relations component of the program will be an important early consideration, and gaining the trust and cooperation of the regional groups will be essential. Each regional group needs to understand that *every group* is being measured, and that the good of the patron is at the heart of the program.

A PC-based computer database for QA will need to be established using an off-the-shelf database program, and confidentiality of information will be an issue. Mechanisms for providing feedback to the regional repair groups, to the lending agencies, and to NLS management will need to be established. Integrating the QA program results with the training program will become ever more important as time passes, and specific trends or problem areas are identified.

6.4.5 Equipment Provision

NLS should consider procuring test and repair equipment for indefinite loan to the regional volunteer groups for as long as they are directly supporting the program with machine repairs. It is assumed that not all regional groups will begin operations with the equipment necessary for doing the job to the new standards. The study team has budgeted $40,000 ($2,000 per group) for a one-time purchase of equipment.

6.4.6 Manufacturer Workshop Trips

An annual (as opposed to biennial) trip to the equipment manufacturers for one member of each group is envisioned. The purpose of the trips is for the manufacturers to prepare and deliver engineering, repair and maintenance workshops for the C-1 and later, the C-2 (and additionally the E-1 and CT-1 for some select individuals). These trips are estimated to be two days in duration. NLS can also provide workshops/panel discussions/presentations. The groups should also prepare materials for presentation. The study team believes that these trips, besides their educational benefit, will help establish an atmosphere of professionalism and responsibility among the regional group volunteers. It will also provide them an opportunity to meet in a manner that they do not currently enjoy. Annual travel costs are budgeted at $13,700, and the annual cost to the manufacturers' contracts are estimated to be $10,000.

6.4.7 Accreditation

The subject of accreditation is somewhat different under the regional repair option from that of the decentralized repair option. It will not be easy to take accreditation away from one of these larger groups because the alternatives for placing their repair workload somewhere else will be few. The workload of some of the smaller regional repair centers might be split among several other regional centers, but the ability of any one center to assume a 15%, or greater, increase in workload should be questioned seriously.

6.4.8 MLA/SLA Roles

The MLAs/SLAs need to become more proactive in the envisioned regionalized operation, but not as active as that required for the decentralized option. The personnel who will be performing triage in the lending agencies should also perform abbreviated QA on samples of machines returned from the regional repair groups. This will provide valuable information both to the NLS and to the groups with a frequency that the NLS QA program cannot realistically match.

6.4.9 Other Issues

The study team also recommends that methods for mass communication of program information be developed. Items such as training videos and newsletters, although secondary in importance to the steps mentioned above, can be developed in support of the repair goals. The NLS must take the initiative in this area, but should solicit input from network agencies and the regional repair groups as necessary.

6.5 SUMMARY OF REGIONALIZED OPERATIONS

Because recommendations with regard to regionalized operations are contained in this section of the report, in Section 4 of the report, and the Addenda, a summary of the salient aspects of this envisioned scenario with respect to machine repair operations are listed below.

- o The network will make maximum use of its existing repair capacity consisting of both large volunteer groups and in-house repair; all repairs except warranty repairs are to be performed by this structure, and are estimated to be 80,000 per year once triage is implemented at all agencies, and once repair quality is improved to the target level. (Approximately 1,000 CT-1s, 3,000 E-1s, and virtually all of the balance being standard CBM repairs given the phase-out of TBMs)

- o Both the NLS and lending agencies will have responsibility for directly fostering and coordinating the repair efforts of their supporting regional repair group.

o The NLS will play an active role in these operations via the creation and funding of a formal organization and operations for training, monitoring, coordinating and supporting regionalized repair groups.

o Network lending agencies will implement, to the maximum extent possible, the recommended operating procedures detailed in Addendum A of this report.

o Movement of machines to and from regional repair groups will be treated as conventional inter-agency transactions by the lending agencies, i.e., transfers, with all regional repair groups acting as reporting agencies for both inventory control and custody purposes.

o Network lending agencies will implement, to the maximum extent possible, the inventory management and other recommendations that apply to their operations detailed in Section 4 of this report.

o The MSCs will continue to support agencies and repair groups with equipment-related supplies, parts, new CT-1s and E-1s (and A-1s, while there is still a demand for them), and as a passthrough and staging area for CT-1s and E-1s needing repair due to repair group space limitations. However, some regional repair group(s) may specialize in the repair of these machines, and arrangements could be made to conceivably store all machines of these models needing repair at that location(s). In either event, the MSCs will cease to receive, store and issue standard CBMs, in any condition, and will neither store nor issue refurbished E-1s and CT-1s repaired by the specialized regional repair group(s), which will be directly shipped by the repairers to specific lending agencies at NLS direction.

o Given the implementation of the recommendations in this section, i.e. close NLS coordination, a database of repair operations, etc., and given the implementation of the automated parts inventory management system recommended in Section 4, shipment of parts directly to the regional repair groups from the NLS parts operation is recommended, and storage of parts in lending agencies will continue to exist only for those sites that have in-house staff repairs.

o Any free inventory of standard CBMs will be distributed equitably among lending agencies in this operational scenario; some portion of the free inventory (all new E-1s and CT-1s, and those in need of repair (TBD, as noted earlier)), and new TBMs (A-1s, to the extent that they will be used) will be stored in the MSCs.

Section 7
Centralized Repair Option

Section 7

CENTRALIZED REPAIR OPTION

This section of the report outlines the functional design requirements, mode of operation and pro forma operating costs of a central depository/repair facility for machines. The descriptions also include the benefits of implementing such an operation, e.g. a possible reduction in the number of new machines needed annually. The facility would be operated by a private contractor under a multi-year contractual relationship with the NLS, and would have agency status under the proposed Machine Inventory Management System (MIMS) and Custody Accounting System (CAS).

7.1 FACILITY DESIGN PARAMETERS

The central facility design requirements were developed after quantifying machine activity and inventory levels and deployment throughout the network, and after critiquing contractor and warranty repair operations, MLA repair and disposal operations, and NLS disposal operations at Landover. The facility design parameters that will impact the cost, capacity and service effectiveness of the central depository/repair facility are presented below. It is assumed that implementation of such a scenario is, realistically, several years in the future, even if the decision is made today to go forward. Therefore, several assumptions with regard to the workload profile of the center are predicated on this assumption.

7.1.1 Machine Repair Requirement

As discussed in Addendum A, the triage of patron returns in the MLAs will change the definition of what constitutes a repair to cover only those repairs that must be made after opening the machine. Older machines would, however, be fully reconditioned after opening, but newer machines will only be put back in good working order, and reconditioned if they fail QA. Also as previously discussed in Section 3, current repair quality is quite poor, and "repeat" repairs inflate annual reported repair statistics by at least 43% (actually more because some of these repeat again).

With this new definition of repair, all repair requirements for the entire network currently performed, including in-house, volunteer, and present contractor (and possibly warranty depending upon NLS decisions) repair, would be centralized in one repair facility operated by a contractor. Centralized repair is, therefore, the only option that addresses the possible secular decline in future volunteer repair capacity.

The *pro forma* repair requirement for the central facility would be 80,000 machines per year, or 1,600 machines per week, as noted in Exhibit 7-1 below.

Exhibit 7-1

CENTRAL FACILITY MACHINE REPAIR REQUIREMENT REPRESENTATIVE WEEK		
Machine Model	No. of Machines	% of Machines
CBM (Residual TBM)*	1,514	94.6
CT-1	24	1.5
E-1	62	3.9
Total	1600	100.0%

* Virtually all CBM at start-up.

The repair department throughput associated with this level of repair activity will average 340 machines per day, 320 of which will be repaired as good machines (G), and 20 will be scrapped (D).

Machine repair could better be done at a contractor's place of business, if the only mission of the central facility was machine repair. Approximately 3,600 machines are now repaired in this manner by Cintrex Audio Visual, and an additional 3,000 machines are repaired under warranty by Telex. The total present cost for these contractual repair services is $90,000 (labor only) and $550,000 (parts and labor), respectively, per year. The Cintrex costs are a quantifiable goal and potential offsetting savings under all repair options; the question of warranty repair must be determined by the NLS.

7.1.2 Depository Machine Storage

The depository function, as envisioned, would consolidate all free machine inventory into a pool of repairable machines that, if reconditioned, would be available to any MLA when needed. This pooling of excess stock is expected to reduce free inventory by 20%, or 15,000 machines, having a first cost of approximately $2,250,000; this is possible via the "square root law" of inventory consolidation. All network agencies would operate within the guidelines of NLS established working inventory targets.

Repaired machines would be allocated by the NLS in conjunction with the allocation of new machines that would be shipped directly to the MLAs by the manufacturer. There will be no need to store new machines in the central depository, and the storage area has been so sized. However, some new machines could be temporarily accommodated, as a prerogative of the equipment control officer (ECO).

The number of machines in the lending agencies and the MSCs that were not assigned to patrons as of 30 September, 1994 is shown in Exhibit 7-2. Approximately 63% of these machines (all models) are in excess of the recommended working inventory target of 64 machines per 1,000 assigned machines and will therefore be theoretically eligible for depository storage.

Exhibit 7-2

WORKING AND FREE INVENTORY IN THE NETWORK 30 September 1994						
Model No.	Number of Machines					
	Present		Pro Forma MLA		Pro Forma CF	
	Available	In-Repair	Available	In-Repair	Available	In-Repair
TBM*	21,553	4,978	6,956	2,078	14,597	2,900
C-1, etc	28,214	33,785	24,075	7,191	4,139	26,594
E-1	5,350	5,749	1,283	383	4,067	5,366
CT-1	14,456	270	145	43	14,311	227
Total	69,573	44,782	32,459	9,695	37,114	35,087

* Phase Out timing will significantly impact storage needs.

In addition to being a reliable source of machines for the MLAs, the depository will also serve as a reservoir to buffer variations in the rates of defective machine receipt and withdrawal for repair. All machines in depository storage will be bar coded, and both machines needing repair and repaired machines will be randomly stored in mobile shelving. The machines will be stored uncartoned in dust jackets and without batteries or instruction cassettes.

The central facility ADP system will maintain a record of the year of manufacture of each machine in depository storage, and newer machines will be withdrawn for repair before older machines. A backlog of repairable older machines will, therefore, accumulate in depository storage. The oldest of these machines will be terminated when space is needed to store newer machines. The decision to terminate machines solely because of age will thereby be routinely formalized.

7.1.3 Replacement Parts Storage

At rated capacity, the central repair facility will consume virtually all replacement parts other than instruction cassettes and batteries. The parts inventories that are now stored in the NLS and in the MSCs have therefore been relocated to the central facility. Most replacement parts inventories now in the MLAs, and in volunteer and contractor repair facilities, will also be progressively consolidated.

The shelving requirement for NLS and MSC parts inventories as of 30 September 1993 was as follows:

Exhibit 7-3

NLS AND MSC PARTS STORAGE REQUIREMENT 30 September 1993			
Parts Location	Shelf Frontage (Sq.Ft.)		
	12" Deep	18" Deep	Total
NLS	1370	1270	2640
MSCs	190	650	840
Sq. Ft.	1560	1920	3480

Replication of this shelving requirement should adequately provide for all future needs, as random storage, inventory consolidation and centralized parts management will greatly improve storage effectiveness and efficiency while reducing the investment in replacement parts. These measures are expected to provide a one-time savings in parts investment of approximately $1,000,000 (Ref. Appendix 3-13) due to central consolidation.

7.1.4 Machine Supply Storage

The packing materials, accessories, and batteries now stored in the MSCs can be more effectively stored and distributed from the central facility at no net additional cost to the NLS. The storage requirement for these materials as of 30 September 1993 was as follows:

Exhibit 7-4

MACHINE SUPPLY STORAGE REQUIREMENT 30 September 1993	
Product Line	Palletloads
Styrofoam	89
Cartons	64
Accessories	101
Batteries	11
Total	265

Machine supply activity in the MSCs averaged two palletloads per day in 1993. Much of this activity will occur internally under the centralized repair option.

7.1.5 Machine Disposal

The number of machines that were reported as damaged beyond repair in the MMR reports and removed from MLA inventory in FY93 and FY94 are itemized in Appendix 2-3 and summarized below for FY94. However, there is a fair degree of uncertainty in these estimates, because compilation of multiple month MMR activity, and PPHICS extracted data, both have errors associated with them. Furthermore, FY93 activity was considerably greater than FY94 activity. Nevertheless, 16,000 machines is the most reasonable planning value to use, even if TBMs are completely phased out by the time the center is started up.

Exhibit 7-5

NLS MACHINE DISPOSAL ACTIVITY FYE September 1994		
Machine Model	No. of Machines	% of Inventory by Model
TBM	6,715	3.8 %
CT-1	2	-
C-1, etc.	9,450	1.7
E-1	159	.4
Total	16,326	2.1 %

The single largest recipient of machines that are slated for disposal is the Library of Congress facility in Landover, Maryland, the number two recipient was the Arizona reclamation center, and the remainder were locally disposed of. All of these machines were written off of net inventory by the MLAs that disposed of the machines, wherever sent.

At today's prices, the procurement cost of 16,000 CBMs would be $2,450,000. Considering the possibility that a significant portion of these machines could actually be repairable, we therefore suggested that an audit (Ref. Addendum B) be conducted of the condition of machines that are temporarily stored in Landover awaiting disposal. The purpose of the audit would be as follows:

- To determine how well the 57 MLAs, their 301 SLAs, and 288 plus repair groups are assessing the repairability of machines,
- To gain insight into the effects of age on repairability, and
- To determine the practical percentage of machines that could be repaired.

We believe that a salient finding of the audit will be that some 30% of the machines now scrapped could be repaired and returned to service; however, this is supposition only without the audit. We therefore recommend that all machine disposal be centralized at Landover on an interim basis, pending a decision as to the most favorable repair option to pursue. The Landover facility should be staffed and equipped to receive, triage, repair, store and ship machines. In this capacity, Landover would have the agency code DEL, and would officially dispose of machines.

Timewise, the Landover conversion would first apply to all repair options. Disposal operations could then be later transferred to the central repair facility if that repair option is exercised. With Landover in full operation, some 4,500 additional machines per year could be made available (again, a supposition), with a purchase cost savings of approximately $675,000. This quantifiable goal is a potential offsetting savings under all repair options.

For feasibility and costing purposes, the repair/disposal functions that would be performed by an upgraded Landover have been included as a design parameter of the central facility. The increase in central facility throughput required to accommodate these functions would be 65 machines per day, 20 of which would be repaired and returned to service.

7.1.6 ADP Support

The central facility will have an ADP system that is fully compatible with the ADP systems of all agencies, plus the additional capability of bar coded data entry and radio frequency data communication (RFDC) within the facility. This ADP system, in several respects, will be quite similar to the ADP system proposed for the centralized braille distribution centers. Communication with other agencies, including the NLS, would ideally be in an electronic format. However, there will be no patron records and no patron contact at the central facility, and no circulation functions, direct patron access, and several other features necessary for the braille centers. The primary interface requirement with lending agencies is that the processing of conventional transfer transactions must be facilitated.

7.2 FUNCTIONAL BUILDING REQUIREMENTS

For sizing and costing purposes, the central facility is assumed to be a modern, free-standing structure specifically tailored to its appointed use. Design, materials, and workmanship will be first class in every respect, in full conformance with all building codes, and in harmony with the Occupational Safety and Health Act (OSHA) and the Americans with Disabilities Act (ADA). Temperature, humidity, and dust controls and epoxy coated floors will provide a stabilized storage environment for uncartoned machines and a favorable working environment for personnel. Lighting levels and provisions for fire protection will meet or exceed ALA standards.

7.2.1 Building Size and Configuration

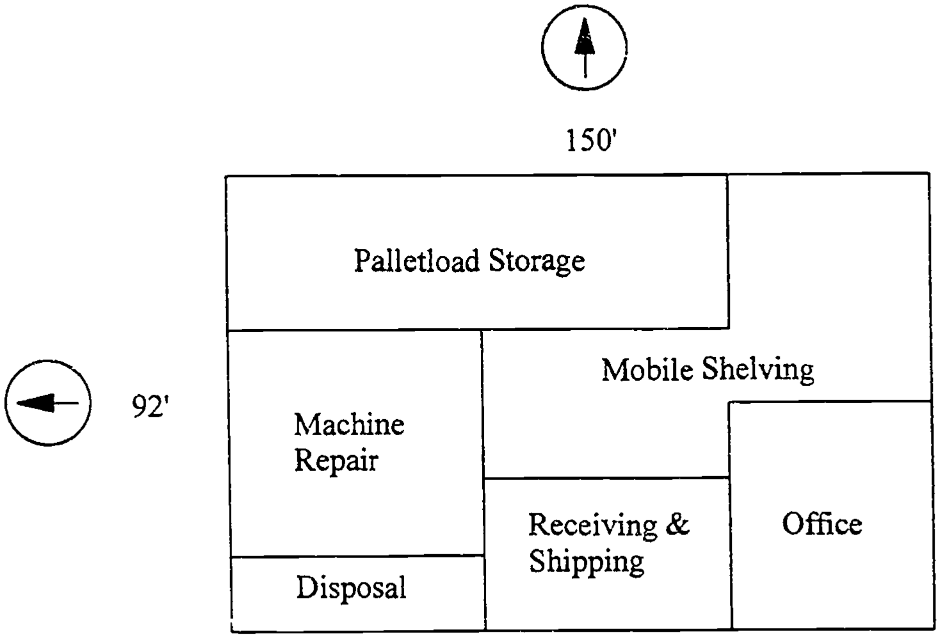
The proposed building configuration, functional adjacencies, and major space allocations are depicted in Exhibit 7-6. The building will have an area of 13,800 square feet and a clear usable storage height of 18 feet. Only fifty percent of total building area will be devoted to the storage function.

7.2.2 Site Size and Configuration

The building configuration, as shown in Exhibit 7-6, is a free standing structure, but the central repair facility could also be designed as an integral part of a larger facility. For example, the Utah State Library has procured a site on which to construct a combination Utah BPH Library, a MSCW, and the western braille center. The site is of sufficient size to also accommodate a central depository/repair facility. Elimination of both MSC equipment operations would provide a quantifiable offsetting savings of approximately $100,000 per year, mainly facility space and labor costs.

Exhibit 7-6

PROPOSED BUILDING CONFIGURATION AND SPACE ALLOCATIONS FOR CENTRAL DEPOSITORY/REPAIR FACILITY



Storage Areas	6,900	Sq. Ft.
Non-Storage Areas	4,600	
Office Areas	2,300	
Total Area	13,800	Sq. Ft.

If a free-standing structure, the central facility should be sited on a parcel of land having a usable area that is at least four times the footprint of the building itself. The minimum acceptable plot size would therefore be 1.7 acres. This coverage ratio will provide adequate room for required setbacks, access and egress roads, off-street parking, truck aprons, utilities, some landscaping, and possible future expansion.

7.2.3 Provision for Expansion

The orientation of functions within the building will permit modular expansion in two directions, with minimum disruption to ongoing operations. All non-storage functions are located at the front of the building, and all storage functions are located at the rear. Expansion to the rear will provide additional storage capacity for machines and supplies, while expansion to the side will accommodate other conceivable, compatible logistics functions. The office area can also be expanded in two directions, but this should not be necessary.

7.2.4 Office Areas

The office area includes a computer room and separate offices for the ECO (if located on-site) and the facility director. The director's office has been sized to accommodate occasional visitors and the director will personally conduct all tours of the facility, as a designated public relations responsibility.

Work stations have been provided in an open office area for a general clerk, who will also provide the limited secretarial support needed, and for an inventory clerk, who will be a full-time assistant to the ECO. Related support equipment includes fax, photocopy and mail machines, files and a time clock. Clerical supplies will be stored in shelf space provided in the machine storage area.

A secured vestibule and reception window are provided for identifying visitors, and one of the clerical staff will always be in attendance. All workers will utilize a passcard to enter the facility through the front door, and will exit through the front door.

The office areas include restrooms, locker rooms, and a common lunchroom for all personnel, and should be sized for a complement of 75 people, 30 of whom would work on the evening shift. Lunchroom equipment should include a full kitchenette and vending machines.

7.3 PROPOSED MODE OF OPERATION

The proposed mode of operation for the central depository/repair facility incorporates the information support and disciplines provided by all agencies, plus bar code scanning and radio frequency data communication (RFDC) within the facility.

7.3.1 Facility Operating Schedule

The proposed central facility operating schedule is as follows:

- **Machine Receiving and Shipping** - will be on a 1-shift schedule, with all receiving performed in the morning hours and all order filling and shipping performed in the afternoon hours. There would be separate Post Office pickups and deliveries to accommodate this operating schedule.

- **Machine Repair** - will be a full 2-shift operation, with an equal number of machines repaired on each shift.

- **Office Functions** - will operate on one shift, but working hours will be staggered to provide time zone coverage for the MLAs served.

7.3.2 Receiving Area

A common receiving and shipping area will be used for all facility input and output functions. The receiving and shipping functions supporting machine repair and depository storage will be separate from those for parts and supplies and will have their own staffing, headed by a supervisor. Receiving and shipping of parts and supplies will be under the repair supervisor.

The receiving and shipping area will be the designated control point for monitoring all machine inventory transactions, and should not be a public place. Access to the area should be restricted to those persons having a well-defined need to be there.

7.3.2.1 Receiving Layout

The receiving area in the central facility will be 50 feet wide x 31 feet deep. There will be two tailgate-height truck spots equipped with wind seals and built-in mechanical dockboards. A bulk storage area of 300 square feet will accommodate both packaging materials and waste. A pedestrian door is provided for driver access, and the door will normally be locked.

The staging area is sized to accommodate 12 USPS pallet boxes for normal receiving activity, and 24 USPS pallet boxes for peak activity. The capacity of a full pallet box is 60 C-1 or E-1 machines, or 15 A-1 or CT-1 machines. Receiving or shipping staging capacity will therefore be 720 or 180 machines, respectively, or any combination thereof.

To the rear of the staging area are two work tables 14 feet long x 4 feet deep. Each table will have two workstations for opening and recording receipts and for packing and recording shipments. The work tables will have a slick top, with a shelf compartment below for storage of receiving and shipping supplies. At the rear of the work tables will be forward ("quick turn") shelving for transient storage of incoming and repaired machines. The shelving is of the same design as the fixed shelving that will be used in the machine storage area, and the shelf locations will be similarly bar coded.

All machines entering the facility will be placed in the forward shelves and all inventory entries will be made while the machines are shelved. Receipts will be recorded at the work stations by the use of Integrated Portable Scanning Devices (bar code scanners) using Radio Frequency Data Communication (RFDC) capabilities. The scanners will also be utilized for data entry when performing stocking and shipping tasks.

7.3.2.2 Forward Shelving

There are 14 sections of cantilever design forward shelving measuring 36" wide x 19" deep, and each shelf section will have 11 tiers. The first seven shelves are reachable from floor level, and the top four shelves can be accessed by ladder cart. Seven-high storage capacity is 1,078 C-1 or E-1 machines, or 196 TBM or CT-1 machines. With an average daily facility throughput of 385 machines, this will be approximately a 2-1/2-day inventory.

7.3.2.3 ADP Equipment

Two computer terminals are required in the area to make receiving, repair, shipping and inventory status inquiries, but most data entry will be from the portable scanners. A printer is also required in the area for printing pick ticket/shipping labels, and the printer must be capable of printing ZIP coded bar codes on the labels for Postal Service use. These labels will be similar in design to those now used for shipping cassettes, except that there will be no return shipping address printed on the back.

7.3.2.4 Bar Code Equipment

The bar code scanning requirement for machine input, storage, repair and output transactions will average 2,300 reads per day. This is more than sufficient reading activity to justify the use of bar coding in the central facility.

A bar code printer will be required to print machine labels with serial numbers in human and machine-readable format; it is again reiterated that NLS should immediately establish an equipment bar coding standard and promulgate this to the network. The printer will also be utilized for printing shelf labels for a computerized stock locator system for depository machines. Six bar code scanners with two-way radio frequency data communication (RFDC) will be needed to maintain communication with the host computer.

All machines entering the facility for repair or disposal that are not bar coded will be bar coded immediately upon receipt. The bar code label should be placed on the handle end of the machine, so as to be fully visible at all times. Any bar coded machine labeling system adopted by an MLA must be in full compliance with the labeling system specified by the NLS, or the labels on incoming machines will be changed.

7.3.2.5 Battery Charging Equipment

Batteries should be removed from all machines by the shipping MLA. Fully charged batteries must therefore be placed in the machines by the receiver before verifying the condition of the machines. These batteries will remain in the machines during the repair processes. A ready supply of fully charged batteries will therefore be needed for both receiving and repair.

We recommend that automated battery charging equipment, similar to the unit designed and installed by the Engineering Department of the Minnesota MLA, be procured for the central facility. The Minnesota battery charger is monitored by a PC, and will automatically test, discharge, charge, and retest (5 times) a bank of batteries in 6 hours without manual intervention. The charger, as designed, should also accommodate lithium ion batteries, which are becoming the battery-of-choice for portable PCs.

The battery charging units should be of modular design, and the suggested module size is 20 batteries. One batch of batteries should be charged on the day shift, a second batch on the evening shift, and a third batch overnight. Based on this charging schedule, 10 battery charging modules will be required. The battery charging area should be secured, and must be ventilated.

7.3.3 Receiving Mode

All machines received by the central facility will be processed in the ADP system as inter-agency transfers, and repaired machines will seldom be returned to the same sender. Receiving data entry is contemplated to be a basically paperless process, and shipping manifests will be telecommunicated directly to the inventory clerk by the sender, for use in tracing errant shipments. These manifests must also be an integral part of the BPHICS/CAS machine custody tracking system.

Average receiving activity in the central facility will be 385 machines per day, of which 320 will carry the MLA assessment of in-repair, and 65 will be classified as scrappable. Following triage, 20 machines will be received as good, 340 will be received as repairable and 25 will be scrapped. This double triage by full-time contractor personnel is expected to reduce the scrap rate by 4,500 machines per year. This quantifiable goal could also be achieved at Landover in the decentralized and regionalized scenarios.

7.3.3.1 Machine Packaging by the MLAs

The MLAs will triage all machines and make minor repairs before making a decision to send machines to the central facility for repair or disposal. Once made, a different packaging procedure will be employed for shipping machines to be repaired and machines to be scrapped. However, instruction cassettes and batteries will be removed from the machines in both instances.

> **Machines for Repair** - The MLAs will affix a pressure sensitive label to each machine on which the symptoms that must be first addressed by the repairers are described. The machines should be packed in their regular cartons, including overpacks, as this packaging must be re-used for shipping repaired machines to the MLAs.

Machines for Scrapping - The MLAs will affix a pressure sensitive label to each machine, indicating that the machine has been assessed as scrappable. The uncartoned machines should then be packed in any appropriate container available.

7.3.3.2 Unpacking Machines

A material handler assigned to the receiving and shipping area will assist the driver in unloading the P.O. truck and, on completion, will uncarton the machines and place them on the work tables within easy reach of the receivers. All usable overpacks, machine cartons and styrofoam inserts will be set aside for re-use in shipping, and all refuse will be sorted and placed in the containers provided in the nearby waste disposal area. Reuse of packing materials is expected to reduce supply costs, but the amount is unknown.

7.3.3.3 Receiving of Machines

To initiate the receiving process, the receiver should check each machine to see if it is properly bar coded and that the label is not damaged and is located on the handle end of the machine. Mislabeled or non-labeled machines should then be bar coded, using a label generated by the bar code printer in the receiving area.

A good battery should then be placed in the machine to begin the triage process, and the symptoms reported on the pressure sensitive label affixed to the machine should be checked for validity. The receiver should also make all minor repairs that can be made without opening the machine. A decision must then be made as to whether the machine is in good condition, is repairable or should be scrapped.

The receiver should then scan the bar code on the machine and enter the appropriate condition status code. For repairable machines, the alleged problem and a defect code must also be entered to complete the receiving data entry. Each defect code will be rated on a scale of 1 to 10, this being a relative measure of the time that should be needed to repair the machine. These defect codes will be used by the computer in allocating uniform batches of work to the repairers.

7.3.3.4 Shelving of Receipts

On completion of triage, the machine will be placed in the forward shelving located immediately behind the receiving station, where separate shelf sections will be assigned to good, repairable, or scrappable machines. The bar code on the machine and the bar code on the shelf will then be scanned to record the shelf location and the receipt of the machine in the inventory record. Machines will remain in this forward location until batched for repair, moved to depository storage, shipped to the MLAs, or scrapped, and these functions will be performed on a daily basis.

7.3.4 Machine Repair Area

Machine repair will be located adjacent to the receiving and shipping area and will occupy an area of 2,250 square feet. All machines needing repair will be delivered to the repair area from receiving or from depository storage on a shelf-type batch cart, and repaired machines will be returned to the receiving area on the same cart. One cartload will be one batch of repair work, and two cartloads will be required per shift. Traffic between the two operations will therefore be minimal.

7.3.4.1 Repair Office

An open office is provided in the repair area for use by the shift supervisors and the machine repair specialists (QC), who will be second in command. In addition to desks and files, the office will have a work table, a computer terminal for making repair data entries, a printer for pressure sensitive batch labels that will later be attached to each machine, and a bar code scanner.

7.3.4.2 Machine Washer

All machines slated for repair must first be disassembled and cleaned in a mechanized washer-dryer. The washing and drying is a batch process, taking approximately 15 minutes, and 90 machines can be batched at one time. A standard commercial solvent is used, and the cleaning area must be ventilated.

7.3.4.3 Repair Workstations

Twenty-three (23) workstations, each with a rated capacity of 7 machines per shift, will satisfy the repair design requirement of 320 machines per day. There will be dedicated workstations for each machine model, and workers will be moved between workstations as required. Additional stations will also be needed for parts salvage, washing and specialized test equipment. A total of thirty-five (35) work stations has therefore been provided in the layout.

7.3.4.4 Parts Crib

Parts cribs will be located along one wall of the repair area, and the repairers will obtain their own working supply of parts. The cribs will be replenished from salvage or by placing requisitions with the parts/supply department, which will be an adjunct of the repair department.

7.3.4.5 Batch Carts

We propose that shelf-type 4-wheel hand trucks be used in the repair area for in-process handling and batch control. The carts will also be used in the receiving and storage areas for both picking of machines for repair and for stocking repaired machines. The cart shelves will be 4-high and of the same cantilever design as the forward shelving in the receiving area. Each cart shelf will be bar coded and this feature will be used in batch control and in machine putaway. The capacity of a full cart is 100 CBM or E-1 machines, or 16 A-1 or CT-1 machines, or any combination thereof. One cartload will be one batch of repair work.

7.3.5 Machine Repair Mode

The repair department will operate on a full 2-shift schedule, and the work will be scheduled in uniform batches of full cartloads, which are expected to contain an average of 85 machines. There will therefore be two batches per shift, and no more than two batches will actually be in process at any time.

Repair persons will be fully qualified to make all repairs, and will fully repair each machine given them. QC inspection will be an ongoing process performed at the work stations, so as to preclude the formal inspection of a completed batch. This QC inspection will be performed by the machine repair specialists, who will also distribute and collect the machines.

7.3.5.1 Batching of Machines for Repair

The ADP system will be programmed to select machines for a batch that will provide a uniform workload for the repairers. Newer machines will have priority over older ones, except when good machines are in short supply, at which time the machines that are easiest to repair will be selected, regardless of age.

Requests for batching will be initiated by either the repair supervisor or the machine repair specialist, using the computer terminal in the repair office. Program output will then be a string of pressure sensitive labels, printed 1-up in storage location sequence, and showing the pick location code, machine serial number, the described symptoms, defect code and rating, and the shelf location on the batch cart where each machine should be placed.

7.3.5.2 Picking of Machine Batches

Most of the machines to be repaired will come from the forward shelving in the receiving area. To pick a batch, the receiver will proceed to the designated storage locations and pick the designated machines, placing the machines on the designated shelves of the batch cart. On completion, the bar code on each machine and the shelf location on the cart will be scanned to confirm that all machines have been picked and properly placed. The receiver will then deliver the batch cart and the string of pressure sensitive labels to the repair department.

7.3.5.3 Cleaning of Machines

To begin the repair process, the batch cart will be taken to a workstation near the washer where the machines will be disassembled prior to washing. After washing, the appropriate pressure-sensitive batch label will be affixed to each machine, and the machines will be placed back on the cart in their designated shelf location, awaiting distribution to the repair stations.

7.3.5.4 Machine Dispatch, Repair and QC Inspection

The repair specialist will give machines to workstations based on anticipated repair time and the special skills of individual workers. After distributing the full batch of machines, the repair specialist will then patrol the area to QC and retrieve repaired machines, advise the repairers on how best to proceed with problem machines, and QC machines for disposal.

After QC inspection, an average of 80 machines per batch will be classified as good and five will be classified as scrapped. The pressure sensitive labels on the machines will be coded accordingly, using a felt-tip marker. The machines will then be placed in their designated shelf location on the batch cart. On completion, the repair specialist will scan the bar code on each machine to confirm that all machines in the batch have been accounted for. The full batch cart will then be delivered to the receiving department.

7.3.5.5 Shelving of Repaired Machines

The receiver will place machines marked good and machines marked scrappable in separate sections of the forward shelving. The condition code will then be keyed into the bar code scanner, and the bar codes on the machines and on the shelves will be scanned. This scanning will simultaneously enter the change of condition status and the shelf location of each machine in the inventory record, and will automatically create a record of the number of machines repaired. The computer will then be queried to verify that all machines in the batch have been accounted for.

7.3.6 Machine and Parts Storage Area

Machine and parts storage will occupy an area of 3,800 square feet. Parts storage will be located to the rear of the repair area, and machine storage will be located behind the receiving/shipping area and the office area. The contemplated machine and parts storage modes are fully compatible, and machines will occupy approximately 82% of total storage space.

7.3.6.1 Mobile Shelving Storage System

We recommend that powered mobile shelving be used for the storage of all depository machines, small supplies, and all replacement parts except batteries. All machines will be stored uncartoned, in plastic dust jackets, and without instruction cassettes or batteries. A shelf opening will accommodate 11 C-1 or E-1 machines, or two A-1 or CT-1 machines, and the shelving will be 11 openings high. Repair parts will be stored in both tote boxes and in their original containers.

7.3.6.2 Module Size

A typical storage module of mobile shelving, including end aisles, will occupy an area of 30 feet x 50 feet, and will consist of mobile shelf ranges that roll on rails imbedded in the floor, one fixed shelf range, and one 4'-3" wide moveable aisle. Mobile ranges will have shelves 13" or 19" deep, and fixed ranges at the column lines will have shelves 19" deep. Each range will contain 14 back-to-back cantilever shelf sections 3 feet wide x 11 shelves high, and will be 42 feet long. All ranges will have top canopies, and the mobile ranges will have overhead anti-tilt protection devices. Controls for moving the ranges will be located on both end panels of each range.

7.3.6.3 Module Lighting

The lighting fixtures in a mobile storage module will be ceiling mounted and the rows of fixtures will be oriented at right angles to the module aisles. The minimum clearance below fixtures will be 13'-0". Each module will be independently wired, and the lights will be turned on or off at a control panel located on the end panel of the fixed shelf range. The modules will not be lighted except when in use.

7.3.6.4 Floor Load Capacity Requirement

The live load in a fully occupied storage module will be 604,800 pounds. This live load will be carried on rails imbedded in the floor, rather than on the floor itself. Assuming that the rails will be designed and installed to evenly distribute the load throughout a storage module, the minimum load-bearing capacity required of the floors in the stack areas will be 430 pounds per square foot. This floor loading capacity should be given to the selected architect, as a building design parameter.

7.3.6.5 Storage Capacity Provided

Two and one-half modules of mobile shelving are provided to satisfy the design requirement. The number of shelf sections in the proposed mobile shelving storage system, and the resultant parts and machine storage capacity, are detailed in Exhibit 7-7 below.

Exhibit 7-7

MOBILE SHELVING STORAGE CAPACITY PROVIDED		
Capacity Allocation	Shelf Sections 13" Deep	Shelf Sections 19" Deep
Total Shelving Provided Required for Parts and Supplies	281 52	364 64
Available for Machine Storage	229	300
C-1 or E-1 Capacity @ 121 Machines/Section	27,700 Machines	
A-1 or CT-1 Capacity @ 22 Machines/Section		6,600 Machines

As noted, storage capacity has been provided for over 27,700 C-1 or E-1 machines, and 6,600 A-1 or CT-1 machines. In the event that this storage ratio should change, the C-1 or E-1 machines could be stored in 19" deep shelves. The resultant increase in storage capacity would be 99 machines per shelf section (121-22). Thus, if only C-1 and E-1 machines were stored in the central facility, capacity would be 64,000 machines. In all likelihood, very few TBMs would be stored in the center given a start-up date several years out (assuming the planned phase-out of TBMs is implemented). Similarly, it has been assumed that with CT-1 production ceased the MSCW stock would be reduced by a level that the above design parameter satisfies.

7.3.7 Storage Mode

As previously noted, the mobile shelving will be 11-high. The first seven shelves are reachable from floor level, and will be utilized for storing the most active machines and parts. The top four tiers are reachable with ladder carts, and will be utilized for storing inactive machines and slow moving parts.

7.3.7.1 Bar Coding of Shelf Locations

We propose that every shelf location in the storage area be bar coded with a unique identification number, so that each machine and machine part will have a machine-readable and human-readable storage location. The bar code label will be positioned on the front lip of each shelf so as to be readily visible for scanning. There will be one location number per 3-foot wide shelf, and all machines, toteboxes or containers in a shelf opening will have the same location number. A similar locator system will be utilized for pallet racks in the supply storage area.

The locator record is an adjunct of the inventory record and the computer will be programmed to reject any inventory entry that does not have an accompanying storage location. This built-in safeguard will ensure that all inventory on premises is always accounted for.

7.3.7.2 Stock Locator Numbering System

The proposed shelf numbering system consists of an alpha character to designate the storage module locations and four numeric characters to designate the shelf opening. There are 2,770 shelf openings in a typical storage module. The first and last shelf number in a storage aisle will be prominently displayed on the end panels of each shelf row.

The shelf openings are numbered by aisle, bin section and tier, in a grid pattern that will enable workers to readily locate stock, and the pick tickets for order filling will be printed in optimum picking sequence. This will greatly reduce travel and search time, thus enhancing picking accuracy, productivity and service effectiveness.

7.3.7.3 Random Storage

The bar coding of machines, toteboxes, containers and shelf locations also permits the individual storage units to be randomly stored. This state-of-the-art storage technique requires no pioneering, and will greatly increase storage density. Shelving costs, construction or lease costs, and occupancy costs will accordingly be reduced an estimated 15%.

7.3.8 Supply Storage Area

Machine supply storage will be located at the rear of the building, and will occupy an area of 3,100 square feet. A traffic aisle 12 feet wide connects the storage area with the receiving and shipping area.

7.3.8.1 Palletload Handling System

All supplies that are not received on vendor pallets will be unitized on standard 48"x40" pallets as received. A reach-type electric fork lift truck will be utilized for palletload stocking and retrieval in the storage area, and a manual pallet jack will be utilized for palletload handling in the receiving and shipping area. The battery charger for the reach truck will be located in the dock area.

7.3.8.2 Palletload Storage System

The palletload storage system consists of 3-high 4-deep floor stacks and 3-high 1-deep pallet racks, and usable stack height in the storage area must be 18 feet. A capacity of 348 palletloads has been provided, consisting of 96 pallet positions of rack storage, and 252 pallet positions of floor storage. This is 30% greater than the identified storage design requirement of 265 palletloads (Exhibit 7-4).

7.3.9 Order Filling and Shipping Mode

The proposed order filling and shipping methodology is designed to ship good machines to any agency, disposed-of machines to authorized salvage parties only, and on rare occasions, repairable machines to any agency. Good machines will be shipped in master carton quantities only.

Order filling and shipping activity will average 340 good machines and 10 disposed-of machines per day. Some 300 good machines will come from the forward shelving in the receiving area, and 40 will come from the stacks. There will be separate pick batches for good, disposed-of, and repairable machines.

7.3.9.1 Batching of Machines for Shipment

The ADP system will be programmed to provide a uniform daily shipping workload, and there will be four batches of 85 pick tickets each on an average day. Newer machines will have priority over older machines in making up a day's shipping workload. The first three batches will therefore usually contain only machines located in the forward shelves of the receiving area, while the fourth batch will also contain machines from the stacks.

The newest machine available for a day's orders will be assigned the transaction serial number 001, the next newest machine the serial number 002, etc. These serial numbers will assist the pickers in sorting picked machines into master carton packing sequence prior to packing. This sorting will be done at sorting tables in the packing area, where a marked zone will be allotted to each 10 machines.

Requests for batching will be initiated by a delegate of the NLS, using a computer terminal in the main office. Program output will then be a string of pick ticket/shipping labels, printed 1-up in pick location sequence. The pick tickets will be of similar design to those now used in shipping cassettes, and will display the pick location, machine model and serial number, name and address of the recipient, and the transaction serial number assigned to each machine. The machine serial number and the zip code of the recipient will be printed in both machine-readable and human-readable format.

7.3.9.2 Picking Machine Batches

All machines will be picked and packed in the afternoon hours, after all receiving has been completed, and the receivers will become picker/packers. The receiving tables will be used for sorting and packing the picked machines. A team of two picker/packers will be assigned to a pick batch, and two pick batches will be processed concurrently.

The pickers will first remove a string of pick tickets from a print run and proceed to the designated shelf area. They will then pick the first designated machine, attach the pick ticket to the machine with pressure sensitive tape, and place the machine on a batch cart. When all machines in the batch have been picked, the pickers will take the batch cart to the sorting and packing area.

7.3.9.3 Sorting and Packing Machines

Both sorting/packing tables will be lined into 10 sorting zones, to correspond with the last two digits of the transaction serial numbers on the pick tickets. The pickers will place the picked machines in their designated sorting slots, and then scan the bar codes on the machines to confirm that all machines in the batch have been picked and that each machine is in its proper sorting slot.

The pickers then proceed to pack each machine, re-using the packing materials obtained from the morning's receipts. The bar code on the machine and the bar code on the label are first scanned to insure that they match. The carton is then closed, and the packer places the bar coded shipping label in a clear plastic envelope affixed to the carton.

On completion, the packers proceed to overpack the machines in master cartons, in strict transaction serial number sequence. The shipping label on the last carton packed will be removed from its plastic envelope before closing the master carton. This label will serve as the shipping label and will be placed in a clear plastic envelope affixed to the master carton.

7.3.10 Stocking Mode

Stocking activity will consist of transferring machines from the forward shelf area to mobile shelving storage. This function will always be performed in the morning hours, so that all new storage locations will be in the database before the order-filling runs for the day are made. Batch carts will be used in making all stock transfers, and a full or partial cartload will constitute a stocking task assignment.

With an estimated 85% of the shipping requirement coming from the forward shelves, 15% of all repaired or repairable machines must later be transferred to the stacks, but not necessarily the same day. The forward shelving in the central facility has been sized to accommodate one full day's receiving/repair activity, plus six days carryover, and not all forward shelves need be cleared in any one day. This buffer storage provides a scheduling flexibility that will help balance day-to-day variations in the workload.

To initiate a transfer to the stacks, the stocker will fill a cart with machines from the forward shelves, making sure that each shelf opening is emptied, and sorting the machines by model as they are placed on the cart. The serial numbers on the machines and on the cart shelves will then be scanned to record the in-transit locations. The emptied shelves in the forward area will also be scanned to confirm that the stock location record has been cleared, and to account for all machines.

The stocker will then proceed to the appropriate storage zone in the stacks and place the first machine in the first available location. The bar code on the machine and its new shelf location will then be scanned to record the new location and to delete the in-transit location; once a bar code on a machine has been scanned, another machine will not be able to be scanned until the shelf location bar code has been scanned. When a cart shelf is emptied, the shelf label will be scanned to confirm that the stock location record has been cleared and to account for all machines. This process will be repeated until the cart is empty.

7.3.11 Waste Disposal Area

The central facility will generate a sufficient volume of disposable and recoverable waste to necessitate a formalized waste disposal program, including special accommodations for hazardous materials, such as spent batteries. Appropriate waste processing equipment, such as sorting bins, shredders, compactors, and balers will therefore be required.

An 800 square foot waste disposal area has been provided adjacent to receiving and to machine repair for this equipment. Approximately 50% of the waste processed will be generated by receiving and 50% by machine repair. The area will also contain the machine washer and the battery chargers. Organizationally, waste disposal will be part of the salvage section of the repair department.

Any batteries received with disposed machines will first be cycled through the battery chargers. The expected recovery rate is 20%.

7.4 SPACE REQUIREMENTS AND COSTS

7.4.1 Construction Costs

The *pro forma* building construction costs for the central facility assume that the chosen site location will be Salt Lake City, Utah; this assumption is subject to change. The cost estimates, as presented in Exhibit 7-8 below, are in 1993 dollars, and include the cost of land and site preparation in addition to the cost of construction. These estimates were obtained from the Building News

General Construction 1993 Costbook, and include geographic cost modifiers for adjusting national average costs to local costs.

Exhibit 7-8

PRO FORMA BUILDING CONSTRUCTION COSTS		
	Warehouse	Office
National Average Cost per Square Foot Geographic Cost Modifier	$45.30 .81	$54.60 .81
Local Cost Per Square Foot	$36.69	$44.23
Total Area (Sq. Ft.)	11,500	2300
Total Area Costs	$421,900	$101,700
Total Facility Costs	$523,600	
Costs Per Square Foot	$37.94	

7.4.2 Leasehold Costs

The cost estimates assume that the central facility will be a built-to-order, free-standing structure, and the building could be either purchased outright or leased. If leased, the annual lease costs would be approximately 10% of the first costs, or $52,400, which is also equivalent to a 30-year fixed-rate annuity of the principal at 9.3% per annum.

7.4.3 Building Occupancy Costs

Annual occupancy costs would be approximately 5% of first costs, or $26,200. These costs would include: all utilities; maintenance of buildings, equipment and grounds; janitorial services; security; and, city services.

7.4.4 Potential Savings in Space Costs

The present and *pro forma* lease and occupancy costs of MSC, Landover and NLS functions that would be relocated to the central facility are detailed in Exhibit 7-9 below.

Exhibit 7-9

PRO FORMA REDUCTION IN NLS SPACE REQUIREMENTS AND COSTS							
Facility Description	Present Space		Pro Forma Space		Net Reduction		Percent Reduction
	Square Feet	Annual Cost ($)	Square Feet	Annual Cost ($)	Square Feet	Annual Cost ($)	
MSC East	16,000	71,040	13,890	61,670	2,110	9,370	13%
MSC West	35,370	113,180	25,930	76,570	11,440	36,610	32%
NLS Parts Landover	2,300	35,880	-		2,300	35,880	100%
Total Sq. Ft.	53,670		37,820		15,850		30%
Annual Cost		$220,100		$138,240		$81,860	37%

These annually recurring costs include space rental, heat, and power. As noted, 15,850 square feet of present MSC, Landover, and NLS parts space will be surplused by consolidation in the central facility. Vacating this surplus space will generate a gross savings of $81,860 per year. After deducting space and occupancy costs of $78,600 per year for the central facility, there would be a small decrease in NLS cost of $3,260 per year.

7.5 EQUIPMENT REQUIREMENTS AND COSTS

7.5.1 Floor Operations

The *pro forma* equipment costs for the floor operations in the central depository/repair facility are presented in Exhibit 7-10 below. The cost estimates are in 1993 dollars, and include the delivered and installed price of all equipment that will be utilized in receiving, stocking and shipping machines, parts and machine supplies, and in repairing machines, except for bar code scanners, printers, and computer terminals.

Exhibit 7-10

PRO FORMA EQUIPMENT COSTS, FLOOR OPERATIONS

Description	Unit Cost	Number of Units	Total Cost
Mobile Shelving Modules	$165,000	2.5	$412,500
Receiving Work Tables	800	3	2,400
Shelf Carts	440	8	3,520
Ladder Carts	560	1	560
Hand Pallet Jacks	800	1	800
Package Scales	800	1	800
Tape Dispensers	360	2	720
Pallet Racks (positions)	40	66	2,640
Pallets	10	300	3,000
Fork Lift, Battery, Charger	27,000	1	27,000
Repair Work Stations	2,000	35	70,000
Machine Cleaner	15,000	1	15,000
CBM Battery Charging Units	2,000	10	20,000
Waste Processing Equipment	40,000	Lot	40,000
Total Equipment Cost			$598,940

As is readily apparent, the most significant equipment cost will be mobile shelving. When weighing the tradeoffs between mobile shelving costs, building constructions costs, and occupancy costs, the economics of mobile shelving have proven to be highly favorable.

The required equipment could be either purchased outright or leased. If leased, the annual lease costs would be approximately 10% of first costs, or $59,900, which is also equivalent to a 30-year fixed-rate annuity of the principal at 9.3% per annum.

7.5.2 Office Operations

In addition to the first costs enumerated in Exhibit 7-10, there will also be a startup cost associated with office equipment. This cost is estimated at approximately $15,000, exclusive of ADP and telecommunications equipment. Office equipment includes desks, chairs, tables, file cabinets, booksnelves, lockers, lunch room equipment and other general and miscellaneous office assets, but excludes expendable materials and supplies.

7.6 STAFFING REQUIREMENTS AND COSTS

The *pro forma* staffing requirements and labor costs for all central facility operations are presented in Exhibit 7-11 below. The rates used in calculating the annual costs of a worker are in 1993 dollars, and include a fringe benefit loading of 30%.

Exhibit 7-11

PRO FORMA LABOR REQUIREMENTS AND COSTS

Description	Workers Required	Annual Cost Per Worker	Total Annual Labor Costs
Facility Manager	1	$ 48,130	$ 48,130
Equipment Control Officer	1	43,320	43,320
Receiving/Shipping Supervisor	1	43,320	43,320
Machine Repair Supervisors	2	43,320	43,320
Office and Floor Clerical	2	25,200	50,400
ADP Operator	1	38,940	38,940
Receive, Screen, Stock and Ship Machines	5	26,120	130,600
Receive, Stock and Ship Parts and Supplies	2	26,120	52,240
Machine Repair Specialists (QC)	2	35,020	70,040
Machine Repairers	48	26,120	1,253,760
Total	65		$ 1,817,390

The staffing estimates assume a productive workday of 7.5 hours. Including two 15-minute rest breaks and a 1-hour lunch break, the total on-premise time of each staff member will be 9 hours per day. As noted, the total staffing at rated repair capacity will be 65 workers. There will be 39 workers on the day shift and 26 workers on the evening shift.

Section 8
Cost-Benefit Analysis

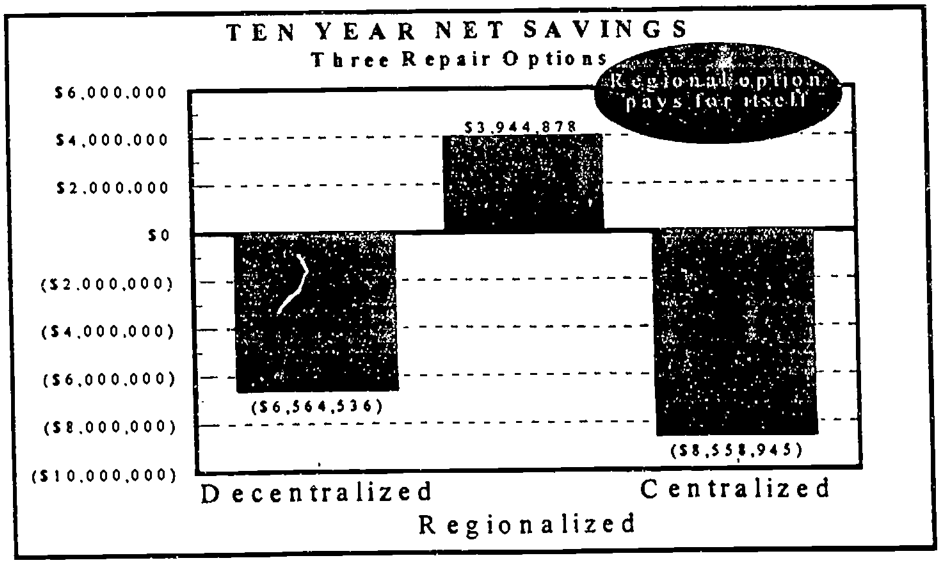
Section 8
COST BENEFIT ANALYSIS

This section of the report presents a cost benefit analysis of the three repair options. Costs that are not directly related to the repair options, such as those associated with the implementation of recommended inventory management systems and procedures at the national and network level, are not computed as they will be essentially the same regardless of which option is implemented. Thus the cost analysis is a comparison of the incremental net costs for alleviating the various repair-related problems cited in this report. Costs have been estimated for a ten-year period using a four percent inflation factor starting in the second year. The relative benefits, both monetary and otherwise, of the three scenarios are also discussed along with the study team's estimation regarding the degree to which each scenario is likely to achieve the stated quality objective.

8.1 TEN-YEAR NET SAVINGS

The estimated incremental costs and savings for each of the three repair options developed were calculated for a ten-year period. Net savings (i.e., savings less costs) were then computed to identify the option that yielded the greatest net savings. This analysis showed that the Regional Repair Option was the only one of the three scenarios to yield greater savings than costs. Exhibit 8-1 below summarizes this result. Detailed costs and savings information is provided in Sections 8.2 and 8.3.

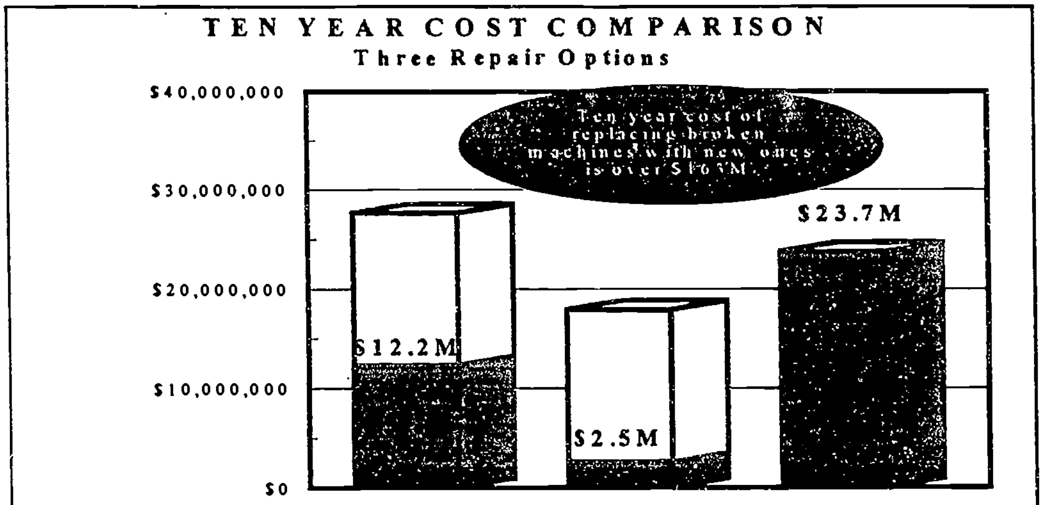
Exhibit 8-1



8.2 PROJECTED TEN-YEAR COSTS

The estimated cost of each repair option was projected for a ten-year period. The results of this effort are shown in Exhibit 8-2 below.

Exhibit 8-2



	Decentralized	Regionalized	Centralized
Realized Cost	$12,295,696	$2,561,282	$23,737,123
Value of Vols	$15,367,817	$15,367,817	

This exhibit clearly shows the Regionalized approach to be the most cost efficient. Over the ten-year project span, the NLS will spend about $5.5 million less on the regional option than the decentralized option, and $21.2 million less than the centralized option. The significant difference is, simply, labor. Specifically, if volunteers are currently performing 90% of the "true" repair requirement of 80,000 CBMs per year, and average parameters of 1.5 hours/repair (the NLS and various other parties have cited this as the best figure to use), $16/hour (BLS national average unloaded rate for electrical technicians), and a 30% loading rate (a good average load rate), then the annual value of volunteer repair labor is approximately $2,250,000. Also, the regionalized option requires fewer NLS staff than the decentralized option because there are far fewer repair sites to manage. Additionally, the centralized option suffers from the fact that the current free labor, which as cited above has a value of over $2 million per year, is replaced by contract labor. The other significant costs are for constructing and equipping a facility under the centralized scenario. Repair parts consumption was assumed to be equal under all three scenarios because there is no statistical data available to the study team to suggest otherwise.

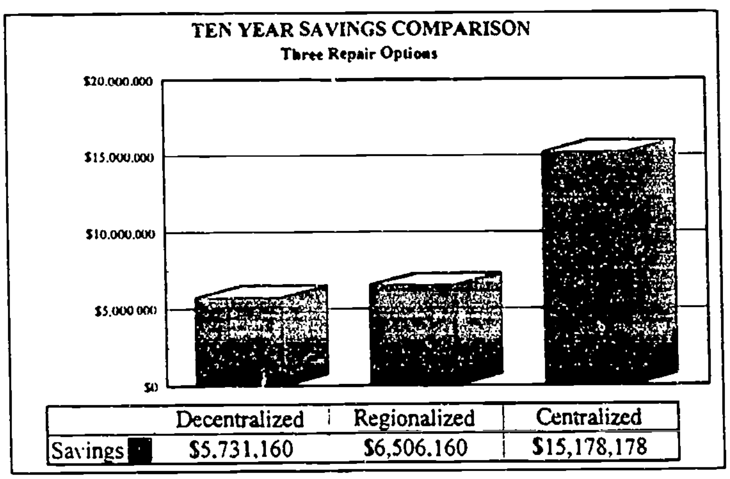
As a way of providing a check on any of the options' total costs, the study team estimated the cost of throwing away machines needing repair (except for triage) and simply replacing them with new ones. At an annual rate of 80,000 replacements per year, the ten-year cost is estimated to be $163,283,057. Obviously, all three options are extremely viable in this context and, conversely, the replacement of broken machines with new ones is not viable. This cost analysis tells the study team that the repair problems must be addressed, and either largely mitigated or totally eliminated.

Appendix 8-1 details the year-by-year and item-by-item incremental cost of each option. Appendix 8-2 details the year-by-year and item-by-item incremental savings of each option. Appendices 8-2 through 8-4 provide cost build-up data for the decentralized and regionalized scenarios; Section 7 contains the cost build-up data for the centralized scenario.

8.3 SAVINGS

Savings for each repair option developed were calculated. These are discussed in the numbered subsections below, and are summarized in Exhibit 8-3.

Exhibit 8-3



8.3.1 Decentralized Repair Option Cost Savings

The decentralized repair option's cost savings would accrue from the elimination of: the current E-1 repair contract with Telex ($64,000/year); the current CT-1 contract with Telex ($25,000/year, estimated); the current CBM repair contract with Cintrex ($91,000/year); and the NLS QC costs, both travel and labor, of monitoring the current Cintrex contract.

A "one-time" (although probably realized over two or three years) savings of $3,450,000 would be realized by a permanent reduction of 23,000 CBMs in the "repair pipeline", i.e. repair queues and in-transit, due to improvements in repair capacity and, especially, quality. This estimate was based upon the cost of a new machine (net of warranty, battery and instruction cassette), which has a "liberal" influence. However, the estimate uses only the reduction of machines in the repair queues as a realized savings (23,000), whereas working inventory (in repair plus assignable) will, in fact, be reduced by almost 33,000 machines almost exclusively due to repair improvements, which has a "conservative" influence. The above estimate used is therefore both a compromise, and robust.

8.3.2 Regionalized Option Cost Savings

The incremental savings associated with the implementation of the regionalized scenario are identical to those listed above for the decentralized scenario, with one notable addition; there would be a "one-time" savings (occurring over two-or-three years) associated with the consolidation of repair parts in 20 locations versus the current, or decentralized, repair operations. The magnitude of these savings, calculated via the "square root law" of inventory consolidation, is estimated at $775,000.

8.3.3 Centralized Option Cost Savings

The incremental savings associated with the implementation of the central repair scenario include those of the regionalized model, except the savings from repair parts consolidation in one location is estimated to be a "one-time" savings of $950,000. Five other areas of savings were also identified and quantified, which are: 1) $250,000/year for the estimated 10% of repairs now performed by agency in-house staff that will be performed by the center; 2) $100,000 per year for the equipment, supplies and parts operations now conducted at both MSCs, which will be handled by the center; 3) $10,000 per year for the facility space occupied at Landover, MD housing disposals, which will be handled by the center (regardless of the results of the audit described in Addendum B; the center will simply scrap if the audit results are unfavorable); 4) $65,000 per year for the parts operation currently conducted by the NLS in Washington, D.C., which will be handled by the center; and, 5) a "one-time" (to be realized over two-to-three years) savings of $2,250,000 (15,000 machines @ $150) due to the consolidation of free inventory in one location, which is not possible in current operations due to complete decentralization of the CBM inventory, and which is not possible under either of the two other alternative scenarios developed.

Lastly, two other adjustments, not truly savings, must be taken into account in offsetting the listed costs for the central scenario for these comparisons. They are: 1) ECO loaded labor costs ($43,320 annually), which have been counted in the central facility costs, but not in the other two scenarios, and will be equally necessary in all three approaches; and, 2) disposal reclamation costs of approximately $52,000 annually, which is predicated upon a successful result in the disposal audit, is counted in the labor costs of the central facility, but is not counted in the other two options' costings.

8.4 OTHER BENEFITS AND RISKS

The benefits and risks associated with the implementation of each option are addressed below.

8.4.1 Control

There can be no question that the central repair option provides the greatest degree of control over machine repair. Through its contractual authority, the NLS would have powers over the repair operation that simply cannot be exercised with the volunteers, regardless of any central coordinating and monitoring entity created for that purpose.

8.4.2 Quality

The study team believes that the opportunity for achieving and sustaining the 95% quality goal is greatest under centralization. The regional approach will provide the next best opportunity because of the relatively limited number of repair sites involved in the effort. The study team believes that the 95% goal may never be achieved with decentralization, and that some pockets of poor performance will continue to persist regardless of the controls put in place by the NLS.

8.4.3 Feasibility

The centralized and decentralized concepts are extremely feasible. The central concept can be implemented successfully in a few years, while the decentralized concept can be put in place in an even shorter amount of time (one year or less). However, the regionalized concept remains a theory with these unanswered questions:

- Can 15 to 25 sites provide NLS the manhours needed to repair 80,000 machines per year?
- Are there enough willing and able large groups to make this viable?
- How will workload be distributed among the groups (uniformly)?
- Will inequities in repair services exist, and for how long?
- Do the large groups have the facility space for the storage volume of machines contemplated?
- What changes in their modes of operation will need to be made to support scope and level of service that will be required?

8.4.6 Volunteer Labor Availability

Discussions with the volunteer leadership across the country (all TP regional coordinators and Elfun national level personnel) indicated that a small decrease (estimated at five percent) in the pool of volunteer labor available to repair machines will occur over the next few years. This would not affect the central concept, and would probably not significantly impact the decentralized concept either. Depending on where the decreases occurred, the impact on the regional concept could range from nonexistent, to very significant; again, further follow-up direct contact with the larger volunteer groups will be necessary in order to determine implementation feasibility.

APPENDICES

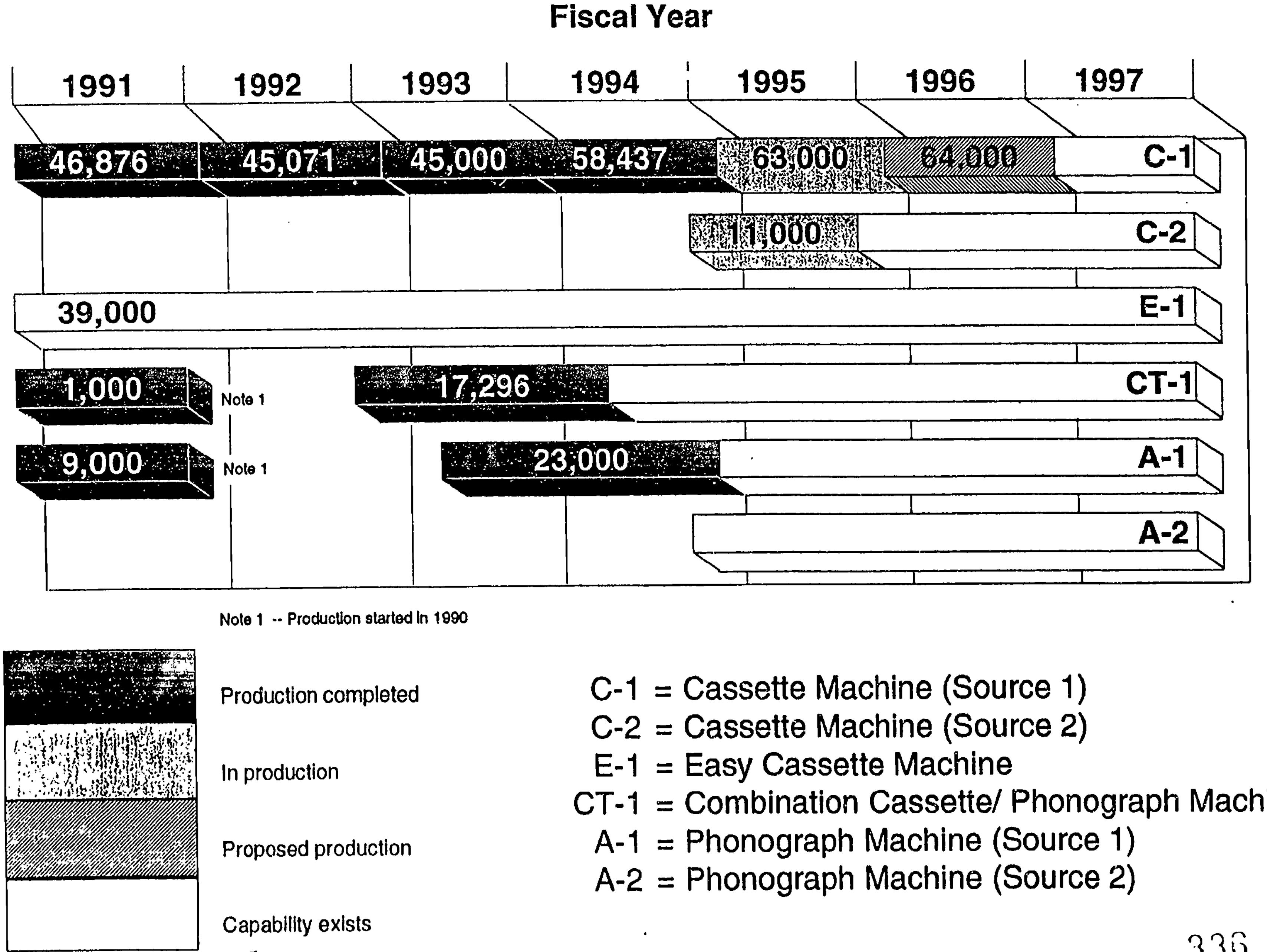
Study II, Part 1, Phase 2

Appendix 1-1
Site Visits Performed
Study II, Part 1
(Excludes Quality of Repair Site Visits)

SITE VISIT	DATE	LOCATION
NLS-Equipment Staff	10/6/93-10/7/93	Washington, D.C.
Florida RL	10/12/93-10/15/93	Daytona Beach, FL
Data Management Assc.	10/14/93	Palm Bay, FL
Arizona RL	10/18/93-10/20/93	Phoenix, AZ
Cintrex Audio Visual	10/21/93	St. Louis, MO
Minnesota MLA	10/25/93-10/26/93	St. Paul, MN
Telex Corp.	10/27/93	Blue Earth, MN
Pennsylvania RL (W)	11/2/93-11/3/93	Pittsburgh, PA
Elfuns Repair	11/4/93	Cincinnati, OH
Multistate Center East	11/4/93	Cincinnati, OH
North Carolina RL	11/17/93	Raleigh, NC
Virginia RL	11/18/93-11/19/93	Richmond, VA
Virginia SRL	11/22/93	Fairfax, VA
NLS-Disposal Operations	11/23/93	Landover, MD
North Carolina RL	8/1/94 - 8/2/94	Raleigh, NC
Kentucky RL	8/3/94 - 8/4/94	Frankfort, KY
Texas RL	8/10/94 - 8/12/94	Austin, TX
Multistate Center West	8/15/94 - 8/17/94	Salt Lake City, UT

The Library of Congress
National Library Service for the Blind and Physically Handicapped

Machine Production Schedule



C-1 = Cassette Machine (Source 1)
C-2 = Cassette Machine (Source 2)
E-1 = Easy Cassette Machine
CT-1 = Combination Cassette/ Phonograph Machine
A-1 = Phonograph Machine (Source 1)
A-2 = Phonograph Machine (Source 2)

Appendix 2-2
C-1 Machine Allocations, FY94

CODE	AGENCY	FY94 C-1 ALLOCATION FORMULA RC indiv	4x RC depos	Total RC readrs	46700 % of network	C-1s frm 46,700
AL9	ALA RL	4,619	648	5,267	1.08%	504
AK9	ALASKA RL	734	364	1,098	0.23%	107
AZ9	ARZ MLA	10,350	3,284	13,634	2.80%	1308
AR9	ARK RL	4,196	776	4,972	1.02%	476
CA8	CAL LA RL	15,658	3,264	18,922	3.89%	1817
CA9	CAL SAC RL	15,561	3,108	18,669	3.84%	1793
CO9	COL RL	9,048	2,624	11,672	2.40%	1121
CT9	CONN RL	6,715	1,000	7,715	1.58%	738
DE9	DEL RL	981	248	1,229	0.25%	117
DC9	DC RL	1,950	320	2,270	0.47%	219
FL9	FLA RL	32,014	4,908	36,922	7.59%	3545
GA9	GA RL	10,554	4,540	15,094	3.10%	1448
HI9	HI RL	1,005	0	1,005	0.21%	98
ID9	ID RL	2,447	184	2,631	0.54%	252
IL9	ILL RL	16,140	7,648	23,788	4.89%	2284
IN9	IND MLA	8,909	2,332	11,241	2.31%	1079
IA9	IO RL	3,684	2,068	5,752	1.18%	551
KS9	KS RL	5,802	2,572	8,374	1.72%	803
KY9	KY RL	4,752	1,368	6,120	1.26%	588
LA9	LA MLA	3,377	700	4,077	0.84%	392
ME9	ME RL	2,688	0	2,688	0.55%	257
MD9	MD RL	3,529	720	4,249	0.87%	406
MA9	MA MLA	13,310	3,244	16,554	3.40%	1588
MI9	MI LAN RL	15,217	3,608	18,825	3.87%	1807
MI8	MI WYN RL	2,892	528	3,420	0.70%	327
MN9	MN MLA	7,423	984	8,407	1.73%	808
MS9	MISS RL	2,018	404	2,422	0.50%	234
MO9	MO RL	9,624	2,592	12,216	2.51%	1172
MT9	MONT RL	2,461	444	2,905	0.60%	280
NE9	NEB RL	3,154	1,220	4,374	0.90%	420
NV9	NEV MLA	1,154	32	1,186	0.24%	112
NH9	NH RL	1,923	264	2,187	0.45%	210
NJ9	NJ RL	8,598	852	9,450	1.94%	906
NM9	NM RL	2,521	752	3,273	0.67%	313
NY8	NYC RL	12,267	1,436	13,703	2.82%	1317
NY9	NY ALB RL	17,579	8,660	26,239	5.39%	2517
NC9	NC RL	7,386	1,184	8,570	1.76%	822
ND9	ND MLA	1,760	504	2,264	0.47%	219
OH9	OH MLA	16,100	4,448	20,548	4.22%	1971
OK9	OK RL	5,222	884	6,106	1.25%	584
OR9	OR RL	7,090	884	7,974	1.64%	766
PA9	PA PITT RL	8,340	1,132	9,472	1.95%	911
PA8	PA PHIL RL	10,248	1,596	11,844	2.43%	1135
PR9	PR RL	964	232	1,196	0.25%	117
RI9	RI RL	1,539	248	1,787	0.37%	173
SC9	SC RL	7,216	888	8,104	1.66%	775
SD9	SD RL	2,174	1,612	3,786	0.78%	364
TN9	TN RL	4,626	632	5,258	1.08%	504
TX9	TX RL	24,047	6,604	30,651	6.30%	2942
UT9	UTAH RL	4,600	464	5,064	1.04%	486
VT9	VT RL	1,536	52	1,588	0.33%	154
VA9	VA RL	7,766	1,276	9,042	1.86%	869
VI9	VI RL	150	28	178	0.04%	19
WA9	WA RL	8,293	1,176	9,469	1.95%	911
WV9	WV RL	3,553	460	4,013	0.82%	383
WI9	WISC RL	6,027	68	6,095	1.25%	584
WY9	WY MLA	1,030	180	1,210	0.25%	117
	TOTALS	394,521	92,248	486,769	100.04%	46720

Appendix 2-3
National Machine Activity and Inventory Summary, FY93 and FY94

12-MONTH NATIONAL ACTIVITY SUMMARY, OCT. 92 - SEP. 93, PER MMR REPORTS												
Model of Machines	Total Inventory 10/1/92	Received from Producer	Received from MSC or NL	Transferred in	Transferred out	Damaged	Location Unknown	Net Inventory Based on Activity	Available Reported 9/30/93	Currently Assigned Reported 9/30/93	In Repair Reported 9/30/93	Net Inventory Reported 9/30/93
A2	0	0	0	5	0	41	8	(44)	0	0	0	0
A1	12,286	2,521	3,078	10,510	6,803	46	919	20,627	4,609	15,467	325	20,401
A80	57,898	211	7,971	1,642	1,375	815	3,956	61,576	2,634	51,072	1,844	55,550
A79	42,022	7	224	7,850	642	851	6,716	41,894	2,908	35,102	1,378	39,388
A78	44,457	20	199	7,001	515	5,886	7,739	37,537	1,494	31,841	769	34,104
A77	20,408	0	72	252	69	1,784	2,454	16,425	569	11,501	207	12,277
A76	7,053	0	14	38	9	466	1,126	5,504	160	3,230	72	3,462
A75	3,500	0	5	19	10	231	353	2,930	99	1,964	49	2,112
A74	9,933	0	19	42	23	682	1,744	7,545	225	5,095	219	5,539
TOTALA	197,557	2,759	11,582	27,359	9,446	10,802	25,015	193,994	12,698	155,272	4,863	172,833
CT1	839	2,307	4,653	5,076	4,414	3	32	8,426	1,177	8,697	100	9,974
E1	38,014	1,632	4,651	2,318	10,634	385	1,029	34,567	4,508	28,115	1,443	34,066
C2	6	0	0	0	0	0	0	6	0	0	0	0
C1	404,511	59,328	25,029	7,968	11,501	4,830	27,326	453,179	28,185	380,333	20,681	429,199
C80	10,057	24	1,598	1,465	1,317	2,169	2,430	7,228	659	6,182	174	7,015
C79	54,045	96	1,143	7,073	1,346	1,525	9,912	49,574	6,537	38,394	4,925	49,856
C78	35,679	103	319	5,380	1,679	7,931	7,148	24,723	1,965	17,727	1,497	21,189
C77	10,987	45	41	73	35	2,491	2,135	6,485	231	5,386	178	5,795
C76	19,211	0	20	50	17	3,166	4,273	11,825	142	13,796	148	14,086
TOTALC	573,349	63,535	37,454	29,403	30,943	22,500	54,285	596,013	43,404	498,630	29,146	571,180
Pillow Speaker									3,808			
Remote Control									24,460			
Head Phone Standard									16,544			
Head Phone Light Weight									3,074			

Summary of FY94 Activity, By Model, By Activity

Appendix 2-3, Continued

Model of Machines	Total Inventory 10/1/93	Received from Producer	Received from MSC or NLS	Transferred in	Transferred out	Damaged	Location Unknown	Net Inventory Based Upon FY94 Activity	Available Reported 9/30/94	Currently Assigned Reported 9/30/94	In Repair Reported 9/30/94	Net Inventory Reported 9/30/94
A2	0	0	0	0	0	0	0	0				
A1	20,086	834	3,351	15,006	5,152	35	405	33,685	2,340	27,312	428	30,080
A80	54,664	21	5,791	955	478	605	3,256	57,092	2,518	48,221	2,136	52,875
A79	38,839	1	262	5,751	408	488	4,045	39,912	2,935	33,058	1,470	37,463
A78	33,694	10	251	5,319	498	2,936	4,684	31,156	1,178	27.455	536	29,169
A77	12,659	1	123	159	38	1,155	747	11,002	403	9,378	225	10,006
A76	3,463	0	66	42	133	362	200	2,876	124	2,550	38	2,712
A75	2,121	0	14	101	33	262	135	1,806	63	1,606	16	1,685
A74	5,547	286	76	45	187	872	308	4,587	155	3,955	105	4,215
TOTAL A MACHINES	171,073	1,153	9,934	27,378	6,927	6,715	13,780	182,116	9,716	153,535	4,954	168,205
CT1 SUBTOTAL	9,959	285	3,082	5,797	1,716	2	58	17,347	1,306	16,162	191	17,659
E1 SUBTOTAL	33,447	540	5,375	4,700	10,106	159	1,333	32,464	2,714	33,220	1,034	36,968
C2	0	0	0	0	0	0	1	(1)	0	0	0	0
C1	425,692	52,293	20,767	13,198	11,927	4,433	25,659	469,931	17,036	418,374	24,812	460,222
C80	6,998	1	1,038	158	271	472	1,134	6,318	533	6,788	188	7,509
C79	49,593	22	460	7,363	2,367	1,757	5,490	47,824	4,523	37,383	5,385	47,291
C78	20,977	6	86	4,358	161	1,943	3,851	19,472	1,641	15,316	1,434	18,391
C77	5,997	2	21	86	20	457	514	5,115	212	4,513	110	4,835
C76	14,076	0	11	45	11	388	524	13,209	154	12,546	133	12,833
CBM SUBTOTAL	523,333	52,324	22,383	25,208	14,757	9,450	37,173	561,868	24,099	494,920	32,062	551,081
TOTAL C MACHINES	566,739	53,149	30,840	35,705	26,579	9,611	38,564	611,679	28,119	544,302	33,287	605,708
TOTAL ALL MACHINES	737,812	54,302	40,774	63,083	33,506	16,326	52,344	793,795	37,835	697,837	38,241	773,912
Pillow Speaker									5,661			5,661
Remote Control									11,654			11,654
Head Phone Standard									36,242			36,242
Head Phone Light Weight									929			929

Appendix 2-4
CBMs by Location, September 30, 1994
(Excludes CT-1s and E-1s)

			Assignable		
Machine Location	Total Inventory	Assigned to Patrons	Available	In Repair	Total
Patrons	488,543	488,543			
MLA's	54,411		24,099	30,312	54,411
MSC's	5,838		4,115	1,723	5,838
Warranty Repair [1]	1,000			1000	1000
Contract Repair [2]	750			750	750
Total	550,542	488,543	28,214	33,785	61,999

%

(1) 4 Month Supply = 1000
(2) 3 Month Supply = 750

Appendix 2-5
Shipping Locations for Repair Parts

Record #	State	Count	Non-states (4)
1	CN	4	(Canada)
2	AK	1	
3	AL	6	
4	AR	12	
5	AZ	5	
6	CA	12	
7	CO	5	
8	CT	4	
9	DC	2	(DC)
10	DE	2	
11	FL	16	
12	GA	12	
13	HI	1	
14	IA	1	
15	ID	1	
16	IL	15	
17	IN	2	
18	KS	6	
19	KY	3	
20	LA	5	
21	MA	3	
22	MD	8	
23	ME	2	
24	MI	15	
25	MN	6	
26	MO	4	
27	MS	1	
28	MT	1	
29	NC	1	
30	ND	4	
31	NE	2	
32	NH	2	
33	NJ	7	
34	NM	3	
35	NV	1	
36	NY	16	
37	OH	16	
38	OK	1	
39	ON	1	(Ontario)
40	OR	1	
41	PA	16	
42	RI	1	
43	SC	1	
44	SD	1	
45	TN	2	
46	TX	7	
47	UT	2	
48	VA	7	
49	VI	1	(Virgin Islands)
50	VT	1	
51	WA	1	
52	WI	5	
53	WV	1	
54	WY	2	

Appendix 2-6

NLS Parts Operation Profile [A]

A. Inventory of Shelving

Shelf Depth	Shelf Width	Shelf Height	No. of Sections	Total Frontage	Description
10"	2'-6"	6'-8"	63	1024 sf	Backroom
12"	3'-0"	6'-8"	1	20	Backroom
12"	3'-0"	7'-2"	8	168	Backroom
18"	3'-9"	6'-8"	1	24	Backroom
18"	3'-9"	7'-2"	12	315	Backroom
18"	3'-9"	8'-2"	4	120	Backroom
24"	3'-0"	6'-8"	16	312	Backroom
24"	3'-0"	7'-2"	25	525	Backroom
	Totals		**130**	**2508** sf	
12"	3'-0"	7'-6"	7	158 sf	Pick Line

B. Inventory of Large Cases

Case Length	Case Width	Case Height	No. of Cases	Total Cube	Description
43"	17.5"	24"	8	84 CuFt	Parts
24.5"	14"	13"	28	72	Parts
22"	19"	14.5"	5	18	Parts
20"	17.5"	16"	11	36	Parts
20"	12"	11"	8	12	Parts
	Total		**60**	**222CuFt**	
18"	10"	19.5"	12	24	CT-1 Machines
16"	8"	17"	3	4	A-1 Machines
	Total		**15**	**28**	

C. Space Utilization (sf)

Storage	1,590
Rec/Ship/Pickline	310
Office	400
Total	2,300

Note (A): Include full, partial full and empty bin openings.

Appendix 2-7

C-1 Warranty Repairs, 1988-1993

1988	3746
1989	3606
1990	2795
1991	2626
1992	1970
1993	3389

Appendix 2-8
Machine Repairs by MLA, FY92

CODE	AGENCY	TBM REPS TPs	TBM REPS NON-TP	CBM REPS TPs	CBM REPS NON-TP	NOTES
AK9	ALASKA	4		85		
AL9	ALABAMA	?	?	1408	384	Missing report, 1992 CBM reports allocated based upo: 1989 detail.
AR9	ARKANSAS	386		1325		
AZ9	ARIZONA	299		5096		
CA8	CALIFORNIA LA	69	837	2741	2703	
CA9	CALIFORNIA SC	295	93	2084	985	
CO9	COLORADO	266		1604		
CT9	CONNECTICUT	?	?	?	2185	Missing report, 1992 CBM reports allocated based upon 1989 detail.
DC6	NLS					
DC9	DIST. OF COL.	257	40	1001	288	
DE9	DELAWARE	42		137		
FL9	FLORIDA	1817	446	8557	5123	
GA9	GEORGIA	218	53	1571	893	
HI9	HAWAII		107		595	
IA9	IOWA	112	98	949	572	
ID9	IDAHO	6	75	134	947	
IL9	ILLINOIS	511	177	6835	2604	
IN9	INDIANA	591	?	2150	?	No TP/Non-TP breakdown, 1992 allocation based upon 1989 detail.
KS9	KANSAS	277	388	2696	430	
KY9	KENTUCKY	40	52	74	939	
LA9	LOUISIANA	3		324	21	
MA9	MASSACHUSETTS	433		935	123	
MD9	MARYLAND	359	60	1033	856	
ME9	MAINE	23		685		
MI8	MICHIGAN WAYNE		155		942	
MI9	MICHIGAN LANS.	492	651	2940	2790	
MN9	MINNESOTA	466		736	3546	
MO9	MISSOURI	242		563	1960	
MS9	MISSISSIPPI	95		734	4	
MT9	MONTANA	58		926		
NC9	NORTH CAROLINA		756	4	2645	
ND9	NORTH DAKOTA	22		138		
NE9	NEBRASKA	35	77	400	907	
NH9	NEW HAMPSHIRE	46		425	172	
NJ9	NEW JERSEY	56	12	1001	613	
NM9	NEW MEXICO	161		1680		
NV9	NEVADA	91		697		
NY8	NEW YORK NY	84	712	961	2000	
NY9	NEW YORK ALBA.	390	260	780	2600	
OH6	MSCE					
OH9	OHIO	439	395	2813	2433	
OK9	OKLAHOMA		365		1624	
OR9	OREGON	229		1313		
PA8	PENNSYLVANIA PI	457	9	1637	136	MLA totals not reported - state total only, 1/3 Pitts - 2/3 Philly
PA9	PENNSYLVANIA PH	913	18	3273	272	MLA totals not reported - state total only, 1/3 Pitts - 2/3 Philly
PR9	PUERTO RICO		40		197	
RI9	RHODE ISLAND	64		496		
SC9	SOUTH CAROLINA	193		1874	100	
SD9	SOUTH DAKOTA		40	610		
TN9	TENNESSEE	44	278	943	1074	
TX9	TEXAS	442		4040		
UT6	MSCW					
UT9	UTAH	127	55	599	574	
VA9	VIRGINIA	334	17	1483	137	
VI9	VIRGIN ISLANDS	52		147		
VT9	VERMONT	49		586		
WA9	WASHINGTON	463		1233	677	
WI9	WISCONSIN	260	337	1690		
WV9	WEST VIRGINIA		255	114	1684	
WY9	WYOMING	?	?	327	?	Missing report, 1992 CBM reports allocated based upon 1989 detail.
	TOTAL	12312	6858	76587	46735	
			19170		123322	

TBMs-MISSING 3 MLAs

Appendix 2-9
Readership and Circulation Profile

FILENAME:	MACHSTAT.WK1								06-Jan-94					
RECORDED BOOK READERSHIP, CIRCULATION, MACHINE INVENTORY, REPAIRS, ETC. BY MLA									04:12 PM					
														CASSETTE
CODE	AGENCY	DISC IND RDS	DISC DEP RDS	DISC IND CIR	DISC DEP CIR	DISC MAG CIR	DISC ILL	CASS IND RDS	CASS DEP RDS	CASS IND CIR	CASS DEP CIR	CASS MAG CIR	CASS ILL	FY92 REPAIRS
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
AK9	ALASKA	205	22	300	100	4,700	0	656	91	20,400	2,500	700	0	85
AL9	ALABAMA	1,704	61	15,900	400	45,600	100	4,712	162	153,600	3,000	7,200	1,100	1,792
AR9	ARKANSAS	1,247	107	14,500	1,000	29,600	30	3,737	194	149,900	5,400	5,000	300	1,325
AZ9	ARIZONA	2,572	276	15,600	200	61,000	0	9,417	821	393,900	6,200	8,600	800	5,098
CA8	CALIFORNIA LA	5,385	254	33,600	1,900	185,100	0	14,607	816	556,100	49,800	15,900	80	5,444
CA9	CALIFORNIA SC	4,876	260	55,000	2,800	166,800	200	14,653	777	641,800	27,800	39,500	1,400	3,069
CO9	COLORADO	3,660	376	28,400	400	82,800	100	7,659	656	218,100	6,300	10,600	1,400	1,604
CT9	CONNECTICUT	3,815	291	9,900	100	31,800	0	6,715	250	193,200	2,500	4,700	30	2,185
DC6	NLS	353	0	1,400	0	77,000	0	1,353	0	19,600	0	300	4,700	
DC9	DIST. OF COL.	1,420	10	5,400	1,600	28,300	0	1,950	80	42,500	800	500	0	1,289
DE9	DELAWARE	440	28	3,100	50	15,900	0	981	62	60,200	1,500	1,300	0	137
FL9	FLORIDA	10,301	588	68,500	3,400	215,300	100	30,428	1,227	1,129,200	39,400	23,400	1,400	13,680
GA9	GEORGIA	3,084	522	23,100	12,600	54,700	200	10,852	1,135	366,600	38,800	19,600	4,000	2,464
HI9	HAWAII	457	0	3,700	0	5,300	0	905	0	27,000	0	500	0	595
IA9	IOWA	3,352	446	17,700	1,100	80,000	0	5,889	517	174,500	19,100	6,900	0	1,521
ID9	IDAHO	502	25	3,600	30	16,300	0	2,296	46	116,100	700	2,800	0	1,081
IL9	ILLINOIS	3,508	358	26,900	2,500	166,000	5,700	17,540	1,912	696,900	45,100	33,000	70,000	9,439
IN9	INDIANA	3,624	322	36,100	1,100	133,500	100	8,135	583	327,400	10,400	20,100	1,700	2,150
KS9	KANSAS	1,653	308	24,000	1,900	58,400	200	5,809	643	224,000	11,100	7,100	1,600	3,126
KY9	KENTUCKY	2,016	182	16,800	400	51,900	400	4,788	342	200,100	5,700	10,200	1,200	1,013
LA9	LOUISIANA	1,493	111	9,600	300	37,400	0	3,329	175	121,300	3,600	6,100	0	345
MA9	MASSACHUSETTS	5,836	535	41,300	2,100	113,500	0	12,493	811	269,900	14,800	9,200	0	1,058
MD9	MARYLAND	2,094	92	15,700	600	49,700	0	5,671	180	256,600	7,100	9,200	0	1,889
ME9	MAINE	582	0	3,700	0	24,200	0	2,695	0	118,900	0	3,100	10	685
MI8	MICHIGAN WAYNE	1,364	84	4,300	300	57,800	200	2,229	132	71,400	4,000	4,300	1,000	942
MI9	MICHIGAN LANS.	6,154	453	43,700	800	127,900	0	13,887	902	473,700	10,700	23,500	0	5,730
MN9	MINNESOTA	1,957	102	14,500	400	49,300	0	7,512	246	235,700	4,300	9,000	40	4,282
MO9	MISSOURI	4,534	380	58,800	3,400	64,300	0	9,193	648	335,500	11,800	18,500	10	2,523
MS9	MISSISSIPPI	554	48	3,200	300	23,900	0	1,900	101	84,500	3,600	1,700	0	738
MT9	MONTANA	414	31	3,200	40	12,300	0	2,302	111	118,800	3,700	3,500	400	928
NC9	NORTH CAROLINA	2,428	141	39,200	1,400	88,700	0	6,597	296	255,100	6,200	17,000	10	2,649
ND9	NORTH DAKOTA	340	39	1,200	500	0	0	1,587	126	36,400	1,200	0	0	138
NE9	NEBRASKA	827	83	14,000	800	22,800	1,200	3,146	305	171,400	13,100	5,400	800	1,307
NH9	NEW HAMPSHIRE	577	26	5,900	100	22,400	0	1,828	66	86,200	2,500	3,000	200	597
NJ9	NEW JERSEY	2,835	74	50,100	600	82,800	0	8,307	213	351,200	4,800	18,600	0	1,614
NM9	NEW MEXICO	978	83	32,100	1,000	20,700	0	2,521	186	70,700	1,200	4,700	0	1,680
NV9	NEVADA	797	2	6,200	50	31,600	70	1,492	8	74,700	50	2,700	400	697
NY8	NEW YORK NY	5,536	254	46,100	800	103,500	200	12,545	359	554,500	26,100	12,400	2,200	2,961
NY9	NEW YORK ALBA.	5,531	1,339	43,600	2,500	116,300	0	16,646	2,165	497,300	25,700	38,300	0	3,380
OH6	MSCE						4,200						27,550	
OH9	OHIO	8,719	789	95,600	7,700	140,400	0	15,669	1,112	820,100	51,300	28,400	0	5,246
OK9	OKLAHOMA	1,476	94	14,600	800	33,600	500	4,429	221	198,700	6,100	8,400	30	1,624
OR9	OREGON	2,296	68	19,100	300	40,300	0	6,004	231	290,300	5,500	6,900	0	1,313
PA8	PENNSYLVANIA PI	4,261	213	73,500	3,500	153,300	0	7,846	283	267,800	5,800	21,900	0	1,773
PA9	PENNSYLVANIA PH	6,518	331	127,500	2,400	187,900	0	10,416	399	305,700	7,300	15,800	0	3,544
PR9	PUERTO RICO	827	58	4,500	2,500	19,000	0	958	58	24,500	8,700	3,400	20	197
RI9	RHODE ISLAND	312	10	2,100	10	11,100	0	1,412	62	61,600	2,200	1,500	0	496
SC9	SOUTH CAROLINA	2,335	92	23,700	900	43,200	0	6,060	222	227,200	6,000	4,200	0	1,094
SD9	SOUTH DAKOTA	686	17	1,600	30	16,900	0	1,959	403	57,400	2,000	2,800	700	610
TN9	TENNESSEE	925	29	14,900	300	60,300	0	4,674	158	224,600	6,000	10,900	0	2,017
TX9	TEXAS	8,911	575	36,300	400	169,400	0	22,627	1,651	469,700	14,100	19,400	900	4,040
UT6	MSCW						4,200						27,550	
UT9	UTAH	618	19	9,000	100	45,200	600	4,379	119	124,300	2,500	6,100	11,800	1,173
VA9	VIRGINIA	2,406	142	23,500	1,100	53,800	400	7,506	319	300,400	7,100	10,200	6,600	1,620
VI9	VIRGIN ISLANDS	49	1	50	20	1,800	0	138	7	2,800	300	300	0	147
VT9	VERMONT	239	1	2,700	0	6,000	0	1,404	13	72,200	200	2,400	0	586
WA9	WASHINGTON	4,041	120	55,800	800	154,100	0	8,391	294	374,200	6,400	8,200	600	1,910
WI9	WISCONSIN	2,271	4	28,400	2,300	83,800	30	5,952	17	215,400	3,800	5,800	500	1,690
WV9	WEST VIRGINIA	1,201	68	8,100	400	22,200	400	3,246	115	100,500	2,300	6,800	6,100	1,798
WY9	WYOMING	158	18	3,100	400	0	0	976	45	42,400	2,300	0	0	327
	TOTAL	147,254	10,962	1,383,950	71,530	3,801,400	19,130	383,008	23,073	14,074,700	580,450	571,500	177,130	123,341

BEST COPY AVAILABLE

Appendix 2-10A
Issues and Receipts, Florida RL

FILENAME: FLRLACT.WK1								06-Jan-94						
FLORIDA REGIONAL LIBRARY MACHINE ACTIVITY								04:01 PM						
FY93, INPUTS AND OUTPUTS														
	IN	IN	IN	IN	IN	IN	IN	OUT	OUT	OUT	OUT	OUT	OUT	OUT
MONTH	CBM-NEW	CBM-USED	E-1 NEW	E-1 USED	TBM	CT-1	TOTAL	CBM-NEW	CBM-USED	E-1 NEW	E-1 USED	TBM	CT-1	TOTAL
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
10/92	248	712	0	40	179	0	1,179	221	805	0	65	149		1,240
11/92	248	602	0	32	145	0	1,027	265	561	0	85	131		1,042
12/92	220	632	0	32	149	0	1,033	207	594	0	20	136		957
1/93	252	653	0	35	151	0	1,091	320	624	0	35	114		1,093
2/93	248	653	52	48	161	0	1,162	323	783	1	62	185		1,354
3/93	248	800	0	50	174	0	1,272	283	592	0	51	168		1,094
4/93	248	733	56	46	279	0	1,362	253	744	8	36	148		1,189
5/93	248	714	0	53	187	0	1,202	233	696	24	41	163		1,157
6/93	520	710	80	35	217	0	1,562	294	827	50	36	180		1,387
7/93	4	748	52	47	139	0	990	224	724	60	25	147		1,180
8/93	492	778	100	42	170	100	1,682	281	769	65	20	124	6	1,265
9/93	244	725	0	52	147	2	1,170	COM.==>	1,119	0	47	112	16	1,294
TOTALS	3,220	8,460	340	512	2,098	102	14,732	2,904	8,838	208	523	1,757	22	14,252
TOTALS	====>	11,680	====>	852	2,098	102	14,732	====>	11,742	====>	731	1,757	22	14,252

Appendix 2-10B
Issues and Receipts, Minnesota MLA

ILENAME MNMLA.WK1 — 27-Jan-94 04:48 PM
MINNESOTA MLA NLS MACHINE ACTIVITY
JULY - SEPTEMBER, 1993
(NOTE - 9 DAYS MISSING IN PERIOD)

DATE	C-1 IN	C-1 OUT	C-76 IN	C-76 OUT	C-77 IN	C-77 OUT	C-78 IN	C-78 OUT	C-79 IN	C-79 OUT	C-80 IN	C-80 OUT	C-1 - C-80 IN	C-1 - C-80 OUT	CT-1 IN	CT-1 OUT	E-1 IN	E-1 OUT	C-TOTAL IN	C-TOTAL OUT
07/02	8	9											8	9			0	9	8	18
07/07	16	9											16	9			2	2	18	11
07/08	14	14											14	14			1	0	15	14
07/09	6	13											6	13			0	4	6	17
07/12	13	27											13	27	0	1	2	3	15	31
07/13	7	8					1	0	1	0			9	8			0	2	9	10
07/14	7	22							1	0			8	22			1	5	9	27
07/15	8	12											8	12					8	12
07/16	16	10							1	0			17	10	0	3			17	13
07/19	13	14											13	14					13	14
07/20	0	2	1	0									1	2					1	2
07/21	2	1											2	1					2	1
07/22	17	28			1	0							18	28					18	28
07/23	5	7											5	7			0	21	5	28
07/26	21	5											21	5	1	1	3	3	25	9
07/27	16	8											16	8			2	6	18	14
07/28	13	17							2	0			15	17			0	1	15	18
07/29	10	21											10	21			3	2	13	23
08/02	17	28							2	0			19	28	0	1	2	3	21	32
08/09	24	26											24	26	1	0	0	2	25	28
08/10	6	20			1	0							7	20	0	1			7	21
08/11	21	24							1	0			22	24			2	1	24	25
08/12	20	6							1	0			21	6			1	1	22	7
08/13	20	1											20	1	0	1	3	1	23	3
08/16	11	20	1	0					1	0			13	20	0	1	1	4	14	25
08/17	10	15											10	15			0	1	10	16
08/18	9	14											9	14			1	3	10	17
08/19	14	2											14	2			2	1	16	3
08/20	7	24											7	24			2	2	9	26
08/23	23	20											23	20			2	1	25	21
08/24	7	11											7	11					7	11
08/25	9	13							1	0			10	13			2	0	12	13
08/26	16	2							1	0			17	2	0	1	2	3	19	6
08/27	13	16											13	16	0	1			13	17
08/30	14	13											14	13			0	3	14	16
09/01	17	17											17	17					17	17
09/02	11	18							1	0			12	18			0	3	12	21
09/03	6	58											6	58			0	2	6	60
09/06													0	0					0	0
09/07	18	13											18	13			2	0	20	13
09/08	11	9							1	0			12	9	0	1	2	3	14	13
09/09	17	10									1	0	18	10			1	2	19	12
09/10	5	3											5	3			2	0	7	3
09/13	14	6											14	6			3	2	17	8
09/14	17	18											17	18			1	2	18	20
09/15	11	4			1	0							12	4	0	1	2	0	14	5
09/16	2	0											2	0					2	0
09/17	24	16											24	16	0	1	3	2	27	19
09/21	13	11							1	0			14	11			2	1	16	12
09/22	17	9											17	9			1	2	18	11
09/23	18	11											18	11			1	0	19	11
09/24	7	10											7	10			0	8	7	18
09/27	7	14							1	0			8	14					8	14
09/28	10	9							1	0			11	9	0	1	1	1	12	11
09/29	10	9	1	0									11	9			1	3	12	12
09/30	10	24							1	0			11	24			1	1	12	25
TOTAL	678	749	3	0	3	0	1	0	18	0	1	0	704	749	2	15	57	116	763	880

BEST COPY AVAILABLE

North Carolina (NC9)
Monthly Machine Activity

Cassette Book Machines

		APR 94	MAY 94	JUN 94	TOTAL	AVG
INPUTS						
	A. New (1)	136	68	84	288	96
	B. Repaired (2)	335	282	409	1026	342
	C. Returns (2)	336	306	340	982	327
	D. Transfer-in (1)	3	3	6	12	4
	E. Warr Repairs (3)	0	1	1	2	1
	F. Recovered (1)	3	5	16	24	8
Input Total		**813**	**665**	**856**	**2334**	**778**
OUTPUTS						
	G. OBS/DBR (1)	3	5	7	15	5
	H. L/S/U (1)	7	5	8	20	7
	I. Warr Repairs (3)	2	2	1	5	2
	J. In Repair (2)	317	292	333	942	314
	K. Assigned (3)	340	286	418	1044	348
	L. Transfer-out (1)	15	13	12	40	13
Output Total		**684**	**603**	**779**	**2066**	**689**

Talking Book Machines

		APR 94	MAY 94	JUN 94	TOTAL	AVG
INPUTS						
	A. New (1)	0	0	0	0	0
	B. Repaired (2)	36	17	28	81	27
	C. Returns (2)	63	50	58	171	57
	D. Transfer-in (1)	0	0	0	0	0
	E. Warr Repairs (3)	1	1	0	2	1
	F. Recovered (1)	2	5	4	11	4
Input Total		**102**	**73**	**90**	**265**	**88**
OUTPUTS						
	G. OBS/DBR (1)	1	0	0	1	0
	H. L/S/U (1)	3	1	2	6	2
	I. Warr Repairs (3)	1	0	0	1	0
	J. In Repair (2)	36	34	43	113	38
	K. Assigned (3)	37	30	29	96	32
	L. Transfer-out (1)	1	3	4	8	3
Output Total		**79**	**68**	**78**	**225**	**75**

nc9_data.wk4

Data Source:
(1) - Monthly Machine Report (MMR) or BPHICS Reports.
(2) - North Carolina Monthly Machine Logs.
(3) - Special System Inquiry by NC.

Appendix 2-10D
Issues and Receipts, Kentucky RL

Kentucky (KY9)
Monthly Machine Activity

Cassette Book Machines

		APR 94	MAY 94	JUN 94	TOTAL	AVG
INPUTS						
	A. New (1)	89	55	37	181	45
	B. Repaired				0	0
	C. Returns (2)	182	154	155	491	123
	D. Transfer in (1)	10	42	8	60	15
	E. Warr Repairs				0	0
	F. Recovered (1)	6	2	9	17	4
Input Total		287	253	209	749	187

OUTPUTS						
	G. OBS/DBR (1)	12	9	16	37	9
	H. L/S/U (1)	33	38	6	77	19
	I. Warr Repairs				0	0
	J. In Repair				0	0
	K. Assigned (2)	157	173	171	501	125
	L. Transfer-out (1)	1	4	3	8	2
Output Total		203	224	196	623	156

Talking Book Machines

		APR 94	MAY 94	JUN 94	TOTAL	AVG
INPUTS						
	A. New (1)	0	12	4	16	4
	B. Repaired				0	0
	C. Returns (2)	18	27	30	75	19
	D. Transfer-in (1)	6	2	2	10	3
	E. Warr Repairs				0	0
	F. Recovered (1)	1	4	7	12	3
Input Total		25	45	43	113	28

OUTPUTS						
	G. OBS/DBR (1)	1	10	11	22	6
	H. L/S/U (1)	7	7	1	15	4
	I. Warr Repairs				0	0
	J. In Repair				0	0
	K. Assigned (2)	15	12	12	39	10
	L. Transfer-out (1	1	1	1	3	1
Output Total		24	30	25	79	20

Data Source:
(1) - Monthly Machine Report (MMR) or BPHICS Reports.
(2) - Kentucky Manual Monthly Machine Logs.

Appendix 2-10E
Issues and Receipts, Texas RL

"C" MACHINES | MLA ACTIVITY, APRIL-JUNE, 1994 | 12/15/94,11:54 PM

NEW STATUS	OLD STATUS	3-MONTH QUANTITY	3-MONTH NEW TOT.	PHY INPUT	PHY OUTPUT	NET INV. INCREASE	NET INV. ECREASE		
ASSIGNED	ASSIGNED	39							
ASSIGNED	AVAILABLE	3,034			3,034				
ASSIGNED	IN WARE.	2			2				
ASSIGNED	LOST	8				8			
ASSIGNED	NOT OWNED	19				19			
ASSIGNED	NOT OWNED	2				2			
ASSIGNED	RECALL	208							
ASSIGNED	RECALL-DEC	2	3,314						
AVAILABLE	DELAYED REC	20							
AVAILABLE	IN WARE.	2,351							
AVAILABLE	NEW	699							
AVAILABLE	WAIT.FOR RE	17	3,087						
DAMAGED	IN REPAIR	17			17		17		
DAMAGED	IN WARE.	26			26		26		
DAMAGED	LOST	1							
DAMAGED	RECALL	3	47				3		
DELAYED REC.	NONE	20	20	20		20			
IN REPAIR	WAIT.FOR R.	1,561	1,561		1,561				
IN WAREHOUSE	ASSIGNED	1,326		1,326					
IN WAREHOUSE	IN REPAIR	1,164		1,164					
IN WAREHOUSE	LOST	28		28		28			
IN WAREHOUSE	NOT OWNED	145		145		145			
IN WAREHOUSE	NOT OWNED	5		5		5			
IN WAREHOUSE	RECALL	1,636		1,636					
IN WAREHOUSE	RECALL DEC.	89		89					
IN WAREHOUSE	TRANSFER O.	1	4,394	1		1			
LOST	ASSIGNED	48					48		
LOST	RECALL	120					120		
LOST	RECALL-DEC	5	173				5		
NEW	NONE	718	718	718		718			
RECALL	ASSIGNED	1,711							
RECALL	IN WARE.	1							
RECALL	RECALL	28	1,740						
RECALL-DEC.	ASSIGNED	128	128						
STOLEN	ASSIGNED	3					3		
STOLEN	RECALL	1	4				1		
TRANSFER OUT	ASSIGNED	31					31		
TRANSFER OUT	IN REPAIR	36			36		36		
TRANSFER OUT	IN WARE.	4			4		4		
TRANSFER OUT	RECALL	3					3		
TRANSFER OUT	WAIT.FOR R.	8	82		8		8		
WAITING FOR R.	AVAILABLE	15							
WAITING FOR R.	IN WARE.	1,612	1,627						
SENT TO NLS	RET. TO NLS	7	7		7				
	TOTALS	16,902		5,132	4,695	946	305		
	DIFFERENCE			437		641			

357

Appendix 2-12
Warranty Repair Utilization by MLA, FY93

FILENAME:	MACHSTAT.WK1							
RECORDED BOOK READERSHIP, CIRCULATION, MACHINE INVENTORY, REPAIRS, ETC. BY MLA								
FY92								
CODE	AGENCY	NUMBER WARR.REP	% OF WARR.REP	CUM.% OF WARR.REP	NUMBER READERS	% OF READERS	CUM.% OF READERS	WARR.REP./ 1000 RDS
OH6	MSCE		0.0%	0.0%	0	0.0%	0.0%	
UT6	MSCW		0.0%	0.0%	0	0.0%	0.0%	
NC9	NORTH CAROLINA	0	0.0%	0.0%	7,781	1.6%	1.6%	0.000
MS9	MISSISSIPPI	0	0.0%	0.0%	2,304	0.5%	2.1%	0.000
PR9	PUERTO RICO	0	0.0%	0.0%	1,190	0.3%	2.4%	0.000
PA9	PENNSYLVANIA PH	0	0.0%	0.0%	12,012	2.5%	4.9%	0.000
HI9	HAWAII	0	0.0%	0.0%	905	0.2%	5.1%	0.000
AK9	ALASKA	0	0.0%	0.0%	1,020	0.2%	5.3%	0.000
MN9	MINNESOTA	0	0.0%	0.0%	8,496	1.8%	7.1%	0.000
WV9	WEST VIRGINIA	0	0.0%	0.0%	3,706	0.8%	7.9%	0.000
DC9	DIST. OF COL.	0	0.0%	0.0%	2,270	0.5%	8.3%	0.000
PA8	PENNSYLVANIA PI	0	0.0%	0.0%	8,978	1.9%	10.2%	0.000
WA9	WASHINGTON	0	0.0%	0.0%	9,567	2.0%	12.3%	0.000
MI9	MICHIGAN LANS.	0	0.0%	0.0%	17,495	3.7%	15.9%	0.000
CT9	CONNECTICUT	0	0.0%	0.0%	7,715	1.6%	17.6%	0.000
NM9	NEW MEXICO	0	0.0%	0.0%	3,265	0.7%	18.2%	0.000
OK9	OKLAHOMA	0	0.0%	0.0%	5,313	1.1%	19.4%	0.000
UT9	UTAH	0	0.0%	0.0%	4,855	1.0%	20.4%	0.000
TX9	TEXAS	1	0.0%	0.0%	29,231	6.2%	26.5%	0.034
MA9	MASSACHUSETTS	1	0.0%	0.1%	15,737	3.3%	29.8%	0.064
KY9	KENTUCKY	1	0.0%	0.1%	6,156	1.3%	31.1%	0.162
VA9	VIRGINIA	2	0.1%	0.2%	8,782	1.8%	33.0%	0.228
OR9	OREGON	4	0.1%	0.3%	6,928	1.5%	34.4%	0.577
GA9	GEORGIA	14	0.5%	0.8%	15,392	3.2%	37.7%	0.910
AL9	ALABAMA	7	0.2%	1.0%	5,360	1.1%	38.8%	1.306
KS9	KANSAS	12	0.4%	1.4%	8,381	1.8%	40.6%	1.432
IN9	INDIANA	15	0.5%	1.9%	10,467	2.2%	42.8%	1.433
IL9	ILLINOIS	45	1.5%	3.3%	25,188	5.3%	48.1%	1.787
CO9	COLORADO	19	0.6%	4.0%	10,283	2.2%	50.2%	1.848
VT9	VERMONT	3	0.1%	4.1%	1,456	0.3%	50.5%	2.060
TN9	TENNESSEE	13	0.4%	4.5%	5,306	1.1%	51.7%	2.450
IA9	IOWA	20	0.7%	5.1%	7,957	1.7%	53.3%	2.514
WY9	WYOMING	3	0.1%	5.2%	1,156	0.2%	53.6%	2.595
SD9	SOUTH DAKOTA	10	0.3%	5.6%	3,571	0.8%	54.3%	2.800
MD9	MARYLAND	22	0.7%	6.3%	6,391	1.3%	55.7%	3.442
CA8	CALIFORNIA LA	66	2.2%	8.4%	17,871	3.8%	59.4%	3.693
SC9	SOUTH CAROLINA	28	0.9%	9.3%	6,948	1.5%	60.9%	4.030
DE9	DELAWARE	5	0.2%	9.5%	1,229	0.3%	61.2%	4.068
NV9	NEVADA	7	0.2%	9.7%	1,524	0.3%	61.5%	4.593
NY9	NEW YORK ALBA.	131	4.3%	14.0%	25,306	5.3%	66.8%	5.177
RI9	RHODE ISLAND	9	0.3%	14.3%	1,660	0.3%	67.1%	5.422
MO9	MISSOURI	64	2.1%	16.4%	11,785	2.5%	69.6%	5.431
AR9	ARKANSAS	30	1.0%	17.4%	4,513	0.9%	70.6%	6.647
OH9	OHIO	135	4.4%	21.8%	20,117	4.2%	74.8%	6.711
NJ9	NEW JERSEY	66	2.2%	24.0%	9,159	1.9%	76.7%	7.206
LA9	LOUISIANA	32	1.0%	25.0%	4,029	0.8%	77.6%	7.942
NE9	NEBRASKA	37	1.2%	26.2%	4,366	0.9%	78.5%	8.475
ID9	IDAHO	23	0.8%	27.0%	2,480	0.5%	79.0%	9.274
NH9	NEW HAMPSHIRE	20	0.7%	27.6%	2,092	0.4%	79.5%	9.560
ME9	MAINE	26	0.8%	28.5%	2,695	0.6%	80.0%	9.647
MI8	MICHIGAN WAYNE	30	1.0%	29.5%	2,757	0.6%	80.6%	10.881
ND9	NORTH DAKOTA	26	0.8%	30.3%	2,091	0.4%	81.1%	12.434
MT9	MONTANA	36	1.2%	31.5%	2,746	0.6%	81.6%	13.110
DC6	NLS	20	0.7%	32.1%	1,353	0.3%	81.9%	14.782
AZ9	ARIZONA	224	7.3%	39.5%	12,701	2.7%	84.6%	17.636
FL9	FLORIDA	753	24.6%	64.1%	35,336	7.4%	92.0%	21.310
NY8	NEW YORK NY	374	12.2%	76.3%	13,981	2.9%	95.0%	26.751
CA9	CALIFORNIA SC	481	15.7%	92.0%	17,761	3.7%	98.7%	27.082
WI9	WISCONSIN	231	7.6%	99.6%	6,020	1.3%	100.0%	38.372
VI9	VIRGIN ISLANDS	13	0.4%	100.0%	166	0.0%	100.0%	78.313
	TOTAL	3,059	100.0%		475,300	100.0%		6.624 (AVERAGE)

Appendix 2-13A
Machine Receipts and Issues, Pittsburgh RL

MACHINES RETURNED								MACHINES ISSUED		
Date	Day	Type	Accepted	To Tel Pion.	Scrapped	Ret. to Pat	Total	New	Reprd.	Total
11/3	Wed	A1/A80		1			1			
		C1	4			2	6	15		15
		E1					0	4		4
11/4	Thur	A1/A80					0			0
		C1	3			2	5	9	8	17
		E1			1		1	3	1	4
11/5	Fri	A1/A80		1			1			0
		C1	3			1	4	2	3	5
		E1					0	1		1
11/8	Mon	A1/A80					0			0
		C1	4	5	1	5	15	18	5	23
		E1	1				1	2	1	3
11/9	Tues	A1/A80					0			0
		C1	4	1	3		8	1	3	4
		E1			1		1	1	1	2
11/10	Wed	A1/A80					0			0
		C1	2	3		4	9	5	5	10
		E1			1		1	1	1	2
11/11	Thur	A1/A80					0			0
		C1					0	3	1	4
		E1					0			0
11/12	Fri	A1/A80					0			0
		C1	7	4	1	1	13	1	2	3
		E1					0			0
11/15	Mon	A1/A80					0			0
		C1	8	2	8	4	22	5	3	8
		E1			1		1	1	1	2
11/16	Tues	A1/A80					0			0
		C1	5	2		2	9	12	1	13
		E1	1				1	1	1	2
11/17	Wed	A1/A80					0			0
		C1	3			1	4	5	5	10
		E1					0			0
11/18	Thur	A1/A80	1				1			0
		C1	12	1		2	15	2		2
		E1					0			0
11/19	Fri	A1/A80					0			0
		C1	4	3		1	8	8	1	9
		E1	2			1	3	3	2	5
11/22	Mon	A1/A80					0			0
		C1	7	4	1	3	15	9	4	13
		E1	1				1	1	1	2
11/23	Tues	A1/A80					0			0
		C1	1	1	1	3	6	5	5	10
		E1					0	1	1	2
11/29	Mon	A1/A80					0			0
		C1	10	1	4	2	17	14		14
		E1	1				1	6		6
11/30	Tues	A1/A80					0			0
		C1	5	1	3	2	11	7	3	10
		E1							2	2
	TOTALS	A1/A80	1	2	0	0	3	0	0	0
		C1	82	28	22	35	167	121	49	170
		E1	6	0	4	1	11	25	12	37

(1) Excludes receipts of new production, transfers in and out, and issues to disposal.

KEY:
Accepted - Equipment returned by patrons and kept for reissue
To Tel Pion - Equipment returned by patrons and sent to the Telephone Pioneers for repair. Later used for reissue.
Scrapped - Equipment returned by patrons and deemed unrepairable and disposed. All E1 machines are sent to Multistate Center West for repair.
Ret To Pat - Equipment returned by patrons which were repaired and returned the following day.
New - New equipment issued to patrons.
Reprd - Repaired equipment issued to patrons.

Appendix 2-13B

TRIAGE RESULTS at THREE MLAs

UT
TOTAL RECEIVED = 1,353

	C1	OTHER
BROKEN =	497	29
WORKS =	827	0

36% C1s BROKEN

188 WERE STILL UNDER WARR. (36 WERE BROKEN)
135 MULTIPLE ENTRIES SN's 288413, 524975, 533340 HAD 5 OR MORE ENTRIES
598 OF THE RECORDERS WERE OVER SERIAL NUMBER 300000, THIS IS 45% OF THE C1s RECEIVED

TX
TOTAL RECEIVED = 666

	C1	OTHER
BROKEN =	283	43
WORKS =	323	17

123 WERE STILL UNDER WARR. (21 WERE BROKEN)
3 MULTI ENTRIES
418 OF THE RECORDERS WERE OVER SERIAL NUMBER 300000, THIS IS 68% OF THE C1s RECEIVED

NC
TOTAL RECEIVED = 723

	C1
BROKEN =	372
WORKS =	351

129 WERE STILL UNDER WARR. (66 WERE BROKEN)
382 OF THE RECORDERS WERE OVER SERIAL NUMBER 300000, THIS IS 53% OF THE C1s RECEIVED

Appendix 2-14
Network Profile of SLAs by MLA, FY93

CODE	AGENCY	NUMBER O SLAs
----	----	----
AK9	ALASKA	
AL9	ALABAMA	5
AR9	ARKANSAS	4
AZ9	ARIZONA	50
CA8	CALIFORNIA LA	25
CA9	CALIFORNIA SC	
CO9	COLORADO	
CT9	CONNECTICUT	
DC6	NLS	
DC9	DIST. OF COL.	
DE9	DELAWARE	
FL9	FLORIDA	11
GA9	GEORGIA	13
HI9	HAWAII	
IA9	IOWA	
ID9	IDAHO	
IL9	ILLINOIS	6
IN9	INDIANA	
KS9	KANSAS	6
KY9	KENTUCKY	2
LA9	LOUISIANA	
MA9	MASSACHUSETTS	
MD9	MARYLAND	2
ME9	MAINE	
MI8	MICHIGAN WAYNE	1
MI9	MICHIGAN LANS.	10
MN9	MINNESOTA	
MO9	MISSOURI	
MS9	MISSISSIPPI	
MT9	MONTANA	
NC9	NORTH CAROLINA	
ND9	NORTH DAKOTA	
NE9	NEBRASKA	2
NH9	NEW HAMPSHIRE	
NJ9	NEW JERSEY	14
NM9	NEW MEXICO	
NV9	NEVADA	1
NY8	NEW YORK NY	2
NY9	NEW YORK ALBA.	21
OH6	MSCE	
OH9	OHIO	64
OK9	OKLAHOMA	
OR9	OREGON	
PA8	PENNSYLVANIA PI	30
PA9	PENNSYLVANIA PH	23
PR9	PUERTO RICO	
RI9	RHODE ISLAND	
SC9	SOUTH CAROLINA	
SD9	SOUTH DAKOTA	
TN9	TENNESSEE	
TX9	TEXAS	
UT6	MSCW	
UT9	UTAH	
VA9	VIRGINIA	9
VI9	VIRGIN ISLANDS	
VT9	VERMONT	
WA9	WASHINGTON	
WI9	WISCONSIN	
WV9	WEST VIRGINIA	
WY9	WYOMING	
	TOTAL	301

Appendix 2-15
Warranty Repair Add-on's, FY93

FILENAME: TELADDON.WK1
TELEX WARRANTY REPAIR "ADD-ONS", 10/92 - 9/93
2-YR MACHINES

PART NUMBER	DESCRIPTION	QUANTITY FY93	FY93 UNIT COST	COST FY93
-------	-------	-------	-------	-------
38108846	INSTRUCTION SHEET	2,114	0.05	$105.70
40254000	HEAD BASE ASS'Y	4	0.42	$1.68
40301006	HEAD SCREW	1	0.02	$0.02
40403030	PUSH BUTTON ASS'Y	25	4.99	$124.75
40500013	CASE, TOP	15	3.5	$52.50
40509011	BOTTOM CASE	13	1.83	$23.79
40513006	JACK PLATE	3	0.34	$1.02
40516006	HANDLE ASS'Y	2	1.26	$2.52
40568000	HEAD CABLE ASS'Y S-1	4	0.52	$2.08
40607010	DOOR ASS'Y	26	1.49	$38.74
40617001	PC BD JACK PANEL ASS'Y	1	7.48	$7.48
40740002	AMP BOARD	4	32.53	$130.12
50783001	PLASTIC BAG	2,114	0.07	$147.98
52275004	POSTAL CARD	2,114	0.02	$42.28
52277000	BRAILLE CARD	2,114	0.15	$317.10
53601001	KEY I.D. PLATE	9	0.13	$1.17
53603001	SWITCH I.D. PLATE	10	0.57	$5.70
54111000	POTENTIOMETER (SLIDE)	1	1	$1.00
55787000	HEAD	449	7.81	$3,506.69
56422009	INSTRUCTION CASSETTE	1,376	0.95	$1,307.20
57158000	POT SLIDE SWITCH	1	1.66	$1.66
57812001	POWER CORD	19	0.61	$11.59
57857000	BATTERY	508	12.65	$6,426.20
96201000	REED SWITCH ASS'Y	1	2.03	$2.03
AC-52691	HANDLING CHARGE	2,218	9.6	$21,292.80
	CUSTOMER ABUSE (HOURS)	78.8	28.34	$2,233.19
MEMO C-1	UNREPAIRABLES-HANDLING	248	4.76	$1,180.48
MEMO C-79	UNREPAIRABLES-HANDLING	35	4.76	$166.60
MEMO C-80	UNREPAIRABLES-HANDLING	1	4.76	$4.76
MEMO CT-1	UNREPAIRABLES-HANDLING	13	4.76	$61.88
	REPAIRS (2-YR)	2,114		
	AWAITING REPAIRS (2-YR)	341	(AVERAGE)	
	TOTAL COST (2-YR)			$37,200.71

BEST COPY AVAILABLE

Appendix 2-16
Warranty Repair Defect Frequencies

CODE	DEFECT	NUMBER 10/92-9/93	NUMBER TOTAL
1	IDLER ASSY	1,742	18,161
2	REEL ASSY	1,743	17,388
4	HEAD	173	5,749
97	NO PROBLEM	388	4,735
3	HEAD DIRTY	353	4,113
9	KEY SLIDES	97	2,893
11	BATTERY LOW	25	2,472
31	CASE	77	2,452
21	THRUST BUTTON	0	2,237
10	BATTERY	132	2,092
25	BELT	4	1,985
48	COMPONENT	45	1,408
5	HEAD ALIGNMENT	10	1,254
17	CAPSTAN/FLYWHEEL	1	1,240
34	LEAF SWITCH	40	1,211
22	EOT	16	804
98	USER DAMAGE	15	613
15	SPEED	30	412
26	TRANSFORMER	23	382
54	LOOSE OBJECT	9	379
38	JACK	20	354
61	OTHER	0	335
35	FRICTION LEVER	1	329
52	WIRE HARNESS	12	309
33	MOTOR PULLEY	0	284
23	PRESSURE ROLLER	9	270
29	FUSE BLOWN	7	240
32	MOTOR	2	189
27	CONTROLS	27	176
6	HEAD SLIDE	0	168
30	SPEAKER	10	154
60	MISC.MECHANICAL	0	48
96	NON-WARRANTY	0	0
	TOTAL DEFECTS	5,011	74,836
	TOTAL MACHINES	3,062	45,590
		1.64	1.64

Appendix 2-16
Warranty Repair Defect Frequencies (cont.)
Sorted in Descending Order of Defect Frequency, All Repairs of C-1s

CODE	DEFECT	PERCENT 10/92-9/93	PERCENT TOTAL
1	IDLER ASSY	34.76%	24.27%
2	REEL ASSY	34.78%	23.23%
4	HEAD	3.45%	7.68%
97	NO PROBLEM	7.74%	6.33%
3	HEAD DIRTY	7.04%	5.50%
9	KEY SLIDES	1.94%	3.87%
11	BATTERY LOW	0.50%	3.30%
31	CASE	1.54%	3.28%
21	THRUST BUTTON	0.00%	2.99%
10	BATTERY	2.63%	2.80%
25	BELT	0.08%	2.65%
48	COMPONENT	0.90%	1.88%
5	HEAD ALIGNMENT	0.20%	1.68%
17	CAPSTAN/FLYWHEEL	0.02%	1.66%
34	LEAF SWITCH	0.80%	1.62%
22	EOT	0.32%	1.07%
98	USER DAMAGE	0.30%	0.82%
15	SPEED	0.60%	0.55%
26	TRANSFORMER	0.46%	0.51%
54	LOOSE OBJECT	0.18%	0.51%
38	JACK	0.40%	0.47%
61	OTHER	0.00%	0.45%
35	FRICTION LEVER	0.02%	0.44%
52	WIRE HARNESS	0.24%	0.41%
33	MOTOR PULLEY	0.00%	0.38%
23	PRESSURE ROLLER	0.18%	0.36%
29	FUSE BLOWN	0.14%	0.32%
32	MOTOR	0.04%	0.25%
27	CONTROLS	0.54%	0.24%
6	HEAD SLIDE	0.00%	0.22%
30	SPEAKER	0.20%	0.21%
60	MISC.MECHANICAL	0.00%	0.06%
96	NON-WARRANTY	0.00%	0.00%
	TOTAL DEFECTS	100.00%	100.00%

Appendix 2-17
C-1 Repair Distribution, Elfun Operation

10/29/93	1993 USAGE	Page 1

CASSETTE TYPE C-1

PARTS	NUMBER	PERCENT
NO PROBLEMS	71	4.6
DRIVE KITS	1388	90.2
PRESSURE ROLLER	394	25.6
AMP BOARD	171	11.1
KEY ASSEMBLY	25	1.6
AC CORD	33	2.1
HEAD	1226	79.7
BATTERY	1482	96.4
FUSE	43	2.8
MOTOR	62	4.0
MOTOR CONTROL BOARD	73	4.7
JACK BOARD	15	1.0
KNOB	222	14.4
REED SWITCH	7	.5
CAPSTAN BEARING	695	45.2
OTHER 1	42	3.6
OTHER 2	55	3.6
OTHER 3	34	2.2
OTHER 4	8	.5
TOTAL	1538	

BPHICS REPORTING METHOD, by MLA

As of: January 1994 * (Sorted by Agency Code/Agency, Ascending Order)

Agency	ADP System	Agency Code	BPHICS			MMR			
			NLSNET (1)	DISK (2)	PAPER (3)	NLSNET (1)	DISK (2)	PAPER (3)	expEDIte (4)
Anchorage, AK	M	AK9	CIDS			CIDS			
Montgomery, AL	I	AL9			paper	CIDS			
Little Rock, AR	READS	AR9		Disk			Disk		
Phoenix, AZ	DRA	AZ9			paper			paper	
Los Angeles, CA	DRA	CA8			paper			paper	
Sacramento, CA	DRA	CA9			paper	CIDS			
Denver, CO	I	CO9			paper			paper	
Rocky Hill, CT	DRA	CT9			paper			paper	
NLS **	n/a	DC6			paper				
Washington, DC	READS	DC9			paper			paper	
Dover, DE	READS	DE9		Disk			Disk		
Daytona Beach, FL	I	FL9			paper			paper	
Atlanta, GA	READS	GA9		Disk			Disk		
Honolulu, HI	READS	HI9			paper			paper	
Des Moines, IA	P/J	IA9			paper			paper	
Boise, ID	READS	ID9		Disk			Disk		
Chicago, IL	DRA	IL9			paper			paper	
Indianapolis, IN	DRA	IN9	CIDS			CIDS			
Emporia, KS	READS	KS9	CIDS			CIDS			
Frankfort, KY	READS	KY9		Disk			Disk		
Baton Rouge, LA	READS	LA9		Disk			Disk		
Watertown, MA	KEY	MA9			paper			paper	
Baltimore, MD	DRA	MD9			paper			paper	
Augusta, ME	READS	ME9		Disk			Disk		
Wayne ,MI	READS	MI8		Disk			Disk		
Lansing, MI	P/J	MI9	CIDS			CIDS			
St Paul, MN	I	MN9			paper			paper	
Jefferson City, MO	DRA	MO9			paper			paper	
Jackson, MS	READS	MS9		Disk			Disk		
Helena, MT	READS	MT9			paper	CIDS			
Raleigh, NC	KEY	NC9			paper			paper	
Grand Forks, ND	M	ND9			paper			paper	
Lincoln, NE	READS	NE9		Disk			Disk		
Concord, NH	READS	NH9			paper				expEDIte

BPHICS REPORTING METHOD, by MLA

As of: January 1994 * (Sorted by Agency Code/Agency, Ascending Order)

Agency	ADP System	Agency Code	BPHICS NLSNET (1)	BPHICS DISK (2)	BPHICS PAPER (3)	MMR NLSNET (1)	MMR DISK (2)	MMR PAPER (3)	MMR expEDIte (4)
Trenton, NJ	P/J	NJ9			paper			paper	
Santa Fe, NM	M	NM9			paper	CIDS			
Carson City, NV	READS	NV9			paper			paper	
New York, NY	DRA	NY8			paper	CIDS			
Albany, NY	I	NY9			paper	CIDS			
MSCE	READS	OH6			paper			paper	
Columbus, OH	I	OH9			paper			paper	
Oklahoma City, OK	I	OK9			paper	CIDS			
Salem, OR	DRA	OR9			paper	CIDS			
Pittsburgh, PA	P/J	PA8	CIDS			CIDS			
Philadelphia, PA	P/J	PA9			paper			paper	
Puerto Rico	M	PR9			paper			paper	
Providence, RI	READS	RI9		Disk			Disk		
Columbia, SC	DRA	SC9			paper	CIDS			
Pierre, SD	READS	SD9		Disk			Disk		
Nashville, TN	I	TN9	CIDS			CIDS			
Austin, TX	I	TX9			paper			paper	
MSCW	READS	UT6			paper			paper	
Salt Lake City, UT	I	UT9			paper	CIDS			
Richmond, VA	READS	VA9			paper			paper	
Virgin Islands	M	VI9			paper			paper	
Montpelier, VT	DRA	VT9			paper			paper	
Seattle, WA	DRA	WA9			paper	CIDS			
Milwaukee, WI	DRA	WI9			paper			paper	
Charleston, WV	READS	WV9			paper			paper	
Cheyenne, WY	M	WY9			paper			paper	
TOTAL		60	6	12	42	17	12	29	1
Participating %			10.00%	20.00%	70.00%	28.81%	20.34%	49.15%	1.69%

* Information provided/verified by NLS Network Branch & BPHICS Contractor.

** MMR (Monthly Machine Report) Not Applicable, Subtracted from MMR Total Units.

(1) - Transactions keyed/generated by NLSNET and transmitted to BPHICS via CIDS.

(2) - Transactions keyed/generated by READS to diskette and mailed to BPHICS.

(3) - Transactions placed on paper and mailed or Faxed to BPHICS.

(4) - Transactions keyed/generated by NLSNET and transmitted to BPHICS via expEDIte.

ADP System Key
I - Independent
M - Manual
P/J - Penn/Jersey Consortium
KEY - Keystone

(bphic3.wk1)

Appendix 2-19
MSC Equipment Inventory, Activity and Space Used

MODEL	Quantity On-hand MSCW	Quantity On-hand MSCE	Quantity On-hand TOTAL	Total Receipt MSCW	Total Issued MSCW	Total Receipt MSCE	Total Issued MSCE	Receipt Grand TOTAL	Issued Grand TOTAL
A-1	3,954	13	3,967	7,599	3,813	2,689	2,692	10,288	6,505
A-80						100	100	100	100
B-79	2,682	0	2,682	125	145			125	145
TBM SUBTOTAL (GOOD)	**6,636**	**13**	**6,649**	**7,724**	**3,958**			**7,724**	**3,958**
C-1	411	23	434	2,901	3,122	8	0	2,909	3,122
C-1/C-79 ARC	362	0	362	1,794	2,190			1,794	2,190
C-1A	526	0	526	32	72			32	72
C-80	0	1,072	1,072	0	0	0	449	0	449
C-80R	1,300	0	1,300	432	169			432	169
CBM SUBTOTAL (GOOD)	**2,599**	**1,095**	**3,694**	**5,159**	**5,553**			**5,159**	**5,553**
OLD CBMs (NEEDING REPAI	623	0	623	1,324	704			1,324	704
CT-1 SUBTOTAL (GOOD)	7,393	0	7,393	10,516	3,193			10,516	3,193
E-1	4,701	4	4,705	37	4,656	2,920	3,204	2,957	7,860
E-1 ARC	396	0	396	347	0			347	0
E-1 SUBTOTAL (GOOD)	**5,097**	**4**	**5,101**	**384**	**4,656**			**384**	**4,656**
E-1 (NEEDING REPAIR)	2,936	0	2,936	4,104	1,294			4,104	1,294
MACHINE TOTAL	**25,284**	**1,112**	**26,396**	**29,211**	**19,358**			**29,211**	**19,358**
HEADPHONES	12,109	2,405	14,514	2,017	4,098			2,017	4,098
PILLOW SPEAKER	1,798	832	2,630	2,866	1,493			2,866	1,493
AMPLIFIER HEADPHONE	601		601	196	654			196	654
EXTENSION LEVER	2,748	165	2,913	2,232	708			2,232	708
HEADPHONE COVER	11,600	6,400	18,000	0	1,635			0	1,635
EAR CUSHION	2,150	465	2,615	0	302			0	302
REMOTE CONTROL	11,944		11,944	0	186			0	186
HEADPHONE AMPLIFIER	1,524		1,524	0	0			0	0
ACCESSORIES TOTAL	**44,474**	**10,267**	**54,741**	**7,311**	**9,076**			**7,311**	**9,076**

	MSCW	MSCE	TOTAL
MACHINE STORAGE	9,390	1,000	10,390
SUPPLY STORAGE	2,050	1,110	3,160
TOTAL AREA (SF)	**11,440**	**2,110**	**13,550**

Appendix 2-19 Continued			
MSC Equipment Inventory, September 30, 1994			
	Quantity	Quantity	Quantity
	On-hand	On-hand	On-hand
MODEL	MSCW	MSCE	TOTAL
------------	------	------	------
A-1	11,420	417	11,837
A-80			
B-79	2,572		2,572
	------	------	------
TBM SUBTOTAL (GOOD)	13,992	417	14,409
A-1 NEEDING REPAIR	24		24
C-1	1,286	23	1,309
C-1/C-79 ARC	381		381
C-1A	502		502
C-78	116		116
C-80		1,071	1,071
C-80R	1,238		1,238
	------	------	------
CBM SUBTOTAL (GOOD)	3,523	1,094	4,617
OLD CBMs (NEEDING REPAIR)	1,723		1,723
CT-1 SUBTOTAL (GOOD)	13,150		13,150
CT-1 NEEDING REPAIR	79		79
E-1	2,094	238	2,332
E-1 ARC	304		304
	------	------	------
E-1 SUBTOTAL (GOOD)	2,398	238	2,636
E-1 (NEEDING REPAIR)	4,715		4,715
MACHINE TOTAL	39,604	1,749	41,353
=======================	========	========	========
HEADPHONES	21,787	10,938	32,725
PILLOW SPEAKER	4,431	227	4,658
AMPLIFIER HEADPHONE	601		601
EXTENSION LEVER	528	165	693
HEADPHONE COVER	9,022	6,400	15,422
EAR CUSHION	1,241	465	1,706
REMOTE CONTROL	11,554		11,554
HEADPHONE AMPLIFIER	1,224		1,224
		------	------
ACCESSORIES TOTAL	50,388	18,195	68,583
=======================	========	========	========
	MSCW	MSCE	TOTAL
	------	------	------
MACHINE STORAGE	9,390	1,000	10,390
SUPPLY STORAGE	2,050	1,110	3,160
	------	------	------
TOTAL AREA (SF)	11,440	2,110	13,550

Appendix 2-20
MSC Repair Parts Inventory and Activity

Item	Inventory On-hand MSCE	Inventory On-hand MSCW	Inventory On-hand TOTAL	Used this FY
TBM Amplifier	1449	565	2014	96
Battery Pack: C-1 Machine	-48	6144	6096	63552
Idler Wheels	1770	14586	16356	1315
Playback Heads	14260	7380	21640	6725
Needles, Cartridge DD	22575	24600	47175	12175
CBM Amplifier	0	0	0	0
CBM Motor	3236	928	4164	685
CBM Motor Control Board	241	50	291	331
Battery Pack: CT-1	0	450	450	0

Appendix 2-21
MSC Equipment Related Supplies Inventory and Activity

Item	MSCE	MSCW	Total On hand	Used this FY
Machine Repair Log Form	1975	3475	5450	5493
Machine Repair Parts Order	1198	1950	3148	1407
Application for Amplifier	0	0	0	1556
CBM In-Warranty Defect ID	1	160	161	4518
TBM In-Warranty Defect ID	0	0	0	100
Irregular Receipt Record	8656	4676	13332	200
Monthly Report of Machine	2858	5625	8483	6191
Patron Card	1020	2580	3600	11795
Obsolete/Damaged Equipment	11117	8150	19267	6487
Monthly Report of Equip L	3189	5285	8474	2914
MSC Monthly Report of Mac	16800	6710	23510	0
Application: Remote Contr	6878	3998	10876	1619
Monthly Inventory Report	410	11950	12360	2388
Monthly Inventory Report	5947	7950	13897	4788
A-1 Operating Instruction	6440	4250	10690	2605
A-1 Operating Instruction	1593	4040	5633	7181
A-1 Operating Instr Span	1714	1000	2714	200
Intro to TBS Flexidisc	710	0	710	50
Intro to TBS Flexidisc	0	150	150	250
Instructions: Pillow Speaker	9901	5250	15151	262
Instructions F/ Extension	1414	1000	2414	575
Instructions: E-1 (brochure)	0	0	0	228
E1 CBM Op Inst Spanish	0	1497	1497	0
Operating Instructions: E	3039	3687	6726	2852
Model E-1 CBM Card	0	975	975	25
Operating Instructions: A	19067	13660	32727	5365
Operating Instructions: A	22200	6025	28225	3525
Operating Instructions: A	2771	1645	4416	605
Operating Instructions: A	261	410	671	7758
Operating Instructions: C	8	2475	2483	549
Operating Instructions: C	0	25	25	0
Operating Instructions: C	3237	0	3237	17365
Operating Instructions: C	14045	6350	20395	11202
Operating Instructions: C	0	10100	10100	14845
Operating Instructions: C	194	2266	2460	631
Operating Instructions: E	4690	8521	13211	544
Operating Instructions: E	23	89	112	434
Operating Instructions: E	1405	1319	2724	76
Carton, TBM (A71/earlier)	419	0	419	0
Carton: TBM A72-A80 used	2950	8267	11217	12840
Styrofoam: TBM A72-A80 Used	1797	4209	6006	9763
Carton: CBM C76-On use W/	0	0	0	10090
Sty..oam: CBM C76-on Use	0	270	270	20730
Carton CBM (C74/earlier)	100	275	375	7425
Carton, CBM C76-on	0	652	652	425
Carton: CBM 22x13x10 (Overpak)	782	4540	5322	820
Carton: TBM A-1 Used w/s	1630	2425	4055	1560
Carton: MD 816 Headphone	0	0	0	1554
Carton: LH-1 Headphone	0	0	0	164
Styrofoam A-1 (Tone Arm)	740	870	1610	733
Carton E-1 Machine w/Insert	393	693	1086	1598
Cartons, Rmt Cntr Units O	0	500	500	0
Carton, Rmt Control Units	0	0	0	25

Note: Items with neither inventory nor activity not included.

Appendix 2-22

ADP SYSTEMS USED by MLAs

As of: January 1994

DRA	READS	CONSORTIUM	KEYSTONE	INDEPENDENT *	MANUAL
Arizona	Arkansas	Iowa	Massachusetts	Alabama	Alaska
California (N)	Delaware	Michigan (L)	North Carolina	Colorado	New Mexico
California (S)	District of Columbia	New Jersey		Florida	North Dakota
Connecticut	Georgia	Pennsylvania (E)		Minnesota	Puerto Rico
Illinois	Hawaii	Pennsylvania (W)		New York (A)	Virgin Islands
Indiana	Idaho			Ohio	Wyoming
Maryland	Kansas			Oklahoma	
Missouri	Kentucky			Tennessee	
New York (C)	Louisiana			Texas	
Oregon	Maine			Utah	
South Carolina	Michigan (W)				
Vermont	Mississippi				
Washington	Montana				
Wisconsin	Nebraska				
	Nevada				
	New Hampshire				
	Ohio (MSCE)**				
	Rhode Island				
	South Dakota				
	Utah (MSCW)**				
	Virginia				
	West Virginia				
14	22	5	2	10	6
24%	37%	9%	3%	17%	10%

Source: NLS Staff

* - Independent indicates single location system.

** - Not used for controlling machine inventory.

(statesy1.wk1)

CMLS National Yearly Change in Patrons

	FY88	FY89	FY90	FY91	FY92	FY93	FY94
On file at start of year (Oct. 1)	374,865	392,841	410,099	427,017	439,984	455,448	469,286
On file at end of year (Sept. 30)	438,010	462,341	479,936	499,519	510,344	527,296	--
Increase during year	63,145	69,500	69,837	72,502	70,360	71,848	--
Cancels at end of year	45,169	52,242	52,919	59,535	54,896	58,010	--

NOTE: NLS does not require libraries to submit statistics for "adds" and "drops" during the year. There are no "adds" or "cancels" statistics for disc/cassette readers, or by individuals/organizations. The above totals represent all individuals and organizations combined. Cancels on CMLS are patrons who are no longer active.

METHOD of REPORTING MACHINE DATA by ADF SYSTEM

As of: January 1994 * (Sorted by ADP System/Agency Code, Ascending Order)

Agencies	ADP System	Agency Code	BPHICS NLSNET (1)	BPHICS DISK (2)	BPHICS PAPER (3)	MMR NLSNET (1)	MMR DISK (2)	MMR PAPER (3)	MMR expEDIte (4)
Phoenix, AZ	DRA	AZ9			paper			paper	
Los Angeles, CA	DRA	CA8			paper			paper	
Sacramento, CA	DRA	CA9			paper	CIDS			
Rocky Hill, CT	DRA	CT9			paper			paper	
Chicago, IL	DRA	IL9			paper			paper	
Indianapolis, IN	DRA	IN9	CIDS			CIDS			
Baltimore, MD	DRA	MD9			paper			paper	
Jefferson City, MO	DRA	MO9			paper			paper	
New York, NY	DRA	NY8			paper	CIDS			
Salem, OR	DRA	OR9			paper	CIDS			
Columbia, SC	DRA	SC9			paper	CIDS			
Montpelier, VT	DRA	VT9			paper			paper	
Seattle, WA	DRA	WA9			paper	CIDS			
Milwaukee, WI	DRA	WI9			paper			paper	
Montgomery, AL	I	AL9			paper	CIDS			
Denver, CO	I	CO9			paper			paper	
Daytona Beach, FL	I	FL9			paper			paper	
St Paul, MN	I	MN9			paper			paper	
Albany, NY	I	NY9			paper	CIDS			
Columbus, OH	I	OH9			paper			paper	
Oklahoma City, OK	I	OK9			paper	CIDS			
Nashville, TN	I	TN9	CIDS			CIDS			
Austin, TX	I	TX9			paper			paper	
Salt Lake City, UT	I	UT9			paper	CIDS			
Watertown, MA	KEY	MA9			paper			paper	
Raleigh, NC	KEY	NC9			paper			paper	
Anchorage, AK	M	AK9	CIDS			CIDS			
Grand Forks, ND	M	ND9			paper			paper	
Santa Fe, NM	M	NM9			paper	CIDS			
Puerto Rico	M	PR9			paper			paper	
Virgin Islands	M	VI9			paper			paper	
Cheyenne, WY	M	WY9			paper			paper	
NLS **	n/a	DC6			paper				
Des Moines, IA	P/J	IA9			paper			paper	

Appendix 2-24 (Continued)

METHOD of REPORTING MACHINE DATA by ADP SYSTEM

As of: January 1994 * (Sorted by ADP System/Agency Code, Ascending Order)

Agencies	ADP System	Agency Code	BPHICS NLSNET (1)	BPHICS DISK (2)	BPHICS PAPER (3)	MMR NLSNET (1)	MMR DISK (2)	MMR PAPER (3)	MMR expEDIte (4)
Lansing, MI	P/J	MI9	CIDS			CIDS			
Trenton, NJ	P/J	NJ9			paper			paper	
Pittsburgh, PA	P/J	PA8	CIDS			CIDS			
Philadelphia, PA	P/J	PA9			paper			paper	
Little Rock, AR	READS	AR9		Disk			Disk		
Washington, DC	READS	DC9			paper			paper	
Dover, DE	READS	DE9		Disk			Disk		
Atlanta, GA	READS	GA9		Disk			Disk		
Honolulu, HI	READS	HI9			paper			paper	
Boise, ID	READS	ID9		Disk			Disk		
Emporia, KS	READS	KS9	CIDS			CIDS			
Frankfort, KY	READS	KY9		Disk			Disk		
Baton Rouge, LA	READS	LA9		Disk			Disk		
Augusta, ME	READS	ME9		Disk			Disk		
Wayne ,MI	READS	MI8		Disk			Disk		
Jackson, MS	READS	MS9		Disk			Disk		
Helena, MT	READS	MT9			paper	CIDS			
Lincoln, NE	READS	NE9		Disk			Disk		
Concord, NH	READS	NH9			paper				expEDIte
Carson City, NV	READS	NV9			paper			paper	
MSCE	READS	OH6			paper			paper	
Providence, RI	READS	RI9		D'sk			Disk		
Pierre, SD	READS	SD9		Disk			Disk		
MSCW	READS	UT6			paper			paper	
Richmond, VA	READS	VA9			paper			paper	
Charleston, WV	READS	WV9			paper			paper	
TOTAL		60	6	12	42	17	12	29	1
Participating %			10.00%	20.00%	70.00%	28.81%	20.34%	49.15%	1.69%

* Information provided/verified by NLS Network Branch & BPHICS Contractor.

** MMR (Monthly Machine Report) Not Applicable, Subtracted from MMR Total Units.

(1) - Transactions keyed/generated by NLSNET and transmitted to BPHICS via CIDS.

(2) - Transactions keyed/generated by READS to diskette and mailed to BPHICS.

(3) - Transactions placed on paper and mailed or Faxed to BPHICS.

(4) - Transactions keyed/generated by NLSNET and transmitted to BPHICS via expEDIte.

ADP System Key
I - Independent
M - Manual
P/J - Penn/Jersey Consortium
KEY - Keystone

(bphic4.wk1)

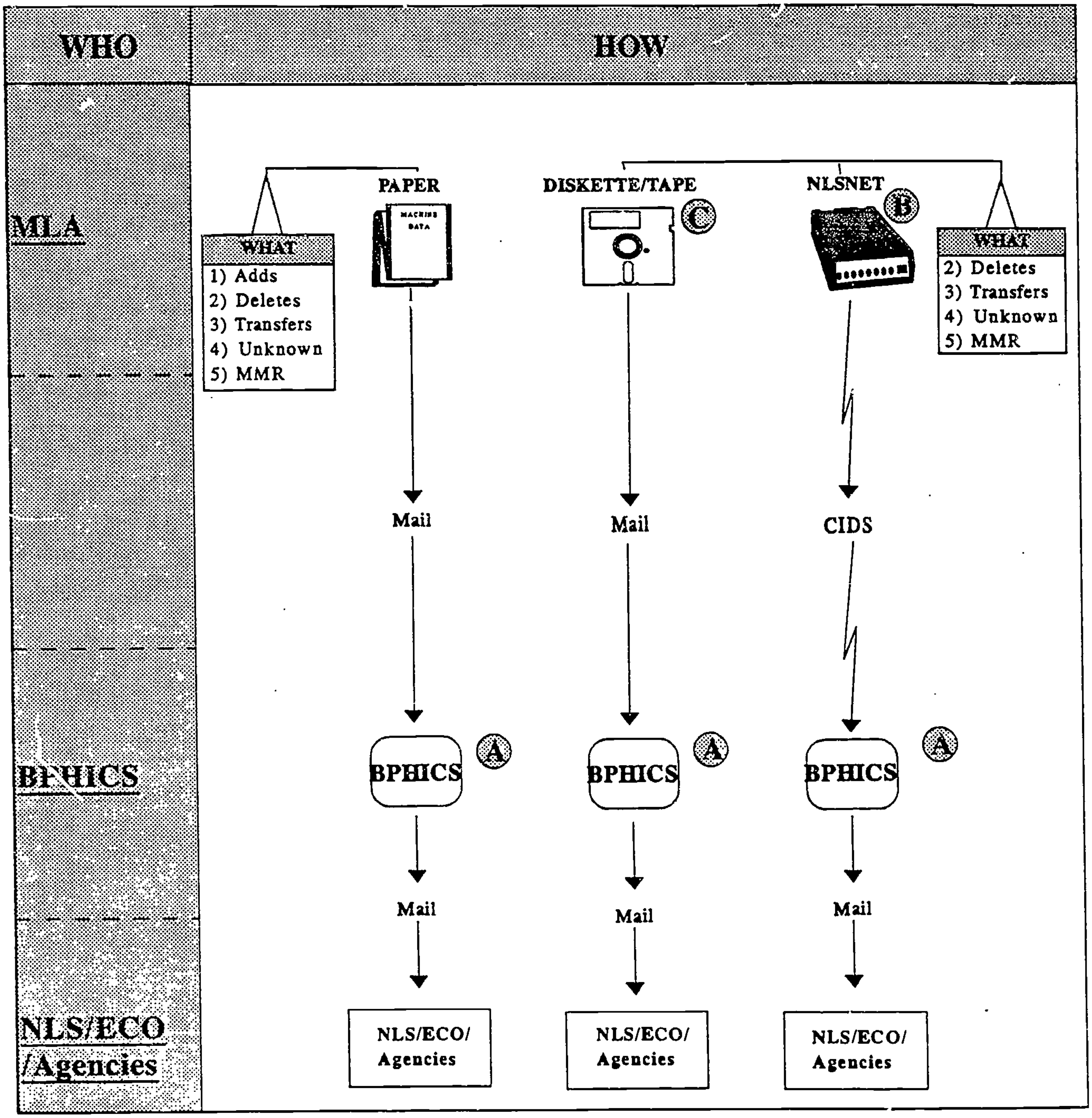
STATUS CODES

READS	
1	Available
2	On Loan
3	In Repair
4	Lost
5	Stolen
6	Location Unknown
7	Returning for Repair
CONSORTIUM	
0	Assigned
1	Location Unknown
2	Reported Lost
3	Unrepairable
4	Reported Stolen
5	Transferred Out of State
6	Obsolete
7	Pending Return
8	Available in Inventory
FLORIDA	
05	Damaged Beyond Repair
06	Location Unknown
07	Stolen
08	Lost in Mail
DRA	
1	New
2	Available
3	Assigned
4	Re–Assigned
5	Waiting Repair
6	In Repair
7	Non–repairable
8	Destroyed
9	Unknown
10	Stolen
11	Lost
12	Obsolete
13	Transferred–in
14	Transferred–out

KEYSTONE	
Check–in 1	
WIR	Waiting In Repair
Check–in 2	
AVL	Available
DBR	Damaged Beyond Repair
IRP	In Repair
OBS	Obsolete
RES	Resend the same machine to the patron
RPL	Send a Replacement
Circulation Maintenance	
ASG	Assigned to a patron
AVL	Available
LOS	Lost
LUN	Location Unknown
OBS	Obsolete
OUT	Checked out
RET	Returned – damaged beyond, or in repair
STL	Stolen
TFI	Transferred in
TFO	Transferred out

(statcode.wk1)

INFORMATION FLOW of MACHINE DATA to NLS



(A) The BPHICS Enter/Edit/Update process is detailed in Appendix 2-34.

(B) The NLSNET Enter/Edit/Update process is detailed in Appendix 2-32.

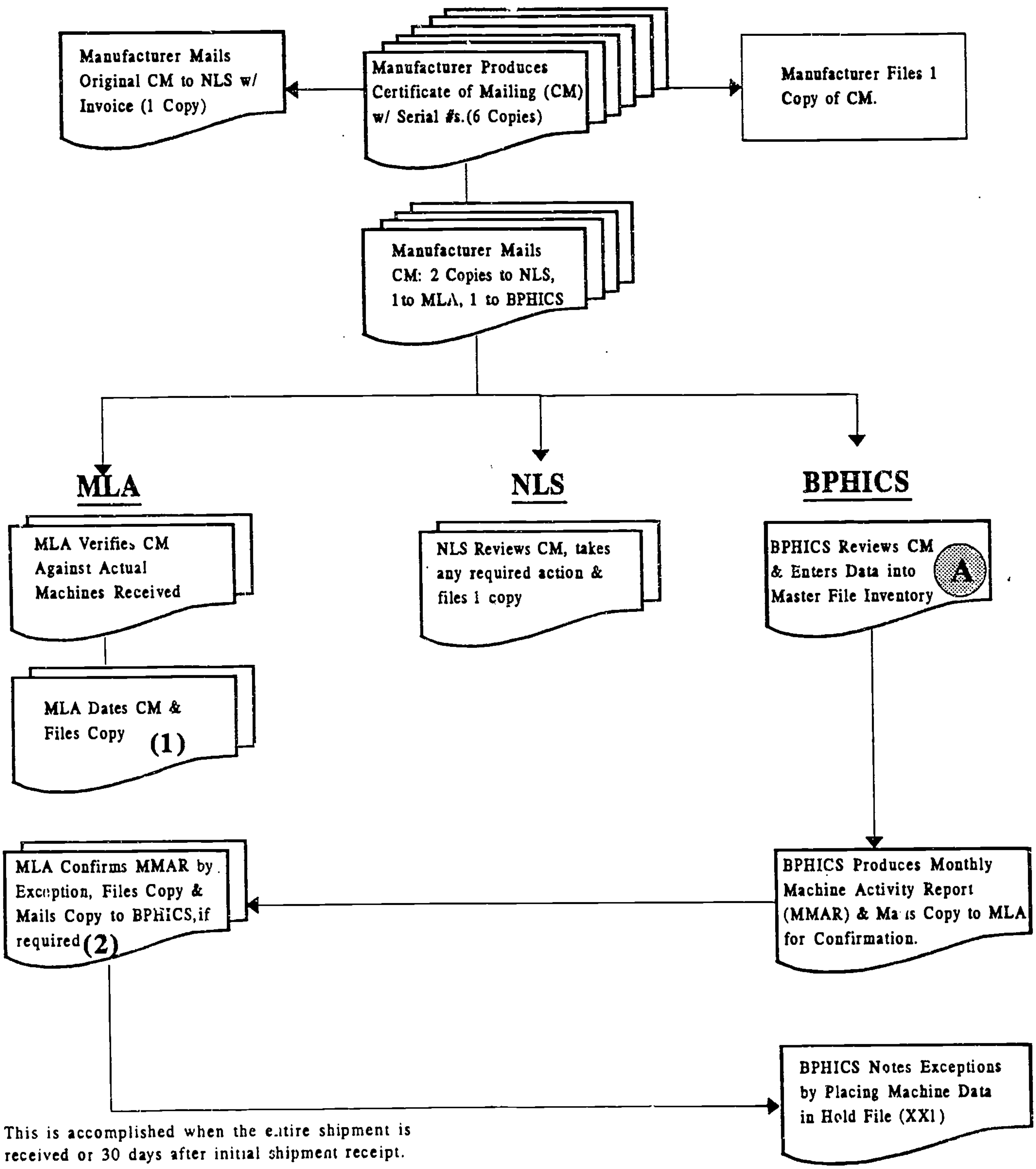
(C) The Diskette (READS) Enter/Edit/Update process is detailed in Appendix 2-33.

Revised 12/94.

Appendix 2-27

INFORMATION FLOW of MACHINE DATA by TYPE of TRANSACTION

1) ACQUISITIONS/ADDs



(1) This is accomplished when the entire shipment is received or 30 days after initial shipment receipt.

(2) Machines received after this process are noted on an Irregular Receipt Report which is mailed to NLS.

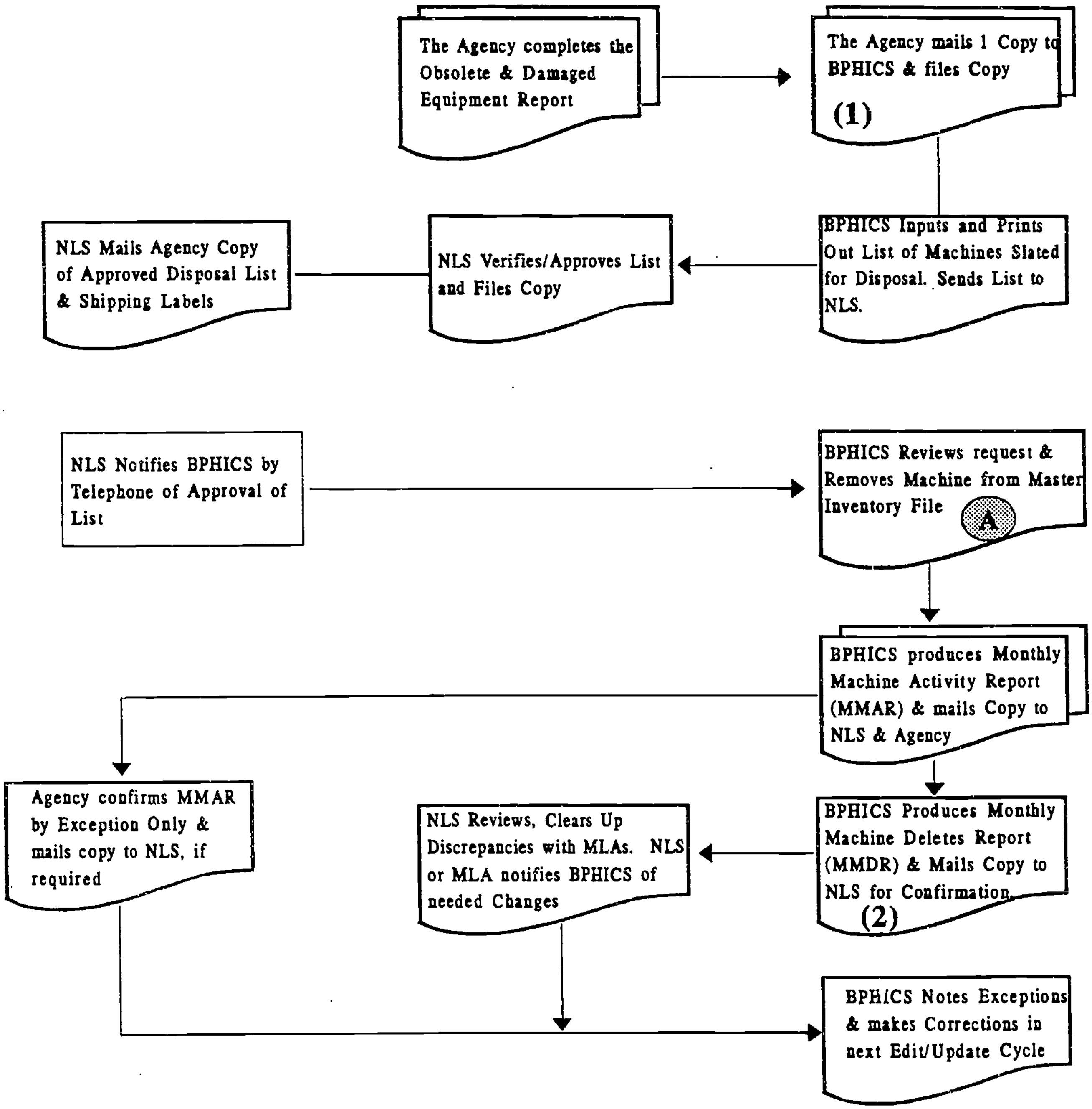
(A) The Enter/Edit/Update process is detailed in Appendix 2-34.

Revised 12/94.

Appendix 2-28

INFORMATION FLOW of MACHINE DATA by TYPE of TRANSACTION

2) DELETES



(1) This process can also be done through NLSNET or Diskette. These functions are defined later in this report.

(2) If BPHICS is unable to delete the machine, the document returned to NLS for review and action.

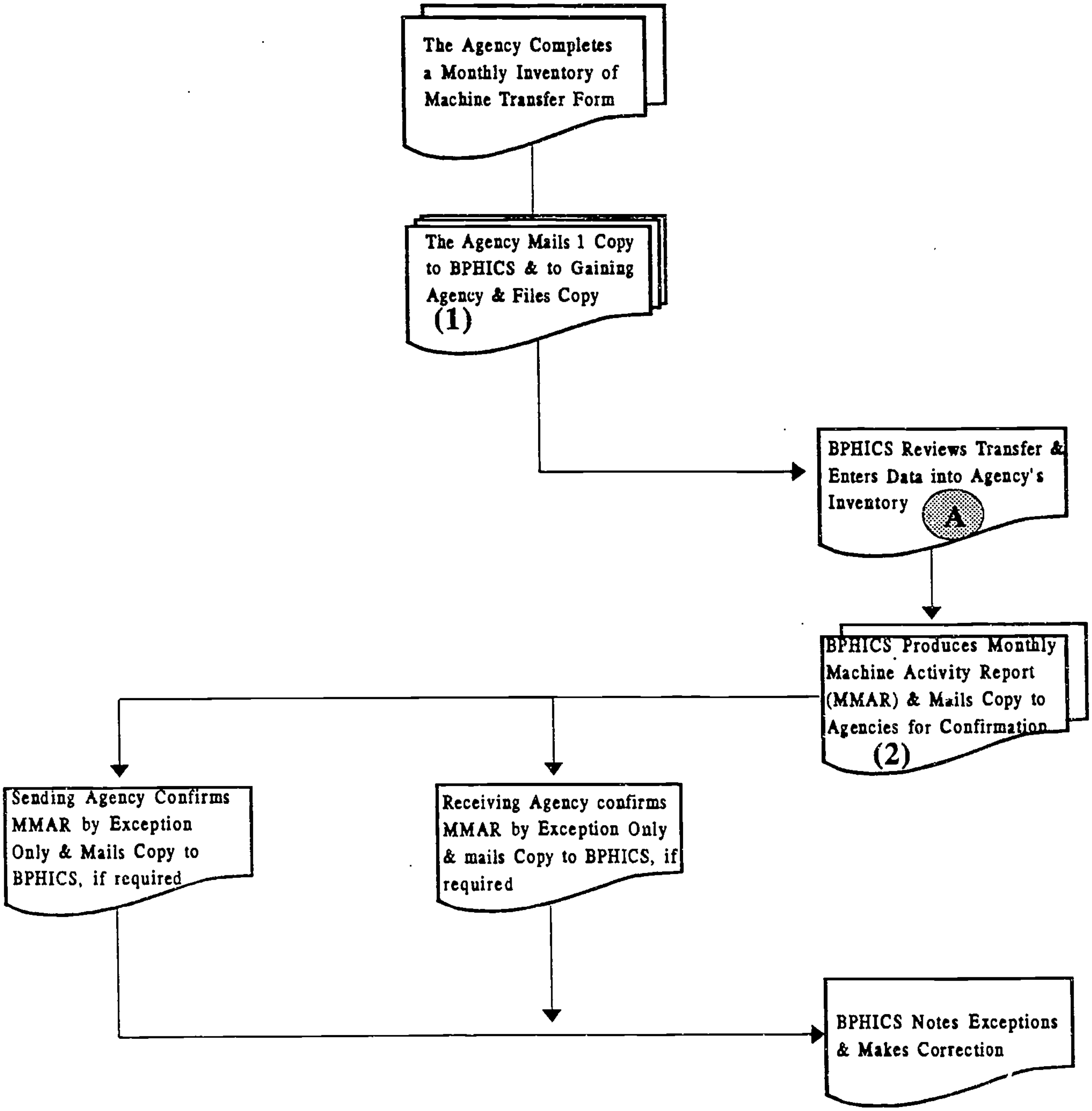
(A) The Edit/Update process is detailed in Appendix 2-34.

Revised 12/94.

Appendix 2-29

INFORMATION FLOW of MACHINE DATA by TYPE of TRANSACTION

3) TRANSFERs



(1) This process could be performed through NLSNET or Diskette. These functions are explain later in this report.

(2) If BPHICS is unable to transfer machine, the document is returned to NLS for review and action.

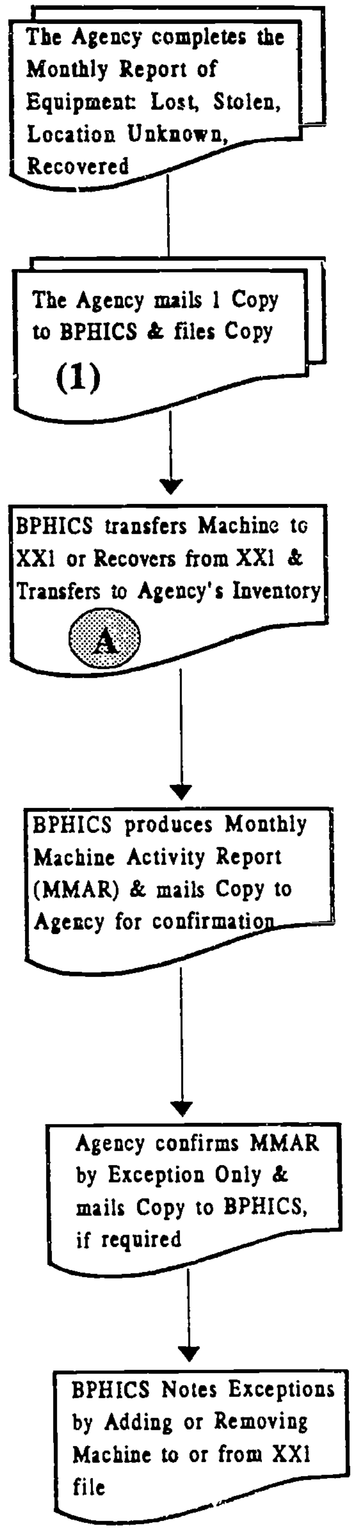
(A) The Enter/Edit/Update process is detailed in Appendix 2-34.

Revised 12/94.

Appendix 2-30

INFORMATION FLOW of MACHINE DATA by TYPE of TRANSACTION

4) LOST, STOLEN, LOCATION UNKNOWN & RECOVERED



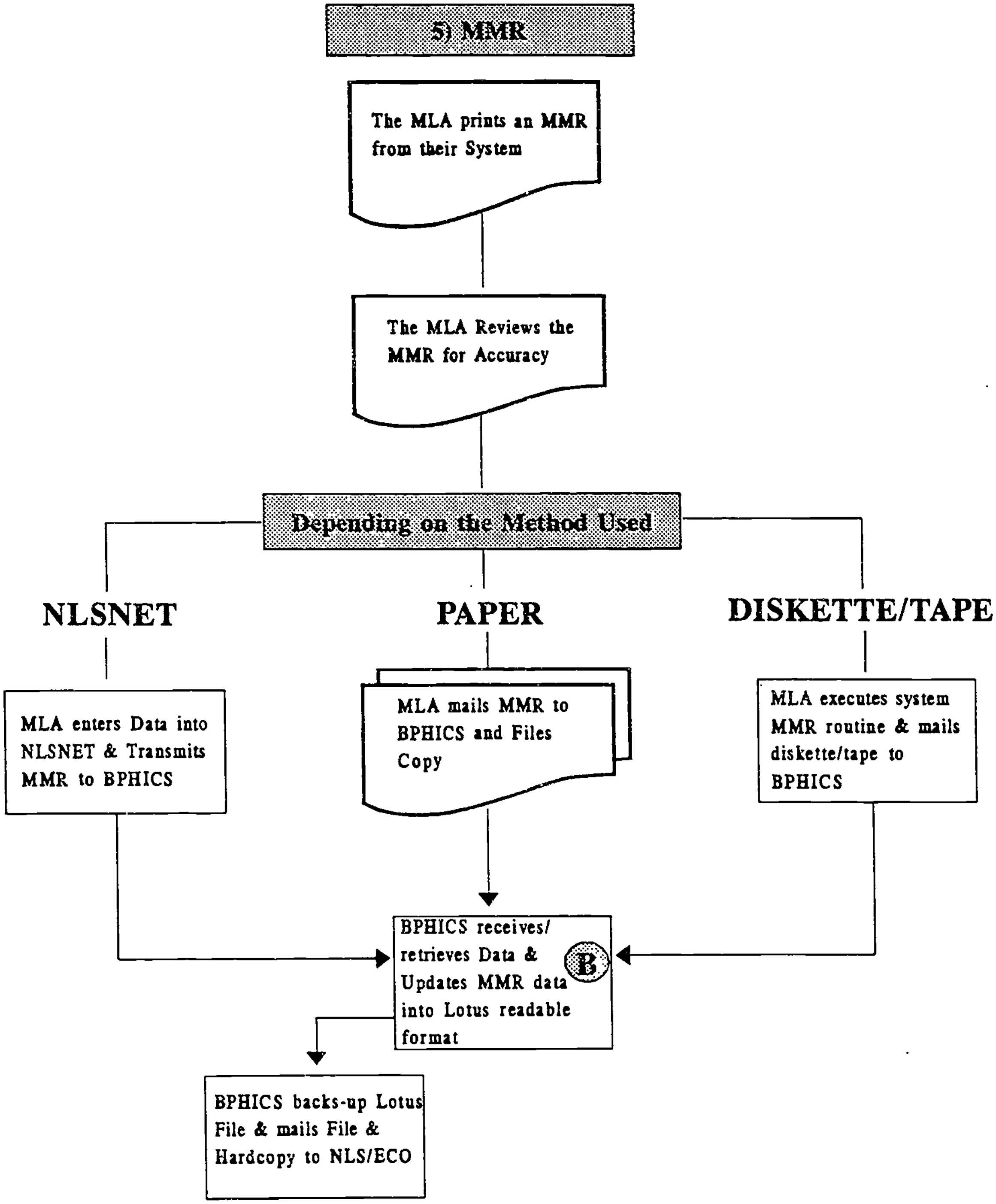
(1) This process can be done through NLSNET or Diskette. These functions are defined later in this report.

(A) The Enter/Edit/Update process is detailed in Appendix 2-34.

Revised 12/94.

Appendix 2-31

INFORMATION FLOW of MACHINE DATA
by TYPE of TRANSACTION



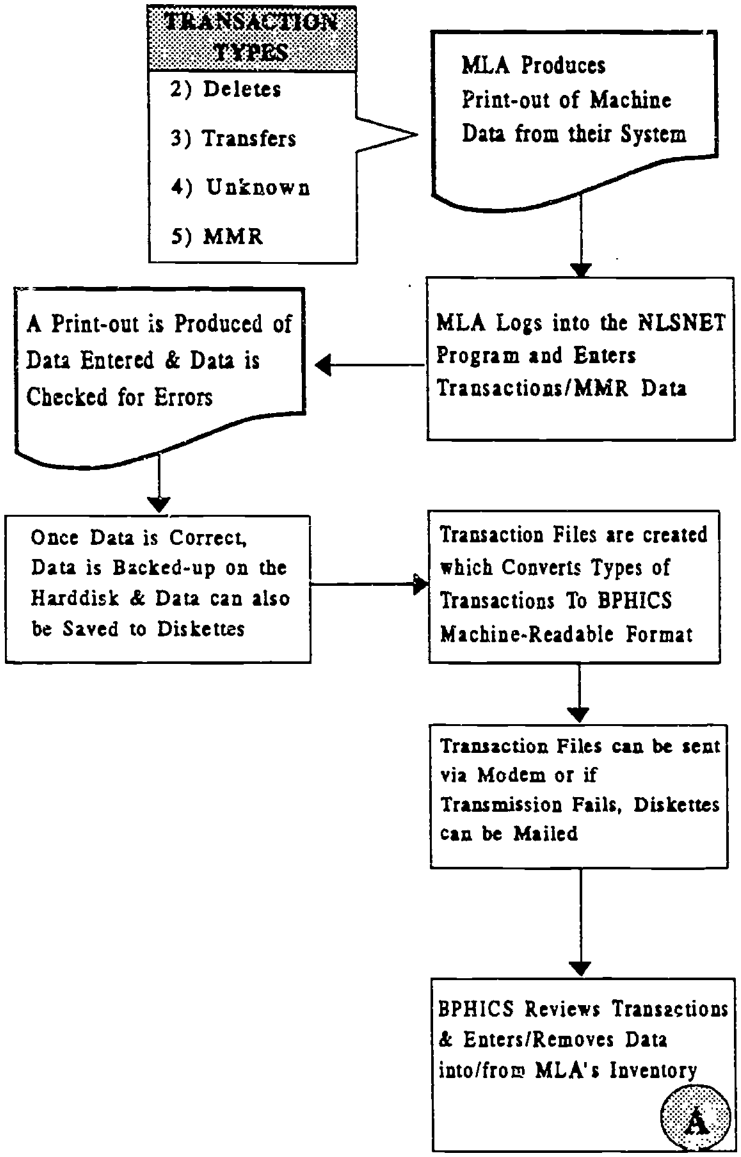
(B) This process is detailed in Appendix 2-34.

Revised 12/94.

Appendix 2-32

NLSNET PROCESSING of MACHINE DATA

(BPHICS Data Only)

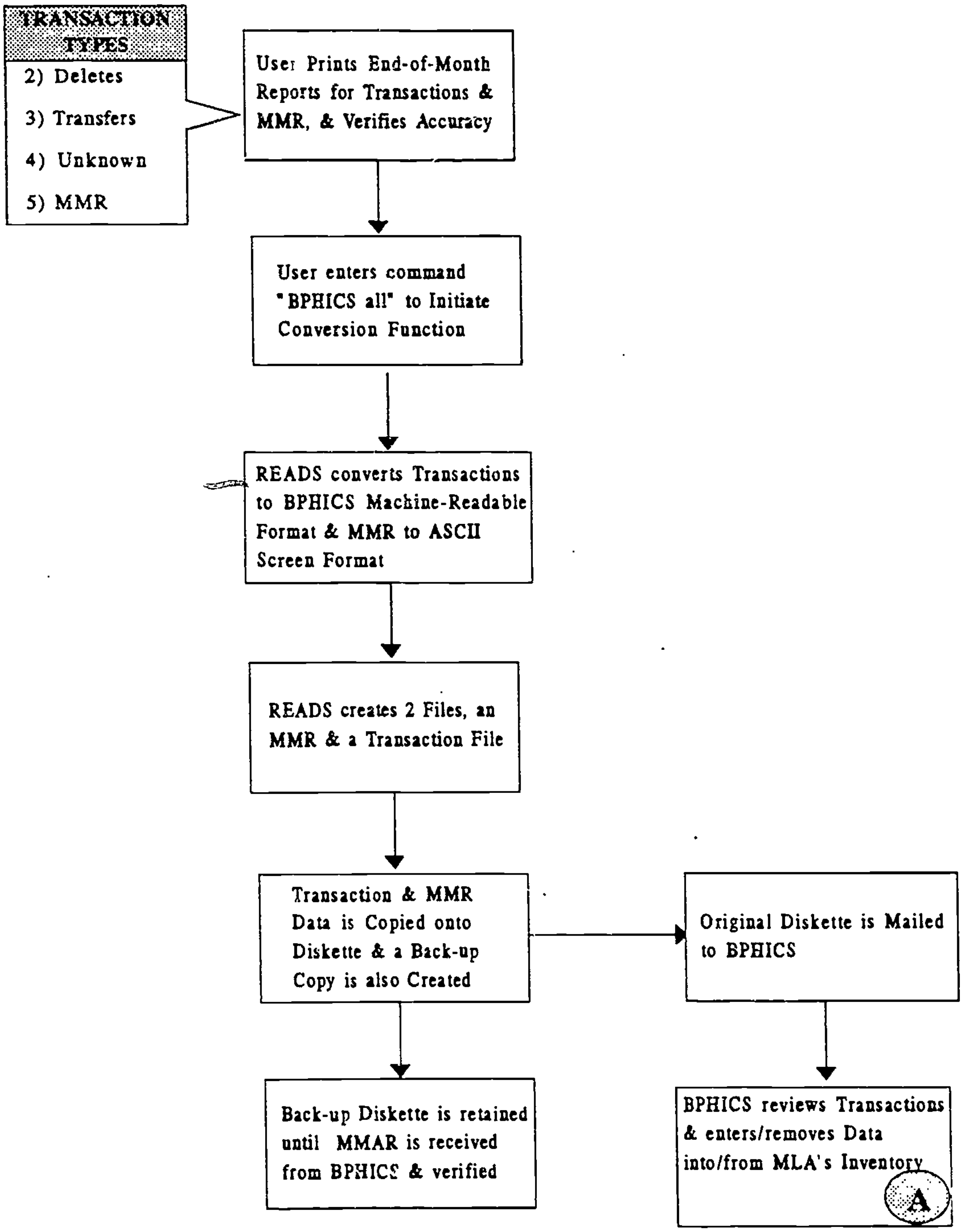


A The Data Enter/Edit/Update process is detailed in Appendix 2-34.

Appendix 2-33

READS PROCESSING of MACHINE DATA

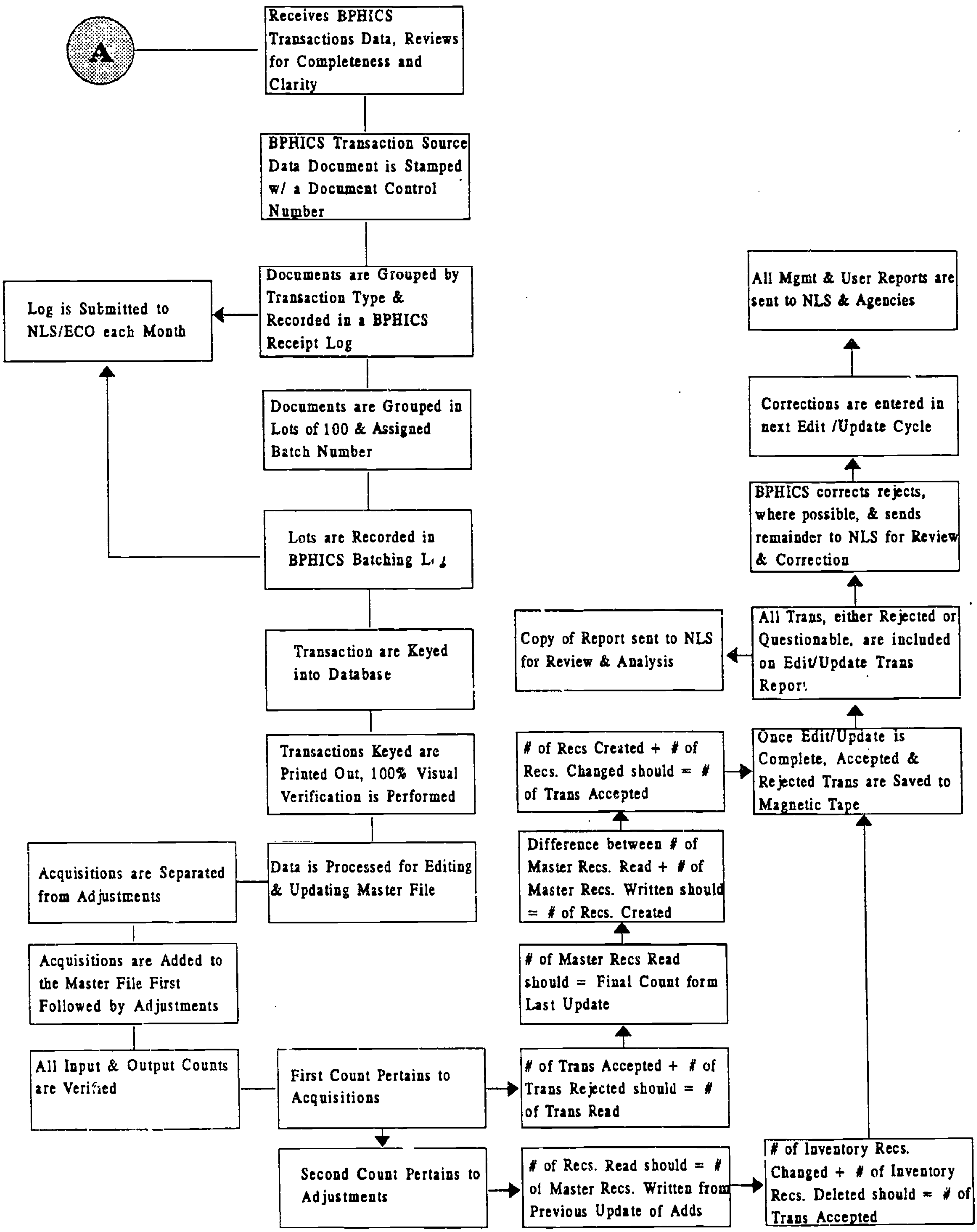
(BPHICS Data Only)



A The Data Enter/Edit/Update process is detailed in Appendix 2-34.

Appendix 2-34

BPHICS PROCESSING of BPHICS TRANSACTIONS



Appendix 2-35

BPHICS TRANSACTIONS REPORTED by AGENCIES *

(Sorted by State, Ascending Order) (Shows CBMs & TBMs)

Agency	Recvd fm Producer	Recv.I MSC/NLS	Transfer In	Transfer Out	Damaged	Loc Unk	Total Trans	Avg Trans Per Month
Anchorage, AK	0	22	28	23	2	41	116	10
Montgomery, AL	0	857	151	132	267	590	1,997	166
Little Rock, AR	412	73	204	86	212	314	1,301	108
Phoenix, AZ	1,290	129	116	343	232	40	2,150	179
Los Angeles, CA	2,180	1,408	370	633	1,002	725	6,318	527
Sacramento, CA	1,923	603	1,284	377	567	1,211	5,965	497
Denver, CO	1,234	148	97	307	145	556	2,487	207
Rocky Hill, CT	304	92	121	58	30	468	1,073	89
NLS	0	0	7,530	7,103	0	0	14,633	1,219
Washington, DC	216	51	26	55	78	159	585	49
Dover, DE	120	10	137	29	205	42	543	45
Daytona Beach, FL	3,129	383	2,926	500	342	4,692	11,972	998
Atlanta, GA	1,657	84	293	121	298	964	3,417	285
Honolulu, HI	96	8	1	3	0	3	111	9
Des Moines, IA	604	131	23	1	1,516	68	2,343	195
Boise, ID	237	110	68	62	168	99	744	62
Chicago, IL	2,475	0	133	263	762	1,327	4,960	413
Indianapolis, IN	1,036	28	227	73	354	456	2,174	181
Emporia, KS	850	328	55	127	278	272	1,910	159
Frankfort, KY	612	268	250	741	409	585	2,865	239
Baton Rouge, LA	426	293	247	112	474	642	2,194	183
Watertown, MA	0	2,145	67	135	47	77	2,471	206
Baltimore, MD	520	24	48	63	355	621	1,631	136
Augusta, ME	268	222	135	104	117	352	1,198	100
Wayne ,MI	726	152	252	125	140	462	1,857	155
Lansing, MI	1,716	552	336	205	312	496	3,617	301
St Paul, MN	0	1,079	405	793	5	127	2,409	201
Jefferson City, MO	1,498	62	77	304	425	1,827	4,193	349
Jackson, MS	2	363	222	437	148	123	1,295	108
Helena, MT	272	60	23	32	65	98	550	46
Raleigh, NC	800	22	261	150	100	3,193	4,526	377
Grand Forks, ND	20	230	24	82	41	54	451	38
Lincoln, NE	296	0	165	85	283	319	1,148	96
Concord, NH	0	19	345	51	131	188	734	61
Trenton, NJ	664	201	419	144	202	269	1,899	158
Santa Fe, NM	312	180	38	75	92	188	885	74
Carson City, NV	131	286	188	78	104	404	1,191	99
New York, NY	286	1,320	1,986	247	1,023	1,990	6,852	571
Albany, NY	2,328	225	628	560	296	670	4,707	392
MSCE	0	0	4,195	4,679	0	0	8,874	740
Columbus, OH	1,904	578	1,023	2,981	728	3,016	10,230	853
Oklahoma City, OK	544	172	181	33	223	142	1,295	108
Salem, OR	768	177	397	97	300	938	2,677	223
Pittsburgh, PA	1,060	297	215	131	847	593	3,143	262
Philadelphia, PA	13,260	14,548	14,048	980	486	12,212	55,534	4,628
Puerto Rico	24	105	200	6	131	137	603	50
Providence, RI	0	194	87	132	240	250	903	75
Columbia, SC	732	218	52	64	234	1,411	2,711	226
Pierre, SD	371	10	45	701	82	85	1,294	108
Nashville, TN	492	205	256	94	157	527	1,731	144
Austin, TX	1,388	1,550	1,196	292	485	3,741	8,652	721
MSCW	0	0	18,722	7,243	0	0	25,965	2,164
Salt Lake City, UT	460	117	578	92	72	574	1,893	158
Richmond, VA	636	707	249	287	210	480	2,569	214
Virgin Islands	0	20	2	28	3	11	64	5
Montpelier, VT	36	16	26	29	52	173	332	28
Seattle, WA	868	357	466	170	42	987	2,890	241
Milwaukee, WI	633	39	75	182	979	402	2,310	193
Charleston, WV	0	228	41	31	64	87	451	38
Cheyenne, WY	72	90	34	77	89	51	413	34
TOTAL	**51,888**	**31,796**	**61,994**	**33,148**	**16,651**	**50,529**	**246,006**	**20,501**
% to TOTAL	**21.1%**	**12.9%**	**25.2%**	**13.5%**	**6.8%**	**20.5%**	**100.0%**	

* Status counts represent MMR reports from 11/93 thru 10/94. mlstot2.wk4

** Spreadsheet is designed to provide some indication of volume of activity, the accuracy of the MMRs has not been questioned. Numbers for "Recvd fm Producer" & "Transfer In" appear to be off. Revised 12/94

EXAMPLE BPHICS EDIT/UPDATE TRANSACTION REPORT

LIBRARY OF CONGRESS
NATIONAL LIBRARY SERVICE FOR THE BLIND AND PHYSICALLY HANDICAPPED
INVENTORY CONTROL SYSTEM

BPHICS01 RUN DATE: 01/03/94 EDIT/UPDATE TRANSACTION REPORT - AS OF 01/94 PAGE 1

	AGENCY CODE	MIC	SERIAL/ PART NO	TRX CODE	DOCUMENT NUMBER	QTY	STAT CODE	LDS AGY	GAIN AGY	PREV AGY	DOC DATE	A/R	TRANSACTION DISPOSITION	BATCH #
***	FL9	A01	00000770	CST	0023001	1	CO				1193	R	MODEL/SERIAL # KEY NOT ON FILE	DMA 710
	GA9	A01	00001812		0011170	1	CO			OH6	0791	*	FIELD VALUES BEFORE UPDATE	
***	NC9	A01	00001812	CLA	0023210	1	SL	NC9	GA9		1093	R	MACHINE/PART ALREADY LOCATED IN THIS AGENCY	DMA 714
***	VA9	A01	00002492	DPA	0023138	1					0893	R	MODEL/SERIAL # KEY NOT ON FILE	DMA 709
***	NY8	A01	00002851	DPA	0023105	1					1093	R	MODEL/SERIAL # KEY NOT ON FILE	DMA 709
	ZA7	A01	00004510		9999999	1	CO			MS9	0893	*	FIELD VALUES BEFORE UPDATE	
***	MS9	A01	00004510	CLA	9999999	1	RL	DC6	MS9		1193	A	LOSING AGENCY HAS NOT SUBMITTED TRANSFER STATUS IS NOW RL - INFORM AGENCY ZA7	RDSMS9
***	MS9	A01	00004510	CLA	9999999	1	RL	DC6	MS9		1193	R	MASTER FILE IS UNABLE TO ACCEPT RL STATUS CURRENT FILE STATUS IS RL - MS9	RDSMS9
***	MS9	A01	00004510	CLA	9999999	1	RL	DC6	MS9		1193	R	MASTER FILE IS UNABLE TO ACCEPT RL STATUS CURRENT FILE STATUS IS RL - MS9	RDSMS9
	MS9	A01	00004510		9999999	1	RL	DC6	MS9	ZA7	1193	*	FIELD VALUES AFTER UPDATE	
	PA9	A01	00005731		0001766	1	CO			PA6	0791	*	FIELD VALUES BEFORE UPDATE	
***	NJ9	A01	00005731	CLA	0023212	1	SL	NJ9	PA9		1193	R	MACHINE/PART ALREADY LOCATED IN THIS AGENCY	DMA 714
	PA6	A01	00006177		0008317	1	CO		PA6		0791	*	FIELD VALUES BEFORE UPDATE	
***	NC9	A01	00006177	CLA	0023207	1	RL	NY8	NC9		1193	A	LOSING AGENCY HAS NOT SUBMITTED TRANSFER STATUS IS NOW RL - INFORM AGENCY PA6	DMA 714
***	NC9	A01	00006177	CLA	0023208	1	RL	NY8	NC9		1193	R	MASTER FILE IS UNABLE TO ACCEPT RL STATUS CURRENT FILE STATUS IS RL - NC9	DMA 714
	NC9	A01	00006177		0023207	1	RL	NY8	NC9	PA6	1193	*	FIELD VALUES AFTER UPDATE	
	IL9	A01	00010508		0020457	1	CO			VA9	0993	*	FIELD VALUES BEFORE UPDATE	
***	VA9	A01	00010508	CLA	0023303	1	SL	VA9	IL9		1193	R	MACHINE/PART ALREADY LOCATED IN THIS AGENCY	DMA 715
***	UT6	A01	00011065	CLA	0023278	1	SL	UT6	CA9		1193	R	MODEL/SERIAL # KEY NOT ON FILE	DMA 715

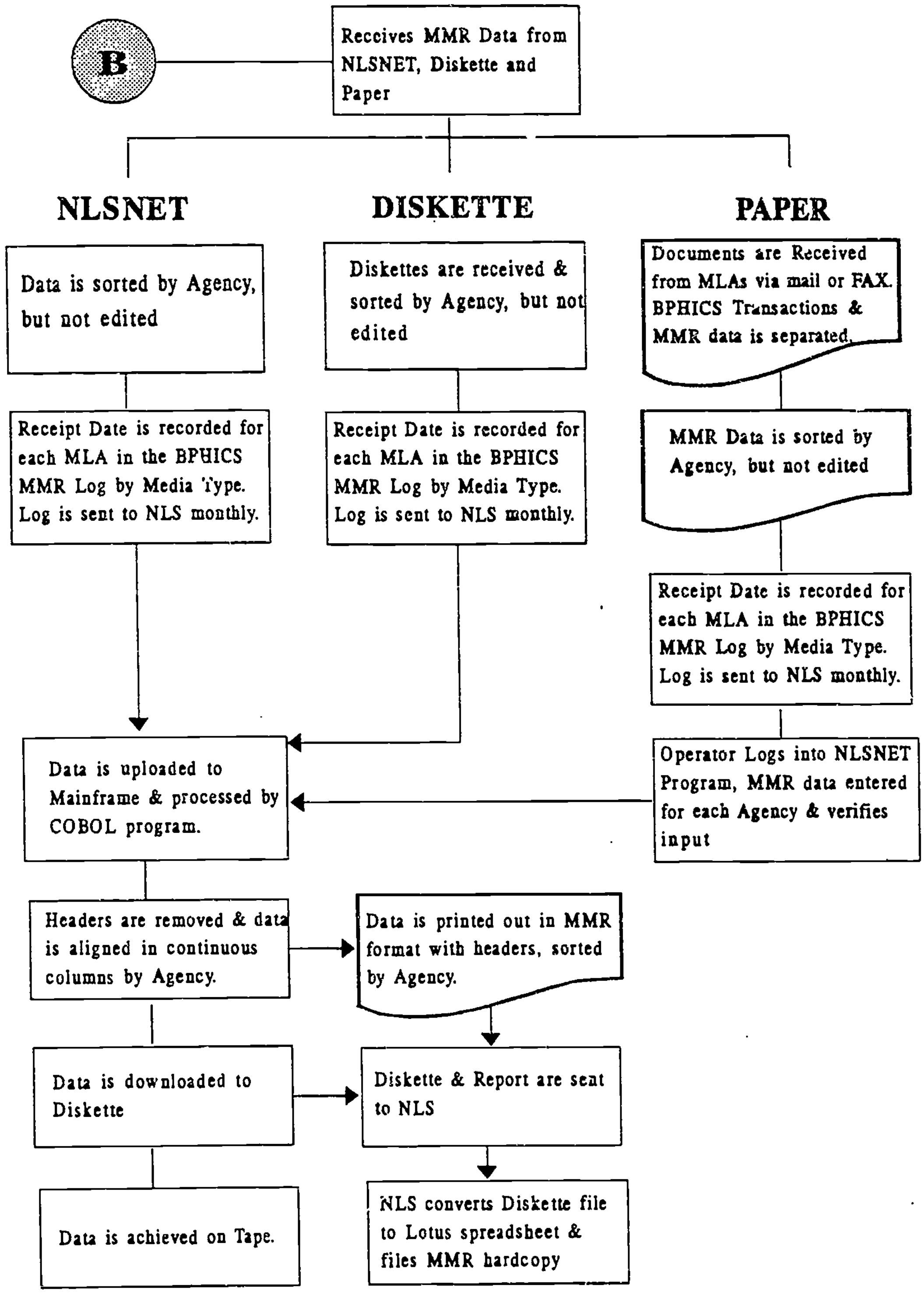
BPHICS EDIT/UPDATE TRANSACTION REPORT SUMMARY

	Total Trans.	Accepted (1)	% to Total Trans.	Rejected (2)	% to Total Trans	Deleted (3)	% to Total Trans
OCT 93	14,546	10,620	73.01%	2,333	16.04%	1,593	10.95%
NOV 93	11,711	8,675	74.08%	1,686	14.40%	1,350	11.53%
DEC 93	11,053	8,074	73.05%	1,713	15.50%	1,266	11.45%
Total	**37,310**	**27,369**	**73.36%**	**5,732**	**15.36%**	**4,209**	**11.28%**

(1) Accepted – Number of Transactions accepted & processed.
(2) Rejected – Number of Transactions that could not be accepted by the BPHICS system.
(3) Deleted – Number of Machines removed from the Master Inventory.

(editupdt.wk1)

Appendix 2-38
BPHICS PROCESSING of MMR DATA



B This process follows the procedures shown in Appendix 2-31.

Revised 12/94.

Appendix 2-39

EXAMPLE BPHICS MONTHLY MACHINE REPORT LOG

BPHICS MONTHLY MACHINE REPORT LOG for the month of AUG 93

Close Out Date : SEPT 16 93

Machine Lending Agencies	TBM	CBM	EXPEDITE	PAPER	READS	CIDS	COMMENTS
AK9 Alaska RL		✓				1793	
AL9 Alabama RL	✓	✓				9.1.93	
AR9 Arkansas RL	✓	✓			1.7.93		
AZ9 Arizona MLA	✓	✓		9.8.93			
CA8 California LA RL	✓	✓		9.8.93			
CA9 California Sac RL							
CO9 Colorado RL	✓	✓		9.10.93			July
CT9 Connecticut RL							
DC6 Special Storage							
DC9 Dist of Columbia RL	✓	✓		9.8.93			
DE9 Delaware RL	✓	✓			9.7.93		
FL9 Florida RL	✓	✓		9.8.93			
GA9 Georgia RL	✓	✓			9 9 93		
HI9 Hawaii RL	✓	✓		9.14.93			
IA9 Iowa RL	✓	✓	9.7.93				
ID9 Idaho State RL	✓	✓			9.7.93		
IL9 Illinois RL							
IN9 Indiana RL	✓	✓				82693	
KS9 Kansas RL	✓	✓				9993	
KY9 Kentucky MLA	✓	✓			91693		
LA9 Louisiana MLA							
MA9 Massachusetts MLA	✓	✓		9.10.93			
MD9 Maryland RL	✓	✓		9.13.93			July
ME9 Maine RL							
MI8 Michigan Wayne RL	✓	✓			9 9 93		
MI9 Michigan Lansing RL	✓	✓				91493	

EXAMPLE MASTER INVENTORY LIST

LIBRARY OF CONGRESS
NATIONAL LIBRARY SERVICE FOR THE BLIND AND PHYSICALLYHANDICAPPED
INVENTORY CONTROL SYSTEM

NPHICS02 RUN DATE: 03/25/92 MASTER INVENTORY LIST -- AS OF 03/92 PAGE 3

LAC	MIC	SERIAL/ PART NO.	STATUS CODE	QTY	LAST TRX DATE	LAST TRX CODE	DOCUMENT NUMBER	LOSING AGENCY	GAINING AGENCY	PREVIOUS AGENCY	ACQUISITION DATE	SUSPENSE CODE
UT6	A1	00000105	SL	1	92085	CLA	0007581	UT6	ON6	DC6	89268	
CO9	A1	00000106	CO	1	91150	CST	0002387				89268	
UT6	A1	00000107	SL	1	92085	CLA	0007629	UT6	ON6	DC6	89335	
CA9	A1	00000108	CO	1	92057	CLA	0006932			UT6	89362	
XX1	A1	00000109	CO	1	91240	CST	0003568				89335	
OK9	A1	00000110	CO	1	91302	CLA	0003530			UT6	89362	
DC6	A1	00000111	CO	1	89362	ANC	0015958		DC6		89362	
DC6	A1	00000112	CO	1	89362	ANC	0015958		DC6		89362	
CA8	A1	00000113	CO	1	91150	CST	0002387				89362	
XX1	A1	00000114	CO	1	91240	CST	0003568				89335	
CA8	A1	00000115	CO		91150	CST	0002387				89362	
CO9	A1	00000116	CO		91150	CST	0002387				89362	
UT6	A1	00000117	CO	1	91120	CLA	0001807			DC6	89362	
UT6	A1	00000118	SL	1	92085	CLA	0007581	UT6	ON6	DC6	89335	
DC6	A1	00000119	CO	1	89335	ANC	0015036		DC6		89335	
UT6	A1	00000120	CO	1	91120	CLA	0001806			DC6	89335	
XX1	A1	00000121	CO	1	91210	CST	0003126				89362	
CA8	A1	00000122	CO	1	91150	CST	0002387				89362	
DC6	A1	00000123	CO	1	89335	ANC	0015033		DC6		89335	
CO9	A1	00000124	CO	1	91150	CST	0002387				89362	
OK9	A1	00000125	CO	1	91302	CLA	0003530			UT6	89362	
XX1	A1	00000126	CO	1	91240	CST	0003568				89335	
OK9	A1	00000127	CO	1	91302	CLA	0003530			UT6	89335	
UT6	A1	00000128	SL	1	92085	CLA	0007629	UT6	ON6	DC6	89362	
DC6	A1	00000129	CO	1	89362	ANC	0015950		DC6		89362	
CO9	A1	00000130	CO	1	91150	CST	0002387				89335	
UT6	A1	00000131	CO	1	91120	CLA	0001806			DC6	89362	
UT6	A1	00000132	CO	1	91120	CLA	0001806			DC6	89362	
CA8	A1	00000133	CO	1	91150	CST	0002387				89335	
OK9	A1	00000134	CO	1	91302	CLA	0003530			UT6	89362	
UT6	A1	00000135	SL	1	92085	CLA	0007581	UT6	ON6	DC6	89362	
UT6	A1	00000136	CO	1	91120	CLA	0001806			DC6	89362	
UT6	A1	00000137	CO	1	91120	CLA	0001806			DC6	89362	
UT6	A1	00000138	CO	1	91120	CLA	0001806			DC6	89335	
UT6	A1	00000139	CO	1	91120	CLA	0001806			DC6	89362	
AR9	A1	00000140	CO	1	91210	CLA	0003349			XX1	89362	
UT6	A1	00000141	SL	1	92085	CLA	0007629	UT6	ON6	DC6	89335	
DC6	A1	00000142	CO	1	89335	ANC	0015033		DC6		89335	
UT6	A1	00000143	CO	1	91120	CLA	0001806			DC6	89335	
UT6	A1	00000144	SL	1	92085	CLA	0007581	UT6	ON6	DC6	89362	
UT6	A1	00000145	CO	1	91120	CLA	0001806			DC6	89362	
UT6	A1	00000146	SL	1	92085	CLA	0007629	UT6	ON6	DC6	89335	
UT6	A1	00000147	CO	1	91120	CLA	0001806			DC6	89362	
UT6	A1	00000148	CO	1	91120	CLA	0001806			DC6	89335	
CO9	A1	00000149	CO	1	91150	CST	0002387				89362	
DC6	A1	00000150	CO	1	89335	ANC	0015036		DC6		89335	
UT6	A1	00000151	SL	1	92085	CLA	0007624	UT6	OK9	UT6	89362	
UT6	A1	00000152	SL	1	92085	CLA	0007629	UT6	ON6	DC6	89335	
DC6	A1	00000153	CO	1	89335	ANC	0015035		DC6		89335	
IA9	A1	00000154	CO	1	92057	CLA	0006964			UT6	89362	
UT6	A1	00000155	CO	1	91120	CLA	0001806			DC6	89335	
XX1	A1	00000156	CO	1	91210	CST	0003117				89362	

EXAMPLE INVENTORY SUMMARY REPORT

LIBRARY OF CONGRESS
NATIONAL LIBRARY SERVICE FOR THE BLIND AND PHYSICALLY HANDICAPPED
INVENTORY CONTROL SYSTEM
INVENTORY SUMMARY REPORT

BPHICSUM RUN DATE : 03/25/92 PAGE 1

AGENCY CODE	LENDING AGENCY	TYPE/ MODEL	SM	LM	RM	SL	LL	RL	CO	TOTAL
			•••••••• STATUS	CODE	MATRIX				••••••••	
AK9	ALASKA	A78	0	0	0	0	0	0	57	57
		A79	0	0	0	0	0	0	75	75
		A80	0	0	0	0	0	0	40	40
	SUB TOTAL	A••	0	0	0	0	•••	0	172	172
		CT1	0	0	0	0	0	0	7	7
		C01	0	0	0	0	0	0	895	895
		C77	0	0	0	0	0	0	6	6
		C78	0	0	0	0	0	0	9	9
		C79	0	0	0	0	0	0	21	21
		C80	0	0	0	0	0	0	63	63
	SUB TOTAL	C••	0	0	0	0	•••	0	1001	1001
		E01	0	0	0	0	0	0	36	36
	SUB TOTAL	E••	0	0	0	0	•••	0	36	36
	AGENCY TOTAL	•••	0	0	0	0	•••	0	1209	1209
AL9	ALABAMA	A1	0	0	0	1	0	0	78	79
		A78	0	0	0	0	0	0	800	800
		A79	0	0	0	.2	1	0	901	903
		A80	0	0	0	0	0	0	1383	1383
	SUB TOTAL	A••	0	0	0	3	•••	0	3162	3165
		CT1	0	0	0	0	0	0	13	13
		C01	0	0	0	7	0	2	5474	5483
		C77	0	0	0	1	0	0	159	160
		C78	0	0	0	1	0	0	530	531
		C79	0	0	0	0	0	3	950	953
		C80	0	0	0	0	0	0	326	326
	SUB TOTAL	C••	0	0	0	9	•••	5	7452	7466
		E01	0	0	0	0	0	0	287	287
	SUB TOTAL	E••	0	0	0	0	•••	0	287	287
	AGENCY TOTAL	•••	0	0	0	12	•••	5	10901	109[illegible]

EXAMPLE MONTHLY MACHINE ACTIVITY REPORT

RUN AS OF MAR 25, 1992
PAGE

NATIONAL LIBRARY SERVICE FOR THE BLIND AND PHYSICALLY HANDICAPPED
THE LIBRARY OF CONGRESS

REPORT # 92-02

MONTHLY MACHINE ACTIVITY REPORT FOR FEBRUARY,1992

COMMUNICATION CENTER
STATE SERVICES FOR THE BLIND
1745 UNIVERSITY AVENUE
ST. PAUL, MN 55104

BPHICS RECORDS INDICATE THE FOLLOWING ACTIVITY IN YOUR MACHINE-LENDING AGENCY DURING THE MONTH OF FEBRUARY,1992 :

MACHINES SHIPPED TO YOUR AGENCY FROM THE MANUFACTURER:

MACHINE MODEL NUMBER	SERIAL NUMBER	RECEIPT DENIED (X)
C01	00469421	
C01	00469422	
C01	00469423	
C01	00469433	
C01	00469434	
C01	00469435	
C01	00469436	
C01	00469437	
C01	00469438	
C01	00469439	
C01	00469440	
C01	00469441	
C01	00469442	
C01	00469443	
C01	00469444	
C01	00469449	
C01	00469450	
C01	00469451	
C01	00469452	
C01	00469453	
C01	00469454	
C01	00469455	
C01	00469456	
C01	00469465	
C01	00469466	
C01	00469467	

Appendix 2-43

EXAMPLE MONTHLY MACHINE REPORT

MONTHLY INVENTORY REPORT
FOR REPORTING MONTH : 09/93

AGENCY ID AL9 - ALABAMA

REPORT DATE 10/15/1993

TALKING BOOK MACHINES
DATE OF DATA : 9/93

MODEL OF MACHINES	TOTAL INVENTORY LAST MONTH	RECEIVED FROM PRODUCER	RECEIVED FROM MSC OR NLS	TRANSFERRED IN	TRANSFERRED OUT	DAMAGED	LOCATION UNKNOWN	NET INVENTORY	AVAILABLE	CURRENTLY ASSIGNED	IN REPAIR	NET INVENTORY
A2												
A1	227							227	36	170	21	227
A80	1565			3	1	7	5	1555	65	1388	102	1555
A79	837			1		20	2	816	15	548	253	816
A78	511		1			4	5	503	6	489	8	503
A77	181			1		2		180		179	1	180
A76	45							45		45		45
A75	25							25		25		25
A74	91							91		91		91
TOTAL	3482		1	5	1	33	12	3442	122	2935	385	3442

CASSETTE BOOK MACHINES
DATE OF DATA : 9/93

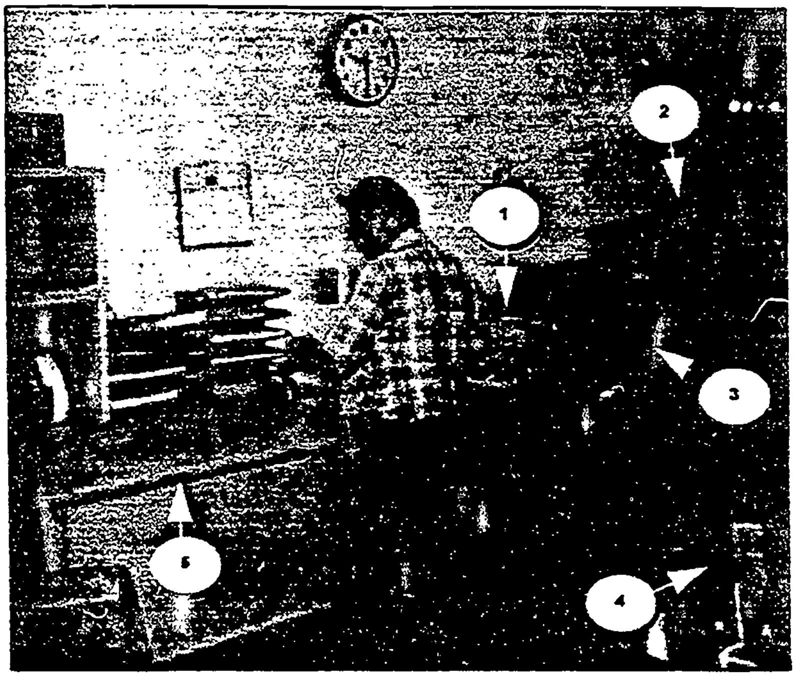
MODEL OF MACHINES	TOTAL INVENTORY LAST MONTH	RECEIVED FROM PRODUCER	RECEIVED FROM MSC OR NLS	TRANSFERRED IN	TRANSFERRED OUT	DAMAGED	LOCATION UNKNOWN	NET INVENTORY	AVAILABLE	CURRENTLY ASSIGNED	IN REPAIR	NET INVENTORY
CT1	14		10					24	15	9		24
E1	349		20					369	31	296	42	369
C2												
C1	6518		6	6	1	8	15	6506	147	5928	431	6506
C80	224				1	1	2	220	3	205	12	220
C79	746		1	23		4	5	761	9	682	70	761
C78	330			1		5	4	322	2	317	3	322
C77	80		2			3		79	1	78		79
C76	169						1	168		166	2	168
TOTAL	8430		39	30	2	21	27	8449	208	7681	560	8449

CASSETTE BOOK MACHINE ACCESSORIES

AVAILABLE

PILLOW SPEAKER
REMOTE CONTROL
HEAD PHONE STANDARD
HEAD PHONE LIGHT WEIGHT

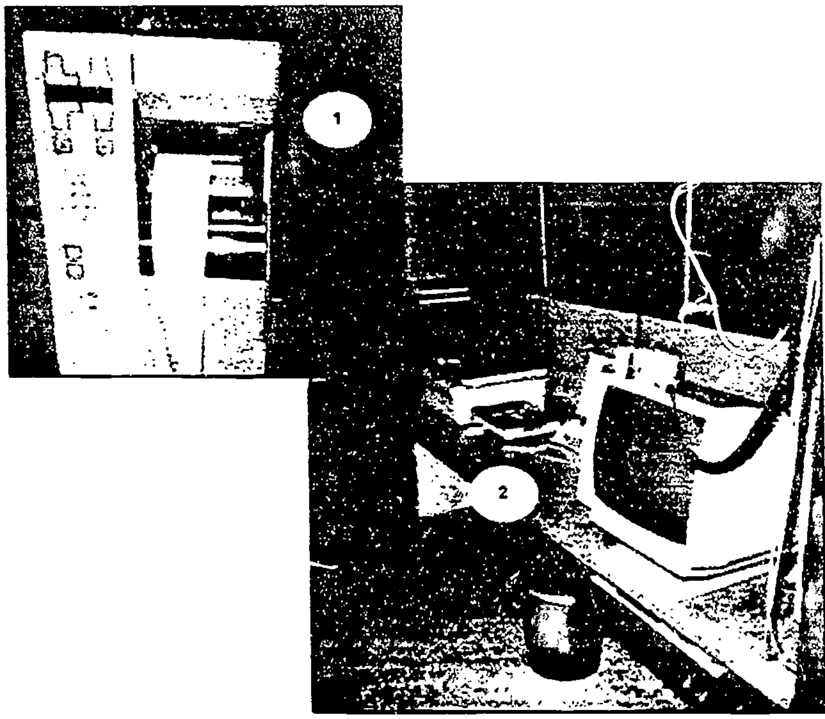
NO DATA REPORTED.



APPENDIX 2-44

Minnesota MLA
Shipping and
Receiving Operations

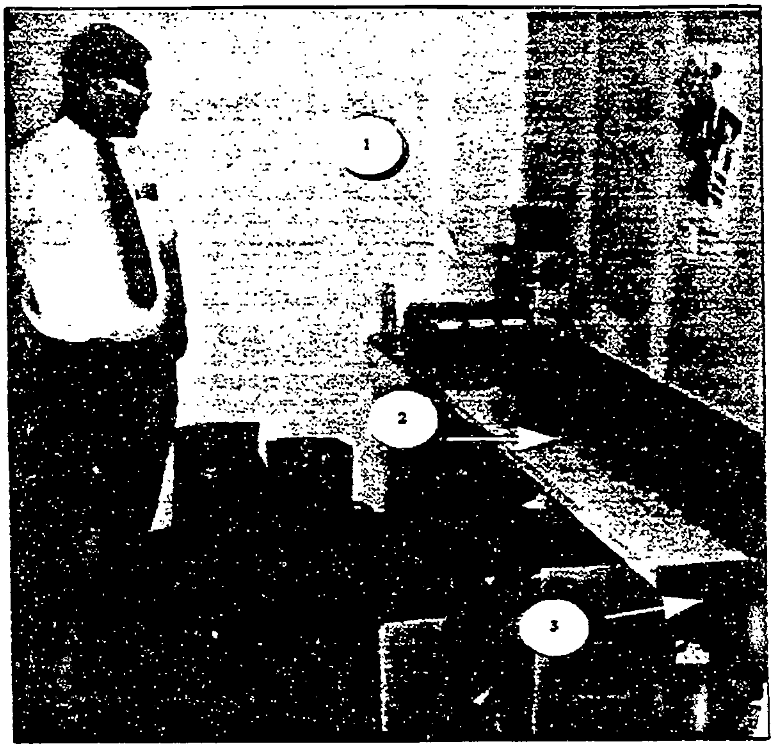
1 - Machines being received
2 - ADP workstation
3 - Hand-help bar code scanner
4 - Empty machine cartons
5 - Large work table



APPENDIX 2-45

Minnesota MLA
Bar Coding
Workstation

1 - Zebra 95 bar code label printer
2 - Bar coding workstation



APPENDIX 2-46

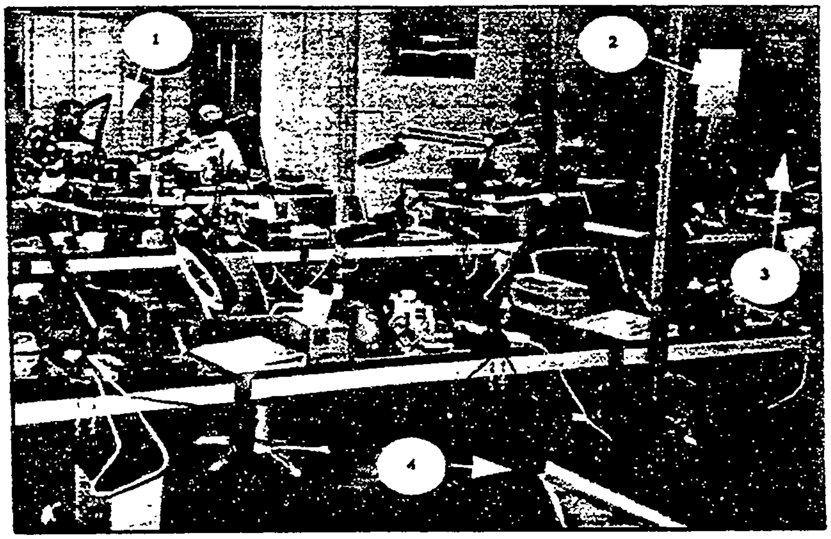
Minnesota MLA Battery Charging Stations - Existing and Planned

1 - Existing station - 36 batteries manually monitored
2 - Planned station - 200 batteries automatically monitored
3 - Location for cycling control PC

APPENDIX 2-47

Pennsylvania Regional Library Triage Operation

1 - Machine Manager performing triage
2 - Empty cartons from incoming machines
3 - Cleaning supplies
4 - Battery tester

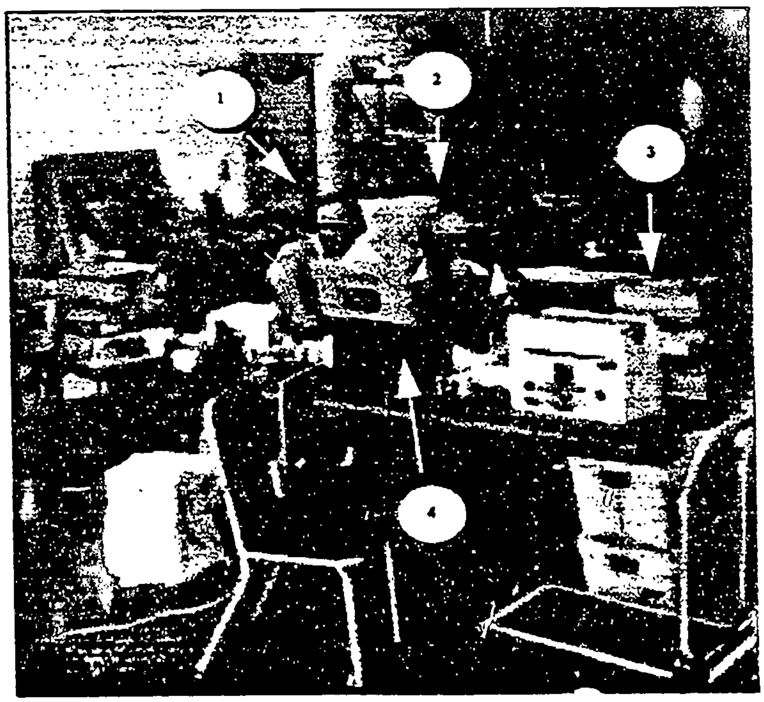


APPENDIX 2-48

Large, Well-Structured Volunteer Repair Facility

Features Include:

1 - Fully equipped repair workstation
2 - Parts storage
3 - Special tools
4 - Reclamation table



APPENDIX 2-49

Volunteer Quality Assurance Operation Sun City, AZ

1 - Packing passed machines
2 - Independent QA specialist
3 - Machines having passed QA
4 - Test equipment

APPENDIX 2-50

Equipment In-repair Tracking System Used by Elfun Volunteers

1 - ADP system
2 - Individual specializing in inventory control

Six-Year Profile of National Equipment Inventory

TOTAL							
MODEL	STATUS	END FY89	END FY90	END FY91	END FY92	END FY93	END FY94
CBM	AVAILABLE	69,634	91,718	68,953	64,103	59,510	48,020
CBM	ASSIGNED	427,154	442,008	457,373	474,017	489,452	517,528
CBM	IN-REPAIR	57,421	39,148	47,739	33,140	32,705	39,804
CBM	WORKING	127,055	130,866	116,692	97,243	92,215	87,824
TBM	AVAILABLE	30,728	22,892	21,645	16,841	16,804	21,553
TBM	ASSIGNED	221,708	209,570	183,145	172,436	151,166	141,155
TBM	IN-REPAIR	12,344	10,045	9,047	7,415	4,863	4,978
TBM	WORKING	43,072	32,937	30,692	24,256	21,667	26,531
E-1	AVAILABLE	26,043	22,631	19,973	15,688	10,005	5,350
E-1	ASSIGNED	10,901	13,749	16,272	19,799	22,966	26,044
E-1	IN-REPAIR	672	1,154	2,259	2,638	4,427	5,749
E-1	WORKING	26,715	23,785	22,232	18,326	14,432	11,099
CT-1	AVAILABLE	61	67	122	189	8,570	14,456
CT-1	ASSIGNED	31	75	534	617	1,304	2,941
CT-1	IN-REPAIR	2	5	13	32	100	270
CT-1	WORKING	63	72	135	221	8,670	14,726
CBMN	AVAILABLE	43,530	69,020	48,858	48,226	40,935	28,214
CBMN	ASSIGNED	416,222	428,184	440,567	453,601	465,182	488,543
CBMN	IN-REPAIR	56,747	37,989	45,467	30,470	28,178	33,785
CBMN	WORKING	100,277	107,009	94,325	78,696	69,113	61,999
TOTAL	AVAILABLE	100,362	114,610	90,598	80,944	76,314	69,573
TOTAL	ASSIGNED	648,862	651,578	640,518	646,453	640,618	658,683
TOTAL	IN-REPAIR	69,765	49,193	56,786	40,555	37,568	44,782
TOTAL	WORKING	170,127	163,803	147,384	121,499	113,882	114,355

CBMN=CBMs NET OF CT-1s/E-1s

Appendix 3-2
CBMs Per Patron, By MLA

CODE	AGENCY	CBM Net Inv.	Total Cass Rds.	CBMs Per Cass Rd.
CO9	COLORADO	7,284	10,283	0.71
AZ9	ARIZONA	9,768	12,701	0.77
TX9	TEXAS	23,525	29,231	0.80
IL9	ILLINOIS	21,637	25,188	0.86
GA9	GEORGIA	13,653	15,392	0.89
PA8	PENNSYLVANIA PI	8,094	8,978	0.90
PA9	PENNSYLVANIA PH	11,337	12,012	0.94
OK9	OKLAHOMA	5,137	5,313	0.97
MI9	MICHIGAN LANS.	17,097	17,495	0.98
KS9	KANSAS	8,332	8,381	0.99
AK9	ALASKA	1,043	1,020	1.02
CA9	CALIFORNIA SC	18,556	17,761	1.04
CT9	CONNECTICUT	8,109	7,715	1.05
NV9	NEVADA	1,614	1,524	1.06
IA9	IOWA	8,432	7,957	1.06
IN9	INDIANA	11,109	10,467	1.06
WA9	WASHINGTON	10,238	9,567	1.07
NM9	NEW MEXICO	3,497	3,265	1.07
VA9	VIRGINIA	9,410	8,782	1.07
AR9	ARKANSAS	4,858	4,513	1.08
NY9	NEW YORK ALBA.	28,053	25,306	1.11
MA9	MASSACHUSETTS	17,812	15,737	1.13
MI8	MICHIGAN WAYNE	3,142	2,757	1.14
ID9	IDAHO	2,881	2,480	1.16
NH9	NEW HAMPSHIRE	2,472	2,092	1.18
MN9	MINNESOTA	10,111	8,496	1.19
OR9	OREGON	8,310	6,928	1.20
MO9	MISSOURI	14,300	11,785	1.21
LA9	LOUISIANA	4,891	4,029	1.21
SC9	SOUTH CAROLINA	8,492	6,948	1.22
NE9	NEBRASKA	5,360	4,366	1.23
PR9	PUERTO RICO	1,463	1,190	1.23
NJ9	NEW JERSEY	11,357	9,159	1.24
SD9	SOUTH DAKOTA	4,534	3,571	1.27
FL9	FLORIDA	45,676	35,336	1.29
MT9	MONTANA	3,563	2,746	1.30
OH9	OHIO	26,233	20,117	1.30
DC9	DIST. OF COL.	3,033	2,270	1.34
ND9	NORTH DAKOTA	2,795	2,091	1.34
HI9	HAWAII	1,213	905	1.34
KY9	KENTUCKY	8,377	6,156	1.36
WV9	WEST VIRGINIA	5,142	3,706	1.39
ME9	MAINE	3,760	2,695	1.40
MS9	MISSISSIPPI	3,277	2,304	1.42
DE9	DELAWARE	1,794	1,229	1.46
WY9	WYOMING	1,692	1,156	1.46
CA8	CALIFORNIA LA	26,178	17,871	1.46
RI9	RHODE ISLAND	2,476	1,660	1.49
NC9	NORTH CAROLINA	11,702	7,781	1.50
UT9	UTAH	7,330	4,855	1.51
WI9	WISCONSIN	9,252	6,020	1.54
AL9	ALABAMA	8,511	5,360	1.59
VT9	VERMONT	2,328	1,456	1.60
NY8	NEW YORK NY	24,943	13,981	1.78
TN9	TENNESSEE	9,828	5,306	1.85
VI9	VIRGIN ISLANDS	354	166	2.13
MD9	MARYLAND	17,111	6,391	2.68
DC6	NLS	4,423	1,353	3.27
UT6	MSCW	11,061	0	N/A
OH6	MSCE	2,416	0	N/A
	TOTAL	570,376	475,300	1.25
				(Avg) 1.20

Appendix 3-3

INSTITUTION DATA (KY,NC,TX)

(Number of Machines per Institution)

	Kentucky		North Carolina		Austin		Average	
	CBMs	TBMs	CBMs	TBMs	CBMs	TBMs	CBMs	TBMs
# Institutions	256	82	329	139	1150	244	1735	465
# Machines	525	103	548	245	2715	363	3788	711
# Machines Per Institution	**2.05**	**1.26**	**1.67**	**1.76**	**2.36**	**1.49**	**2.18**	**1.53**

Source: Number produced by Regional Libraries

inst_mac.wk4

Appendix 3-4

INSPECTION CHECK POINTS, PRIORITY GROUPS AND SCORING VALUES

ITEM No.	ITEM NAME	PRIMARY PRIORITY	SECONDARY PRIORITY	DEDUCT POINTS
1A	BATTERY (DEFECTIVE CELL)	H	H	20
1B	POWER CORD (UNSAFE CORD)	H	H	20
1C	CHARGING CIRCUIT	H	H	20
2A	CLEAN	L	H	4
2B	NO CRACKS	L	L	3.5
2C	NO MISSING PARTS	M	L	5
2D	ALL PLATES SECURE	L	L	3.5
2E	RUBBER FEET IN PLACE	L	L	3.5
2F	HANDLE WORKS SMOOTHLY	L	L	3.5
2G	SEE 3I BELOW			
2H	HEAD ADJUST SCREW SEALED	H	L	10
2I	CHECK HEAD	M	L	5
2J	TAPE RUNS THROUGH SMOOTHLY	H	L	10
3A	OUTPUT	H	L	10
3B	HIGH FREQUENCIES	M	H	7
3C	NO DISTORTION	H	H	20
3D	NO CROSSTALK	H	H	20
3E	NO MOTOR NOISES	H	L	10
3F	NO CRACKLES	H	L	10
3G	NO OTHER NOISES	H	L	10
3H	SHOCK TEST (RETEST SOUND QUALITY)	H	H	20
3I AND 2G	SHAKE - SHAKE NO RATTLES (BEFORE & AFTER)	M	L	5
3J	SWITCHES	M	H	7
3K	HEAD WIRING CORRECT	H	H	20
4A	KEYS SMOOTH	L	L	3.5
4B	KEYS LOCK DOWN	M	H	7
4C	NO BINDING OR STICKING KEYS	L	H	4
5A	TAPE LOADS	M	L	5
5B	TAPE EJECT	M	H	7
6A	VOLUME	M	H	7
6B	TONE	L	L	3.5
6C	VARIABLE SPEED	L	H	4
7A	REMOTE	M	L	5
7B	AUX IN	L	L	3.5
7C	HEADPHONE	L	H	4
7D	EARPHONE	L	H	4
8	END OF TAPE SHUT OFF (EXCLUDES INOP)	L	H	4
9(i)	TORQUE TEST (<25 PLAY, <40 FF/REW)	H	H	20
9(ii)	TORQUE TEST (OUT OF SPEC - NON CRITICAL)	M	L	5
10A(ii)	SPEED AT 15/16 (>2%,<5% FROM SPEC)	L	L	3.5
10A(i)	SPEED AT 15/16 (>=5% FROM SPEC)	M	H	7
10B(ii)	SPEED AT 1 7/8 (>2%,<5% FROM SPEC)	L	L	3.5
10B(i)	SPEED AT 1 7/8 (>=5% FROM SPEC)	M	L	5
12	RECORDER TOTALLY INOP	H	H	20

Rev. 5
9/15/94

STANDARD FOR REPAIRED CBMS

1. Visual inspection - clean, no cracks in case, no cracked or missing knobs, line cord in good condition, escutcheon plates and serial number plate secure, head adjust screw sealed, tape runs through tape guides smoothly, handle works smoothly, rubber feet in place, case screws tight, head clean and not worn.

2. Shock - lift front of machine 2 to 3 inches off table and drop while playing a tape. Listen for break up of sound or other indications of intermittent connections. (Do before other tests.)

3. Battery - perform all tests on battery power.

4. Keys - cycle 5 times each, must be smooth, must lock down, no binding or sticking.

5. Eject - cycle 5 times, must eject C-90 cassette onto keys every time.

6. Jacks - insert plug in remote, aux in, earphone, and headphone jacks while playing a tape. Sound must return when plug is removed.

7. Switches - cycle side and speed switches 5 times while playing tape, listen for intermittent operation.

8. Torque - measure using torque cassette. See attached procedure.

9. Speeds - measure using 3 kHz test tape and frequency counter or strobe disk mounted on capstan. See attached procedure.

10. Controls - volume, tone and variable speed while playing a tape. Must slide smoothly with minimal noise.

11. Sound quality - must reproduce high frequencies on tape, with no distortion, no audible crosstalk, no motor noise, crackles, or other noises. Check both sides.

12. Frequency response - measure output from 250 Hz to 5 kHz using IS1083 test tape and AC voltmeter. (Perform if equipment and tape are available - highly recommended.) Otherwise, listen to high frequencies on a good NLS book tape. See attached procedure.

13. Shake - no rattles.

14. Packaging - Serial number must be only number on box and

must match machine. Instructions included. (If you pack.)

15. End of tape shut off - rewind a cassette to beginning and listen for amplifier shut off.

16. Head wiring - play beginning of C-1 instruction tape. Side 1 should be in english, side 3 spanish.

17. Battery charging circuit - see attached procedure.

Notes:

Book tape for listening test must be checked occasionally for wear.

(Sides 1 and 2 (the edge tracks) will lose some high frequencies after 10 - 20 plays.)

Torque cassette required and available from NLS.

Frequency response tape and AC voltmeter recommended for response test.

Speed tape and frequency counter or NLS-supplied strobe disk required for speed test.

IMPORTANT: Do not duplicate test tapes; never use copies of test tapes. Test tapes are carefully recorded on precision equipment at real speed outside of the cassette shell. High speed duplicators and consumer cassette decks cannot reproduce the important features of these tapes.

FREQUENCY RESPONSE TEST

Use IS1083 test tape at 15/16 ips.

Contents: 30 sec. of 330 Hz at 250 nWb/m - reference level.
15 sec. of 330 Hz at -10 dB from reference level.
60 sec. of 5 kHz at -10 dB.
15 sec. of 330 Hz at -10 dB.
15 sec. each at -10 dB of:
250 Hz, 500 Hz, 1kHz, 2kHz, 3kHz, 4 kHz, 5kHz.

To adjust or check head azimuth, play the long 5kHz tone and adjust the head for maximum output on side 3. Do not try to average between sides 1 and 3. You can also use the 3 kHz speed test tape (IS 1086). A 1 kHz tape gives a very coarse adjustment and should not be used.

NOTE: It is important to use side 3, the inside track. The high frequencies on the edge tracks are affected by tracking problems and edge damage. You also need the tone control full up.

To check frequency response, measure the output with an AC voltmeter at each frequency between 250 Hz and 5 kHz on both sides 1-2 and 3-4 with the volume control about 3/4 up and the tone control full up. The difference between the highest and lowest readings should be less than 6 dB (or the lowest voltage reading should be more than 1/2 the highest one).

NOTE: This test can be performed using the C-1 transformer for step-up to the 50 volts AC scale of the RS meter. (Like alignment with 3 kHz tape.) This gives a 1 dB boost at 5 kHz.

ALTERNATELY: If test equipment and tapes are not available, select a good 15/16 ips book tape produced by NLS and listen. (Not all book tapes are bright when new. Pick the brightest sounding one you can find.) If you turn the tone control down, the sound should change. If you can't hear any difference, the response is bad.

IMPORTANT: If the head seems to be aligned properly but it still measures or sounds bad, check that you have aligned to the center of the highest peak. Changing the azimuth angle gives many peaks with nulls in between, and only the highest peak is right.

SPEED TEST

Use IS 1086 test tape at both 15/16 and 1 7/8 ips.

Contents: 60 min. of 3 kHz at 15/16 ips.

Set speed to 15/16 ips, play the tone and measure the frequency - it must read between 2940 Hz and 3060 Hz.

Set speed to 1 7/8 ips, play the tone and measure the frequency - it must read between 5880 Hz and 6120 Hz.

ALTERNATELY: If counter and tape are not available, use strobe disk made from modified used C-1 reel table and an NLS-supplied disk. You must be under fluorescent light. Slide it onto the capstan (under the open door with no cassette) and press play. The inner and outer marks should rotate in opposite directions. If they do not, the speed is more than 2% off.

NOTE: These machines run faster as the battery runs down. If a unit measures or sounds fast, plug it in for 5 - 10 minutes and retest. If it then reads good, recharge or replace the battery. If you set the speeds with a freshly charged battery (8.5 V), it would be wise to set them a bit slow.

TORQUE TEST

Use ECG AR40 torque cassette at 15/16 ips.

Insert cassette with Play> arrow to right.

Play tape and read torque - must be between 35 and 80 g-cm.
Fast forward tape to end - must be more than 55 g-cm.
Turn tape over so <Rewind arrow is to left.
Rewind tape to end and read torque - must be more than 55 g-cm.

(Other torque testers may need to be stalled to read in play.)

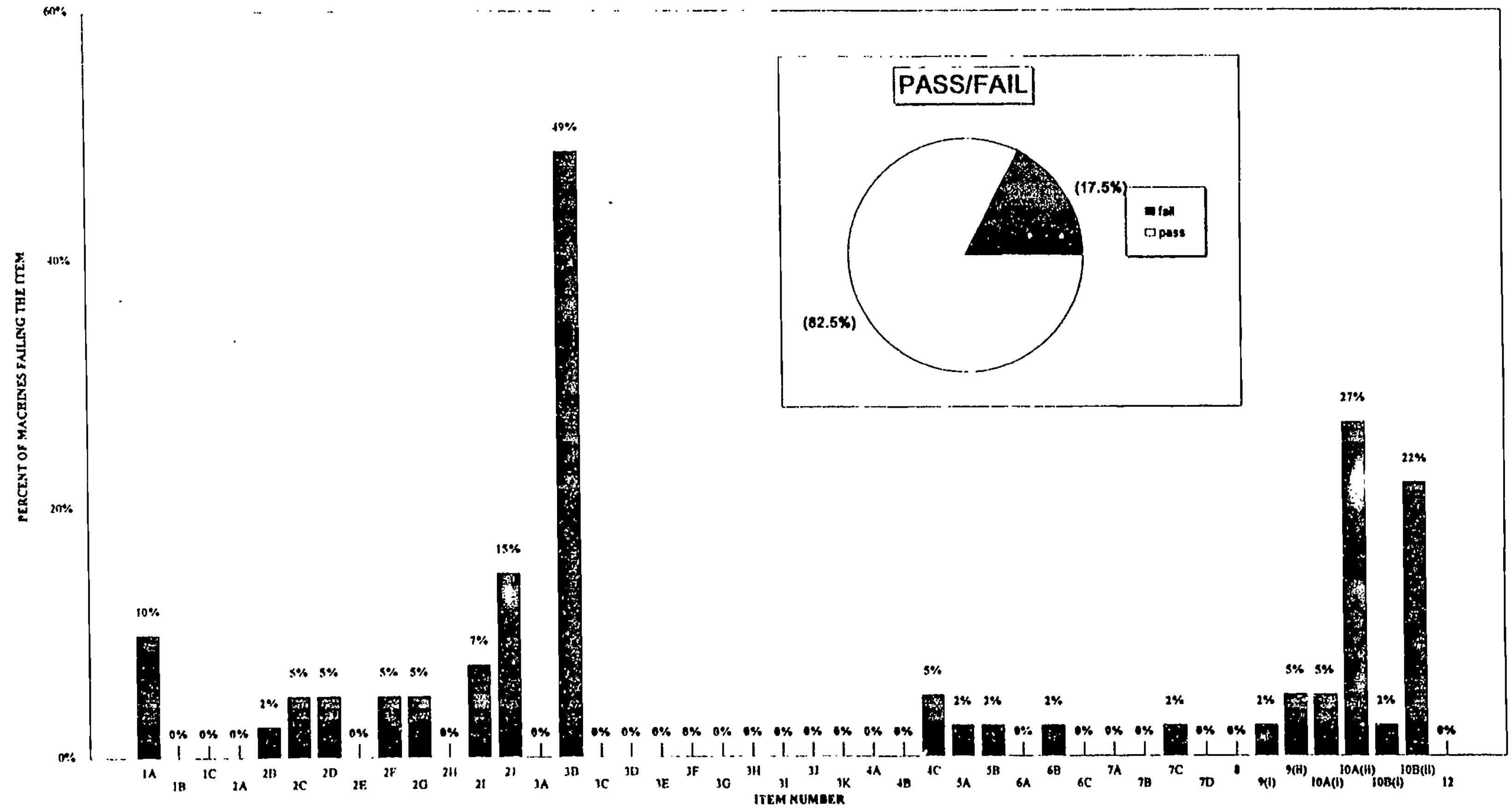
NOTE: If your torque cassette reads in units other than gram-centimeters, call NLS and we will provide the necessary conversion.

BATTERY CHARGING CIRCUIT TEST:

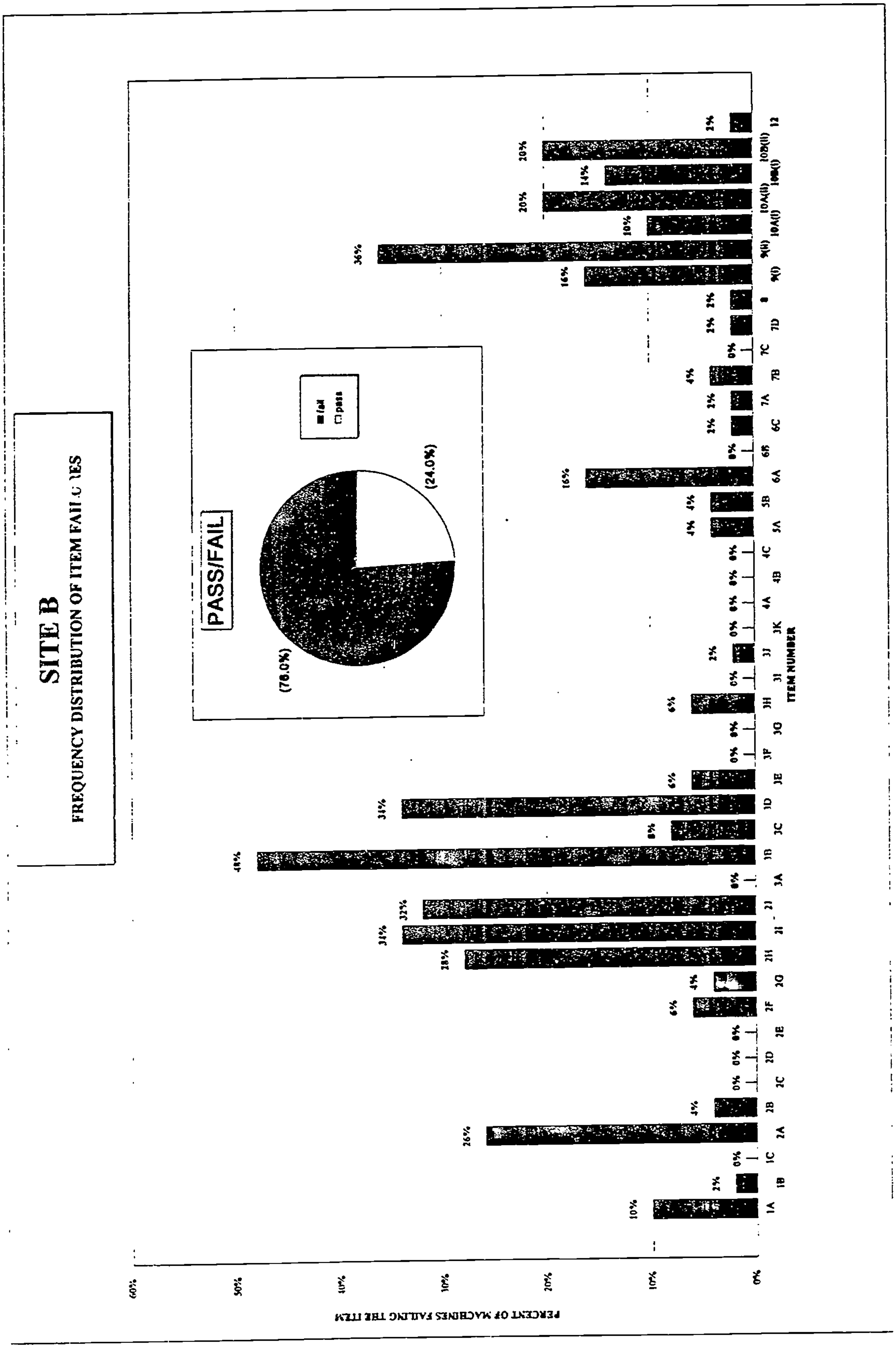
Start test on battery power.
Connect a DC voltmeter to the remote jack.
Press play key - meter should read > 7.2 V.
While observing meter, plug unit into AC - meter reading should increase approximately .2 V.
Unplug unit - voltage should decrease to original reading.
If no change, charging circuit is defective.

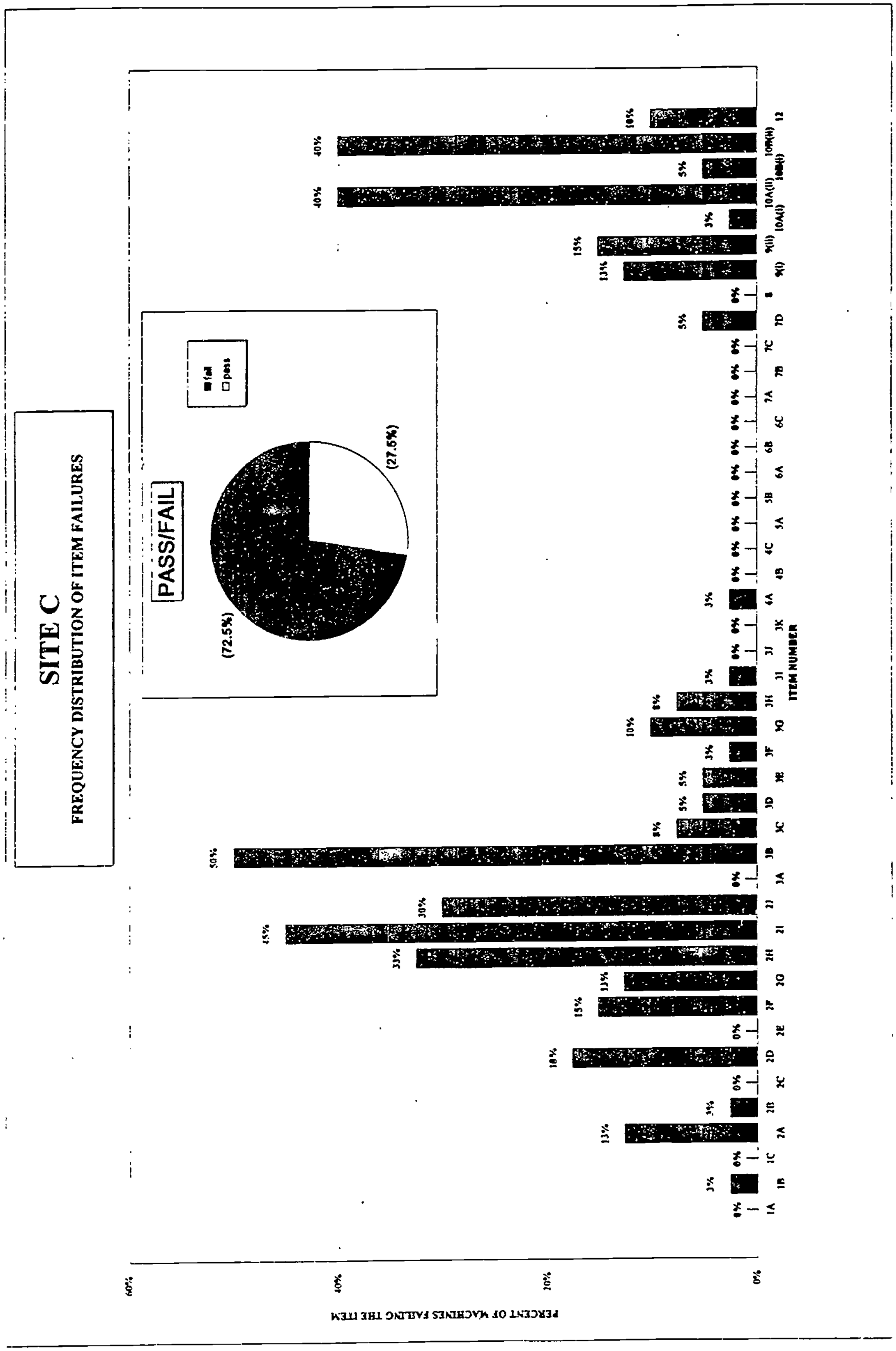
SITE A

FREQUENCY DISTRIBUTION OF ITEM FAILURES

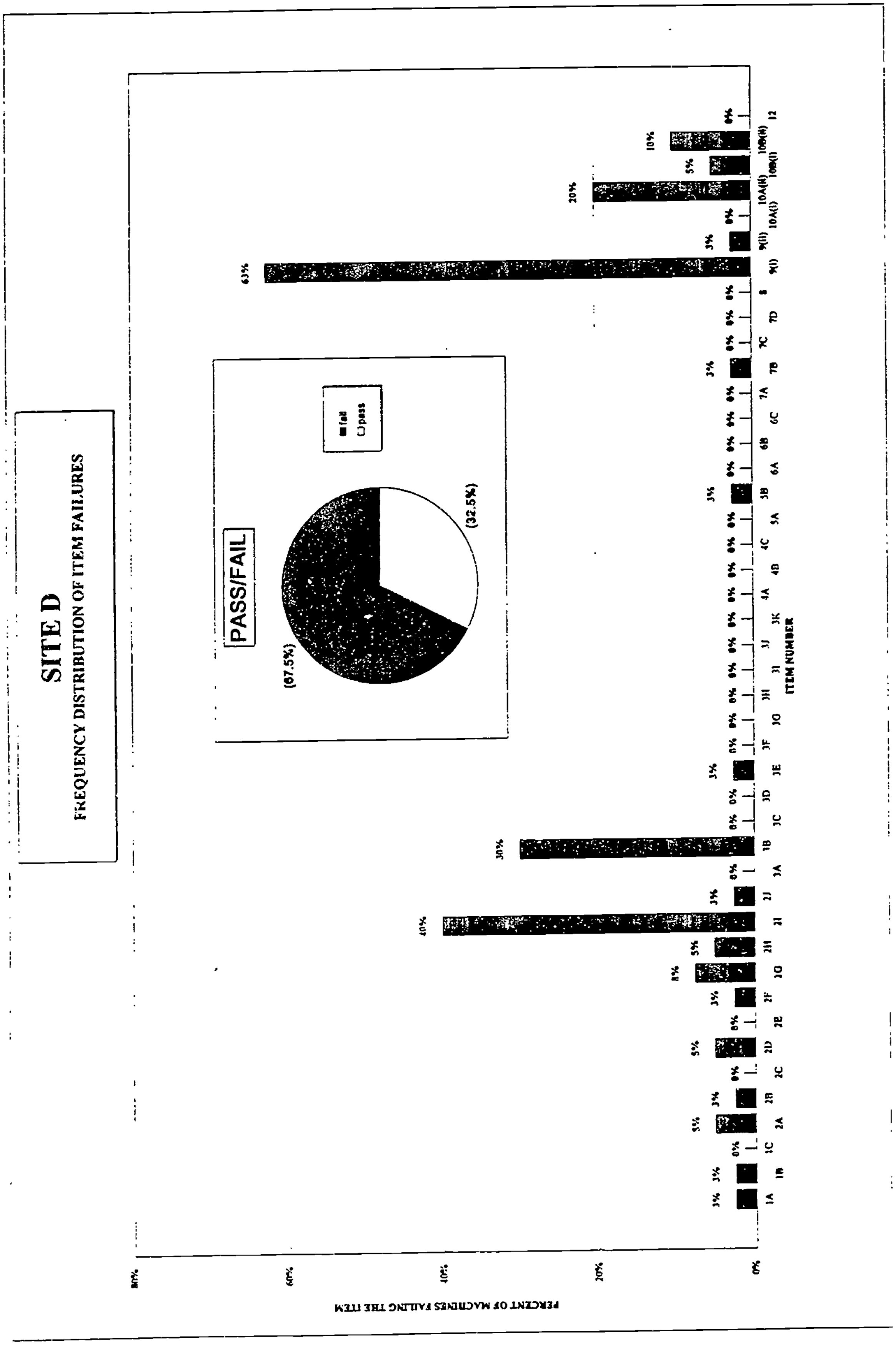


Appendix 3-5 (Continued)

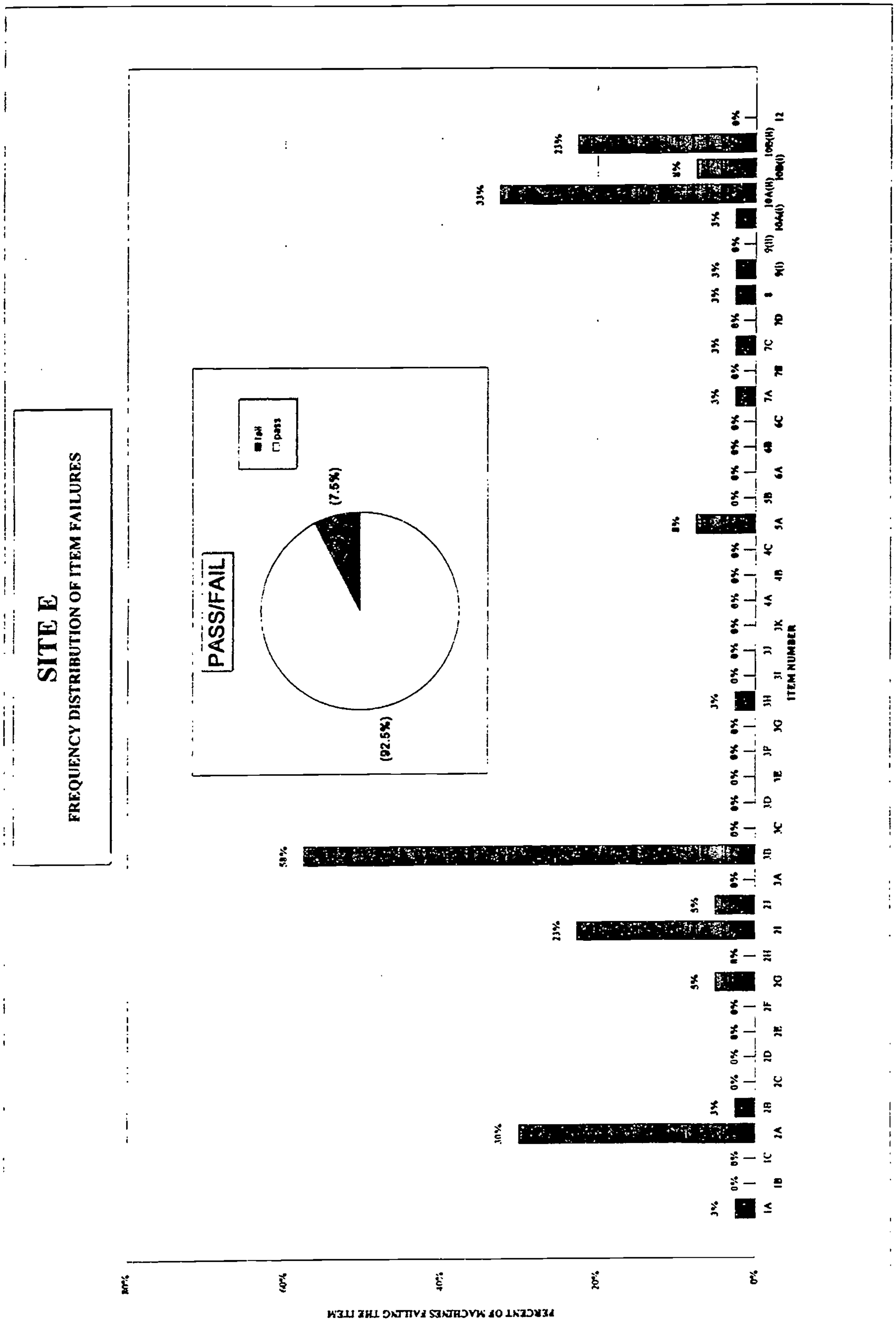



SITE C
FREQUENCY DISTRIBUTION OF ITEM FAILURES
PASS/FAIL
(72.5%)
(27.5%)
fail
pass
ITEM NUMBER
PERCENT OF MACHINES FAILING THE ITEM

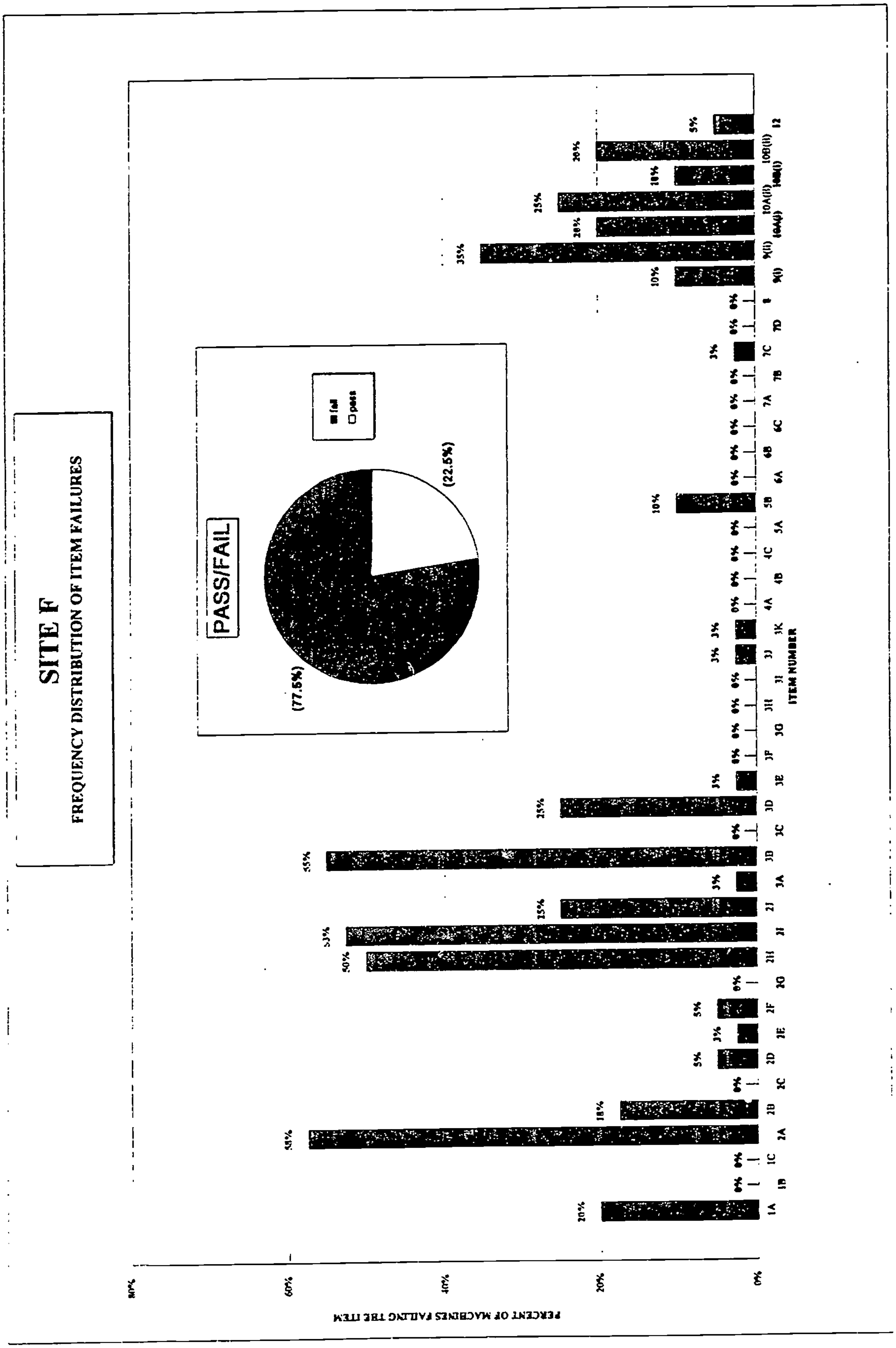
Appendix 3-5 (Continued)



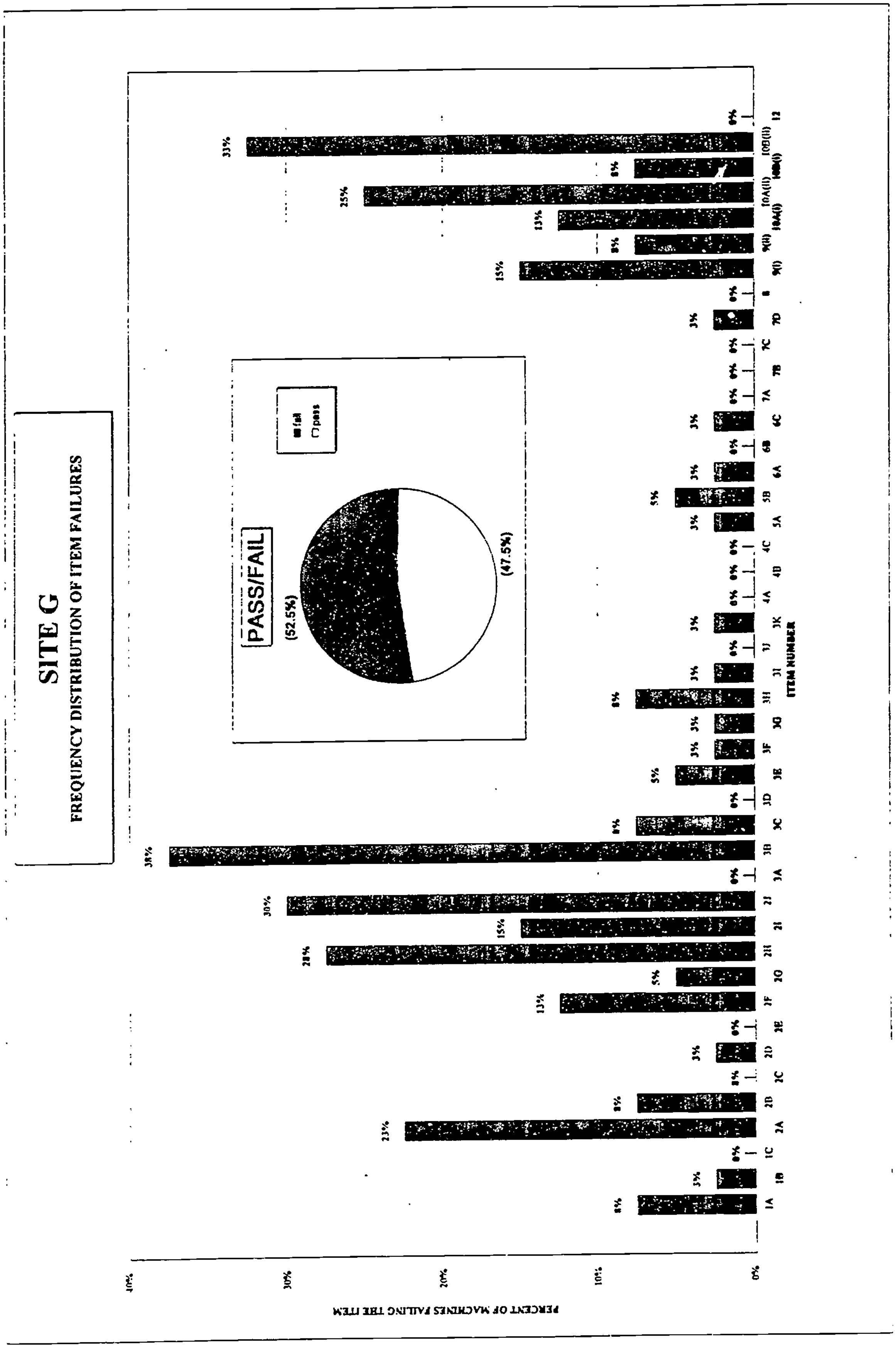
Appendix 3-5 (Continued)



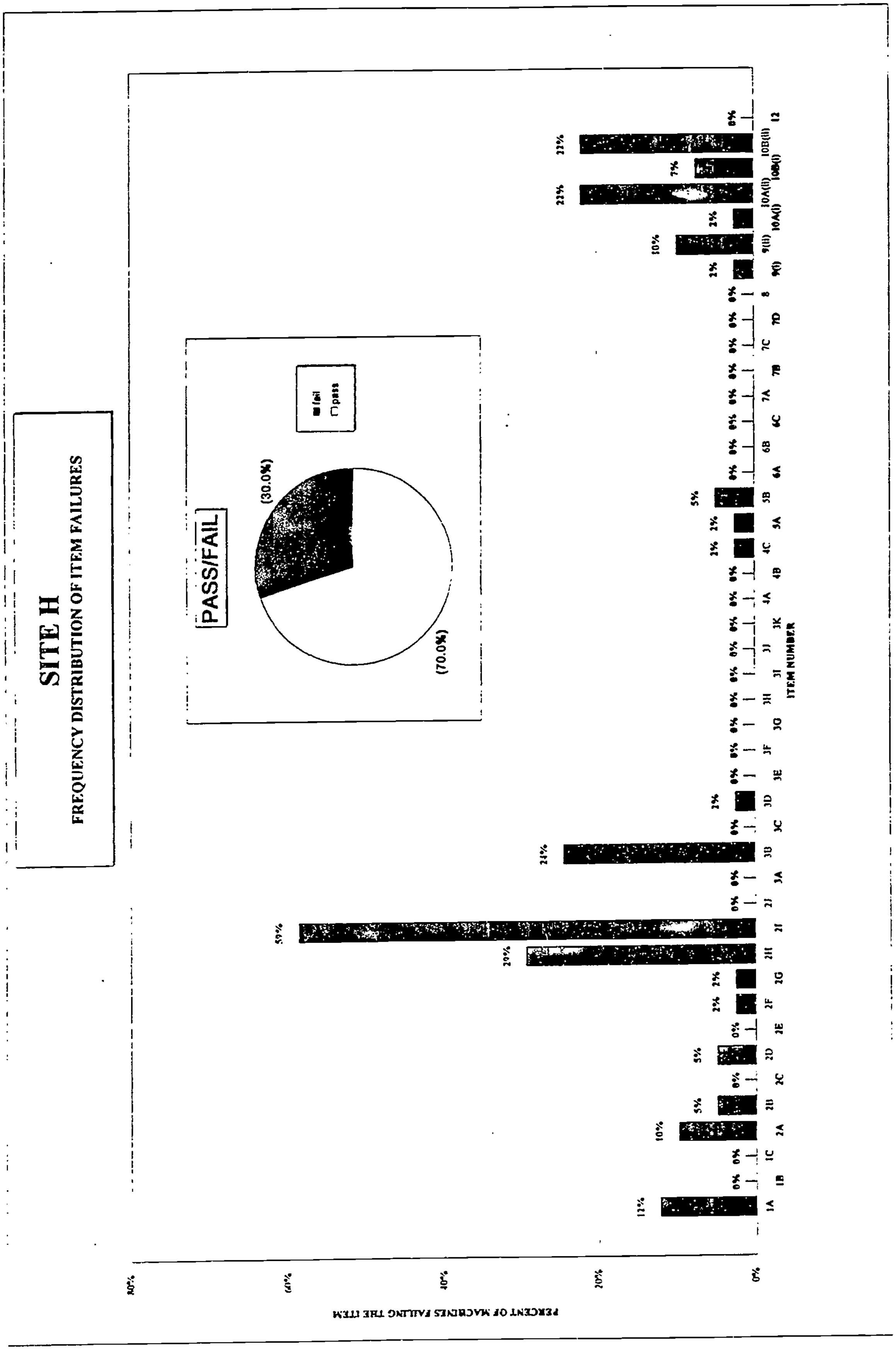
Appendix 3-5 (Continued)



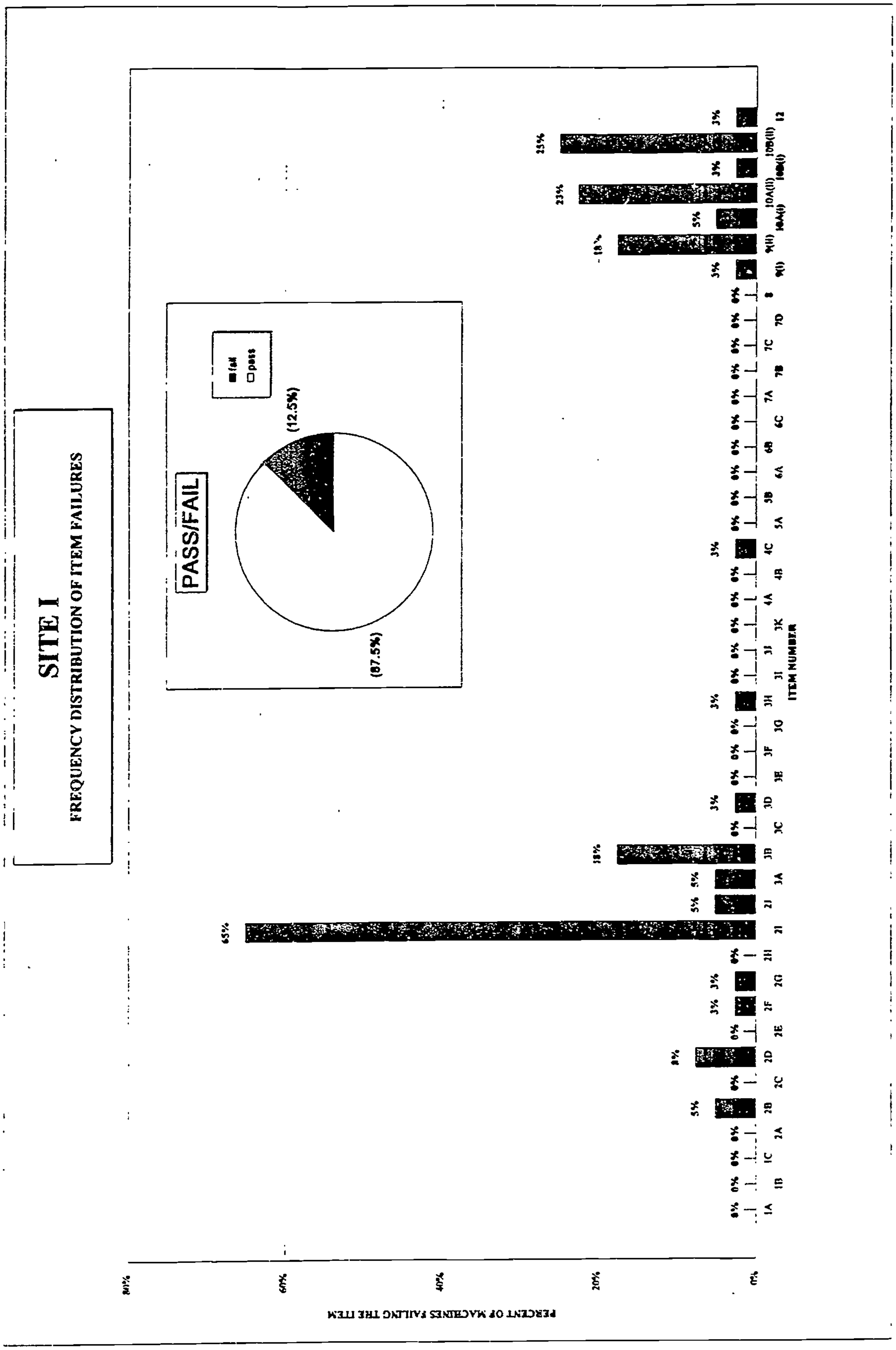
Appendix 3-5 (Continued)



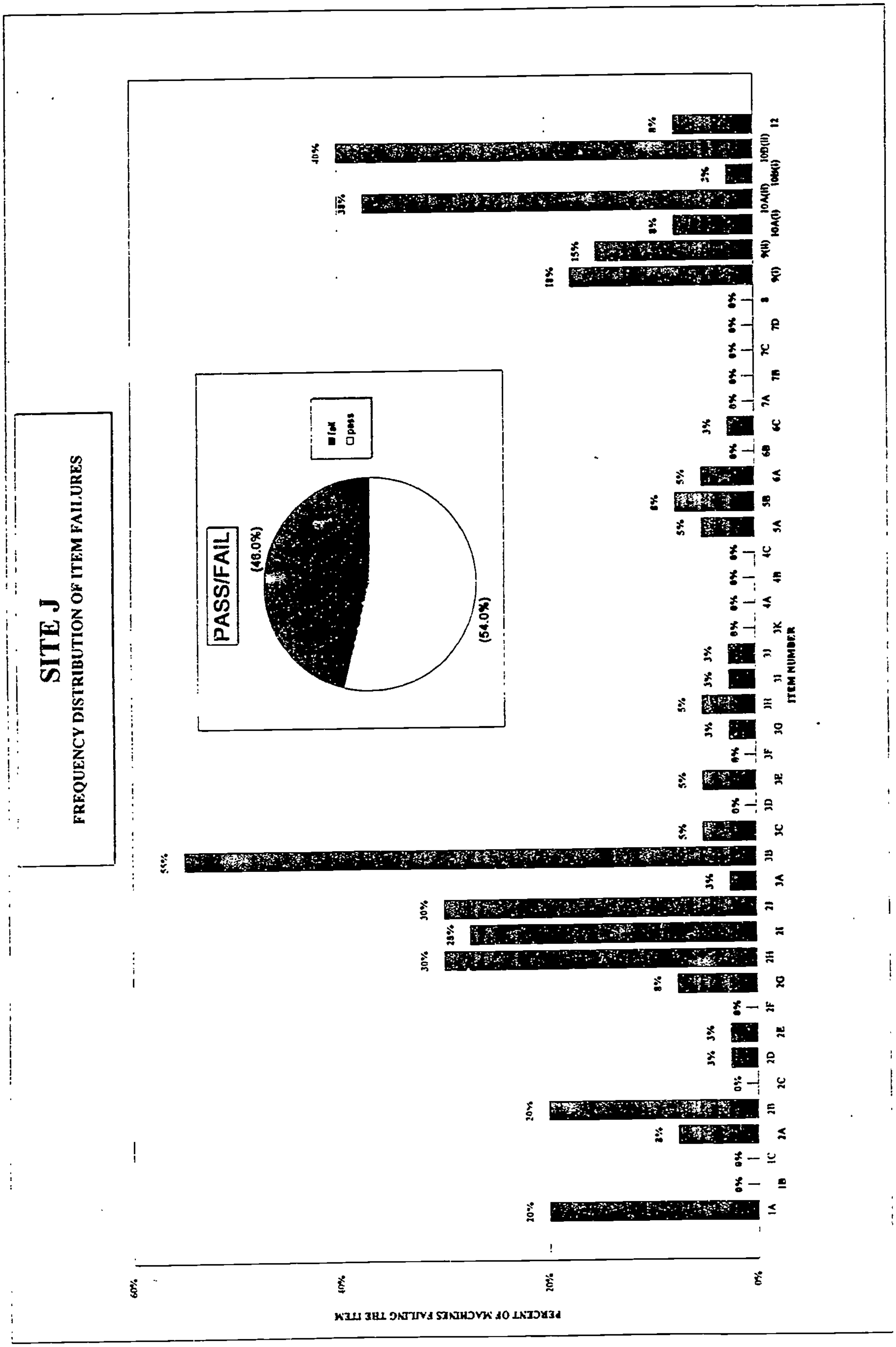
Appendix 3-5 (Continued)



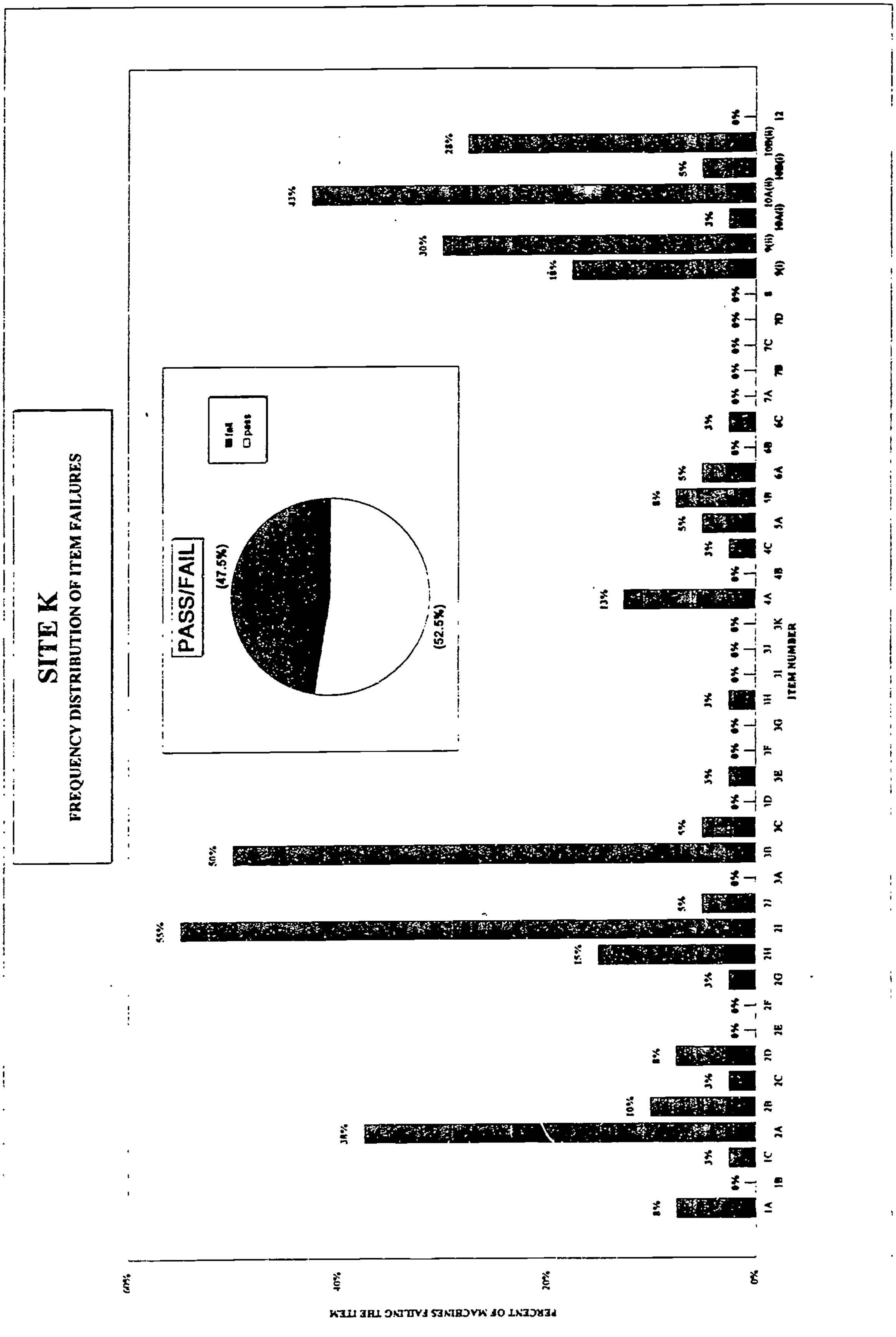
Appendix 3-5 (Continued)



Appendix 3-5 (Continued)



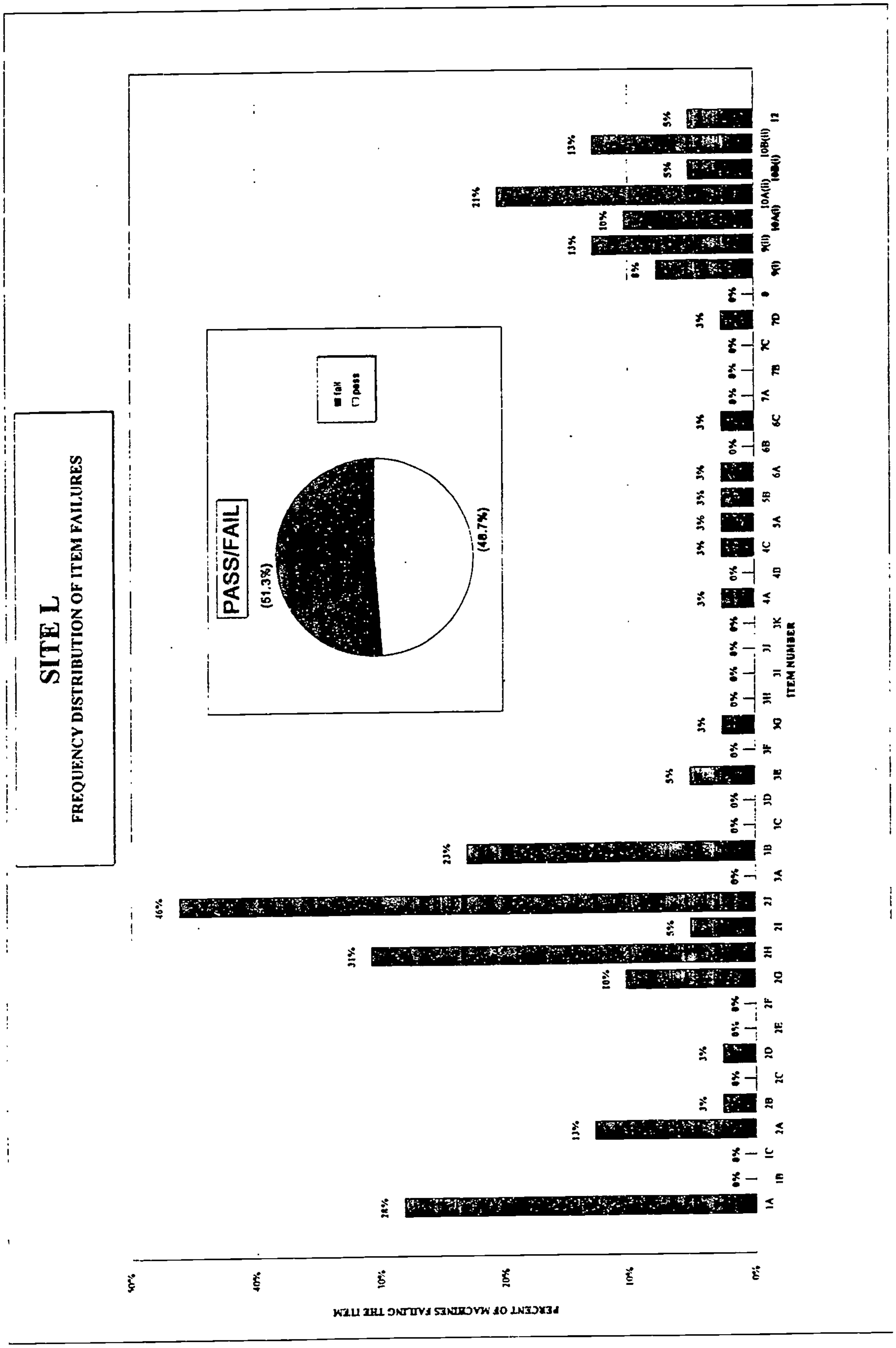
Appendix 3-5 (Continued)



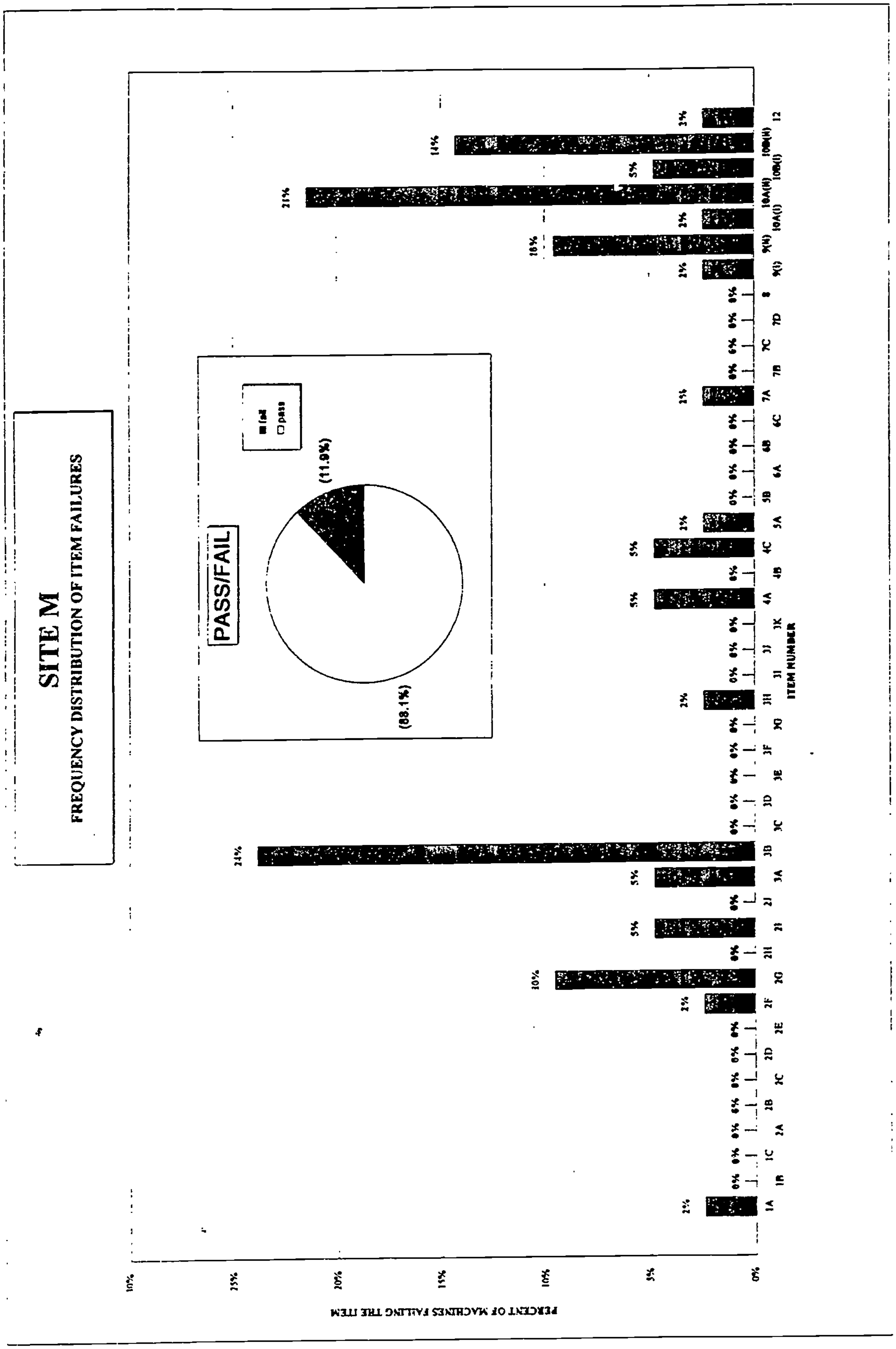
438

439

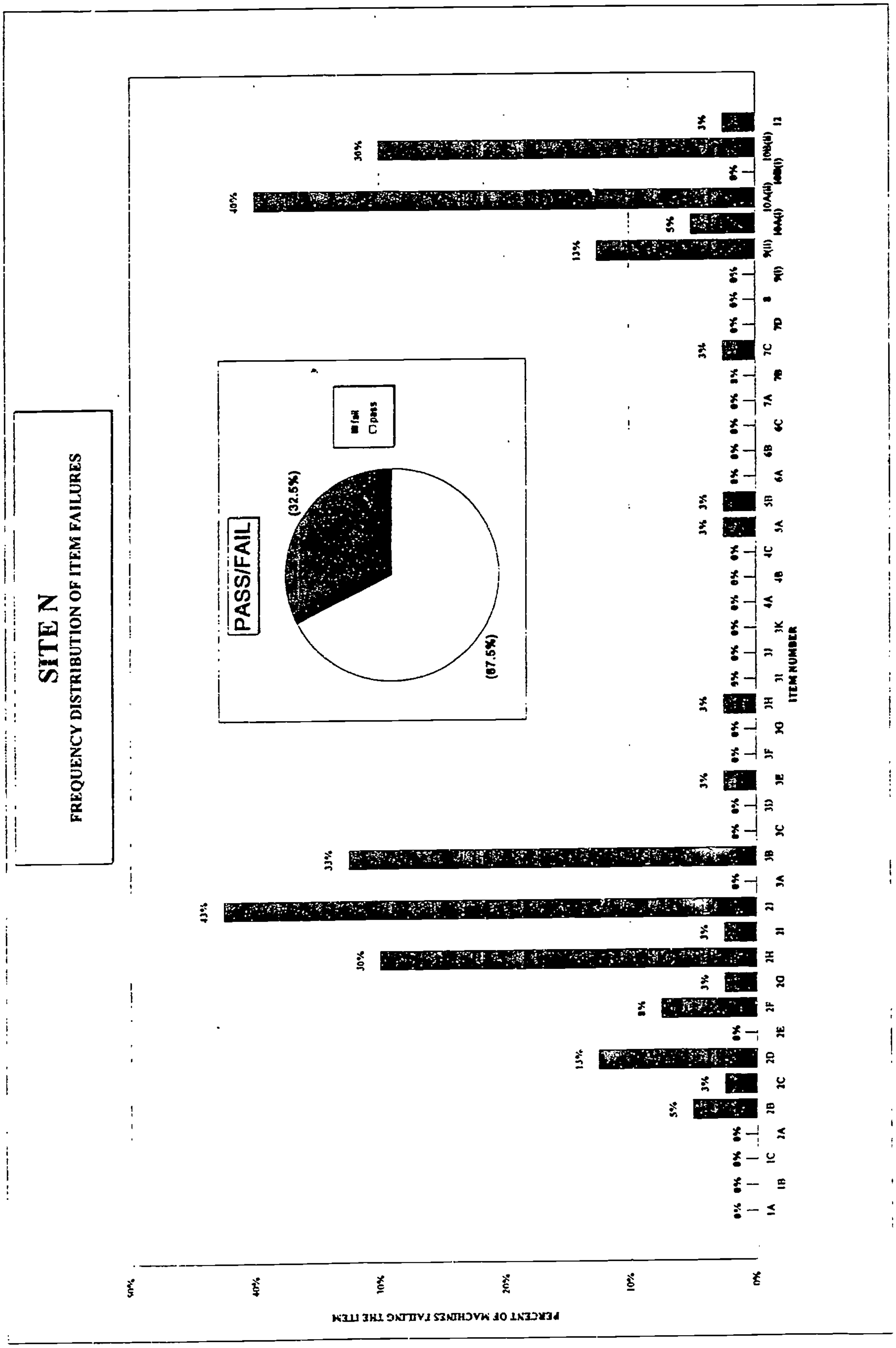
Appendix 3-5 (Continued)



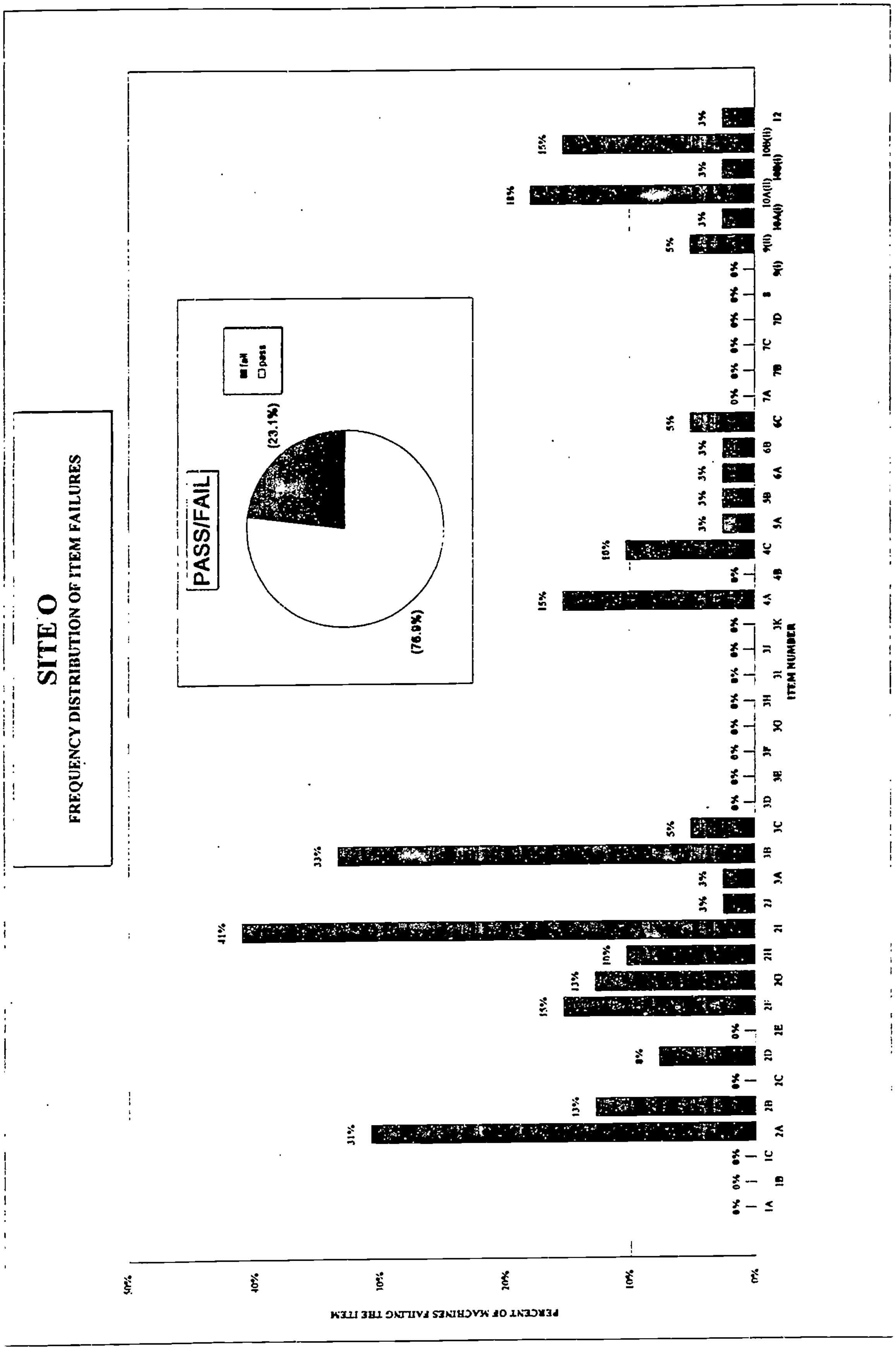
Appendix 3-5 (Continued)



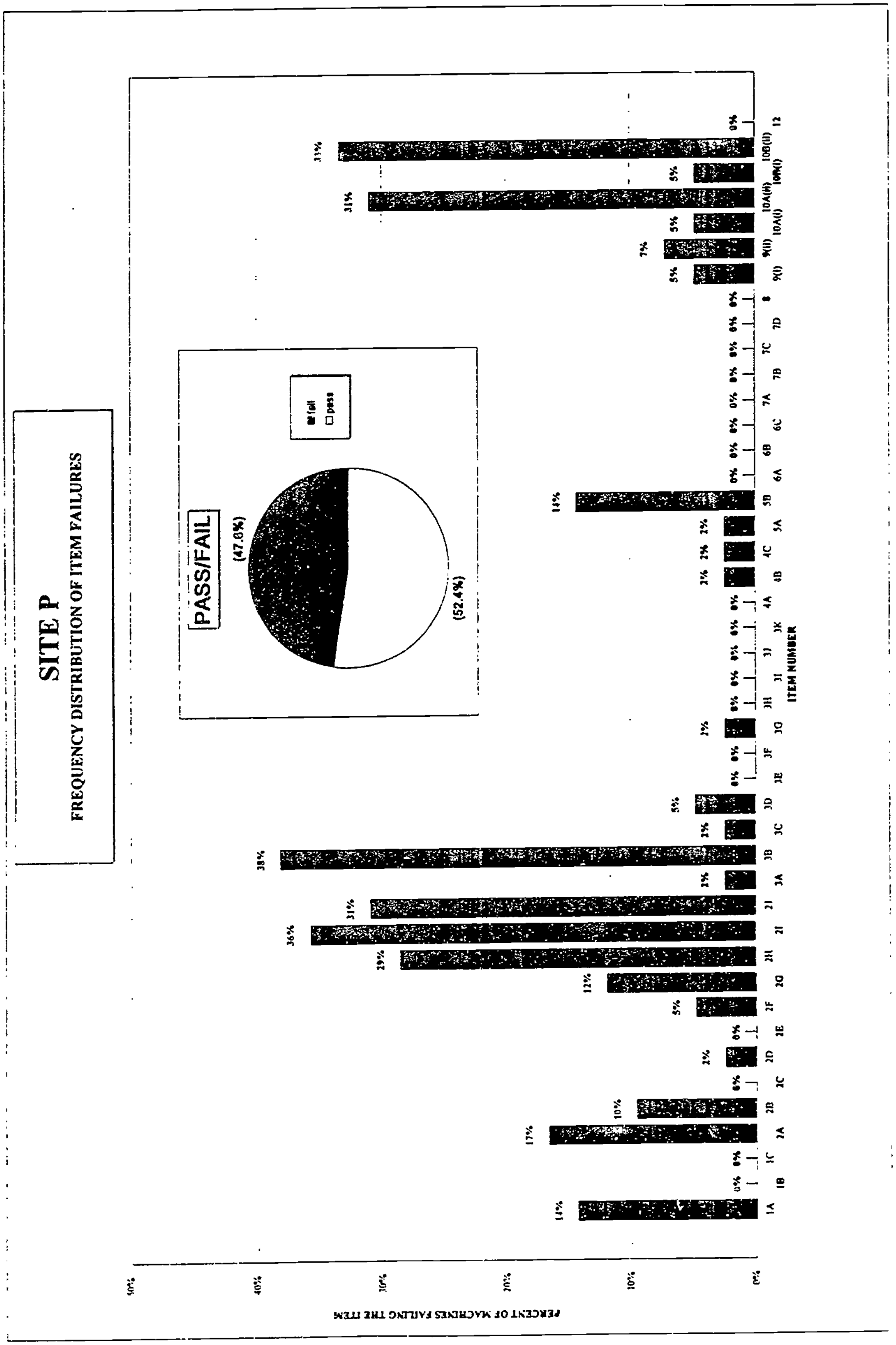
Appendix 3-5 (Continued)

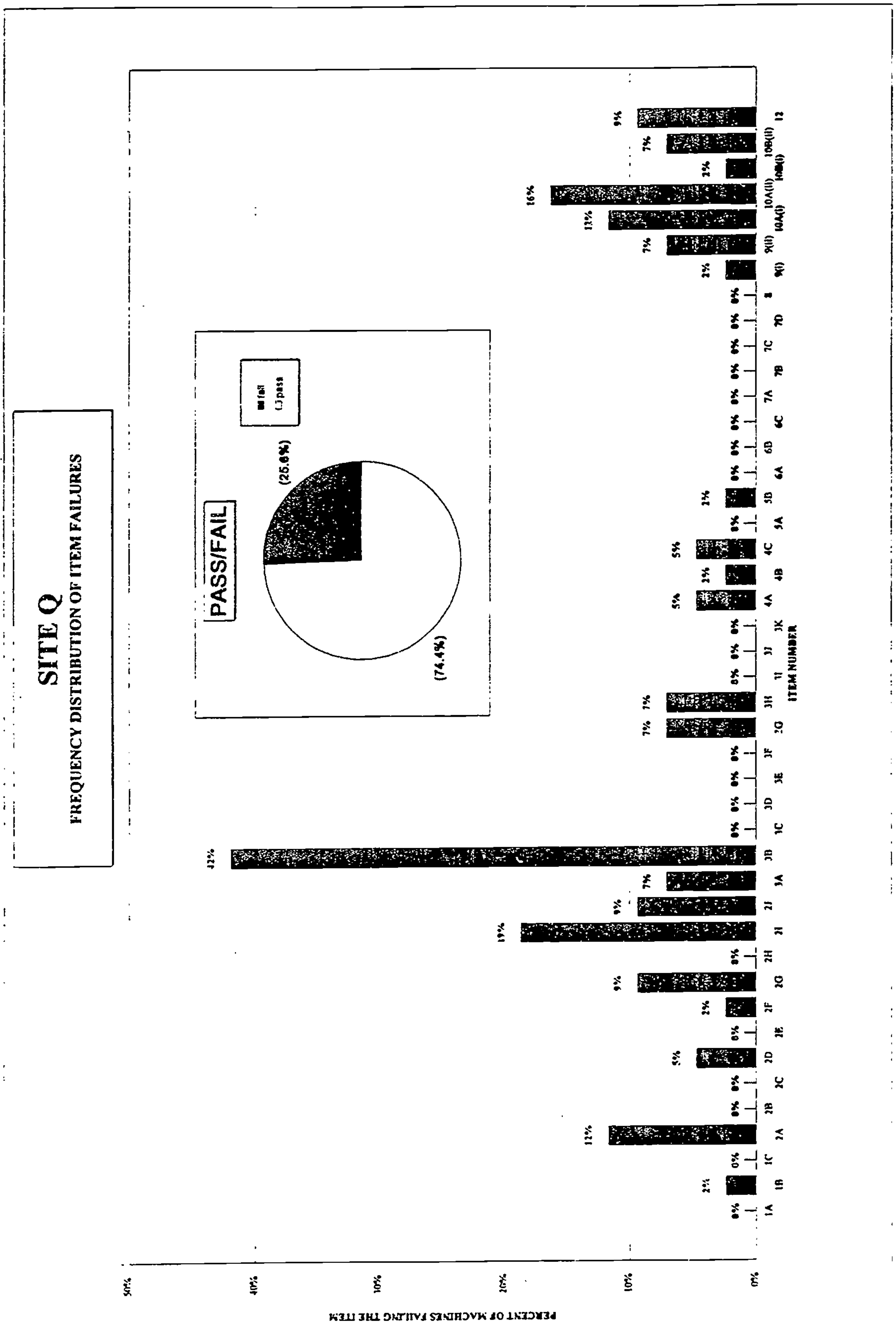


Appendix 3-5 (Continued)

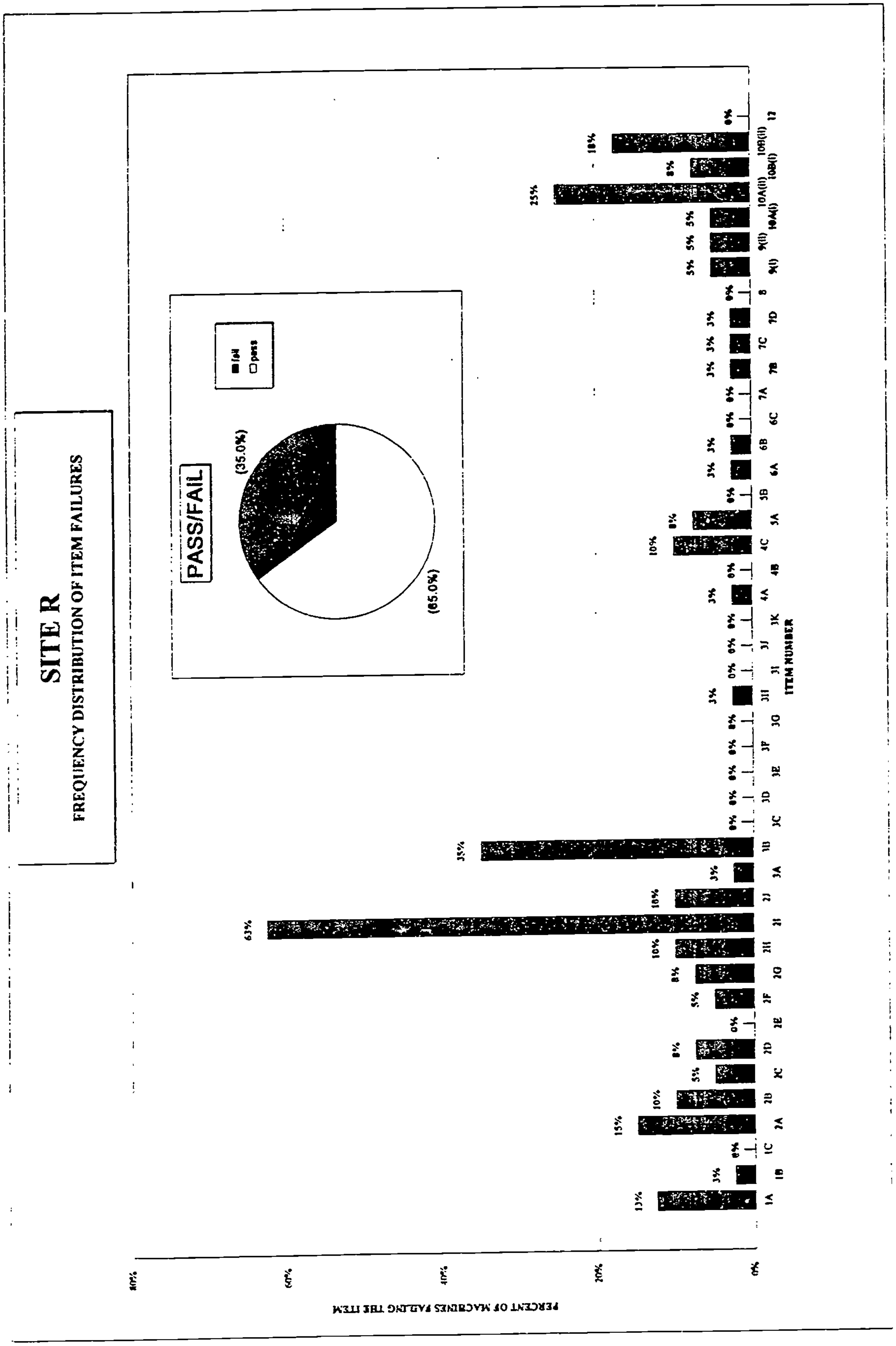


Appendix 3-5 (Continued)

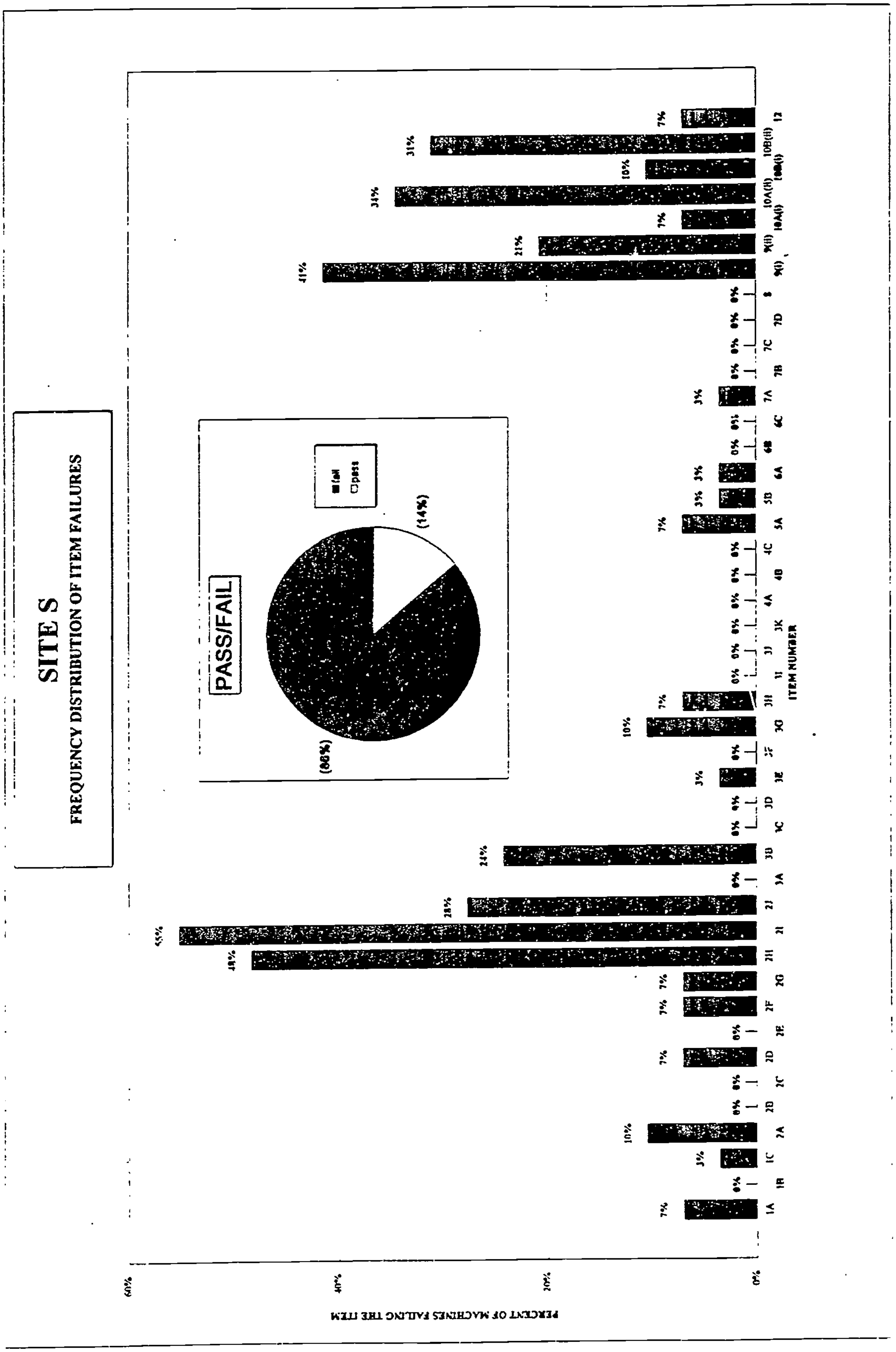



SITE Q
FREQUENCY DISTRIBUTION OF ITEM FAILURES
PASS/FAIL
fail
pass
(25.6%)
(74.4%)
ITEM NUMBER
PERCENT OF MACHINES FAILING THE ITEM
0%
10%
20%
30%
40%
50%

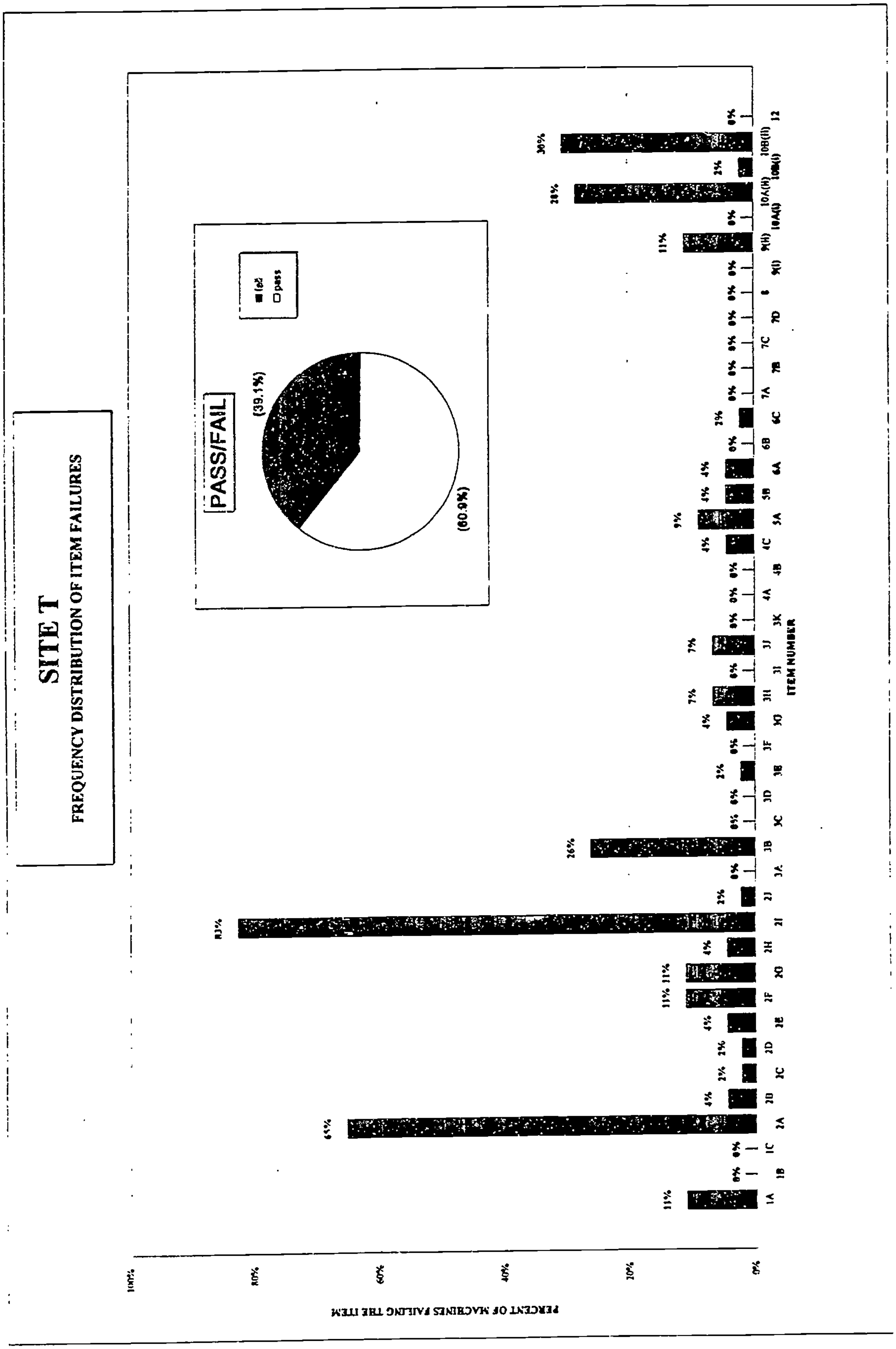
Appendix 3-5 (Continued)



Appendix 3-5 (Continued)

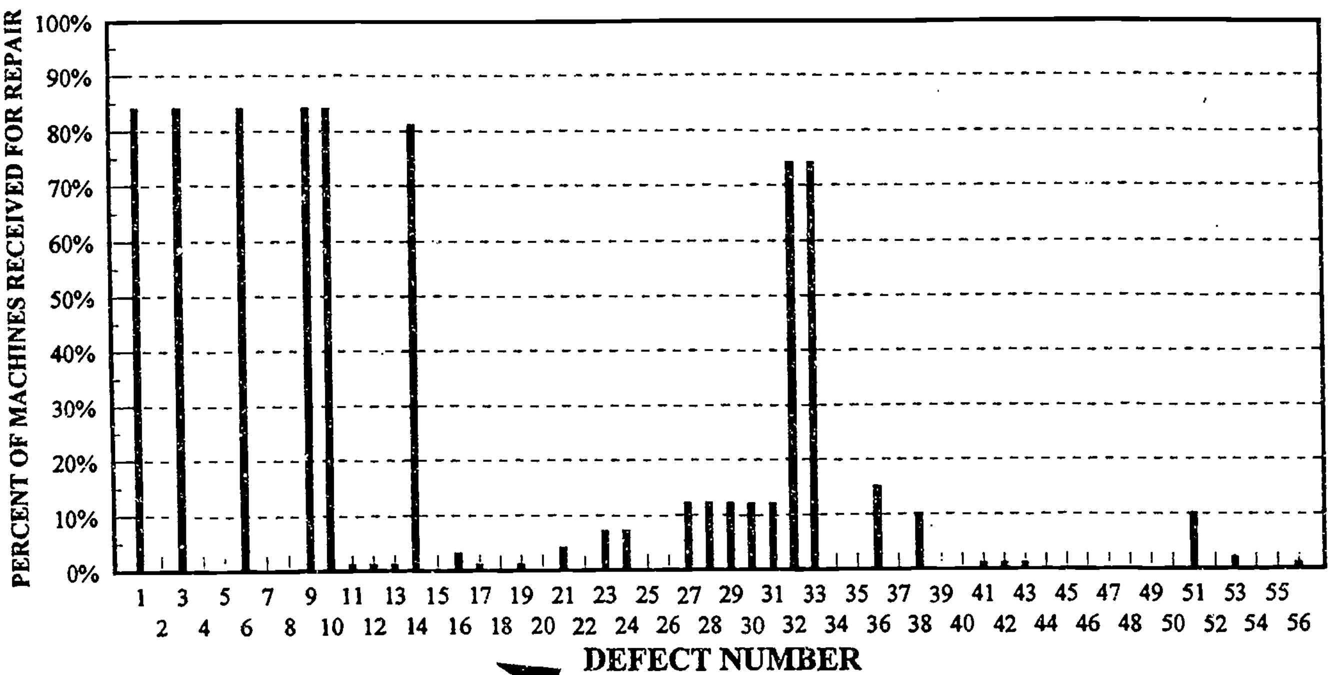


Appendix 3-5 (Continued)



ELFUN REPAIR DATA - 1993

Percentage Distribution of Defects to Machines Repaired



...correspond to these defect numbers

These defect numbers...

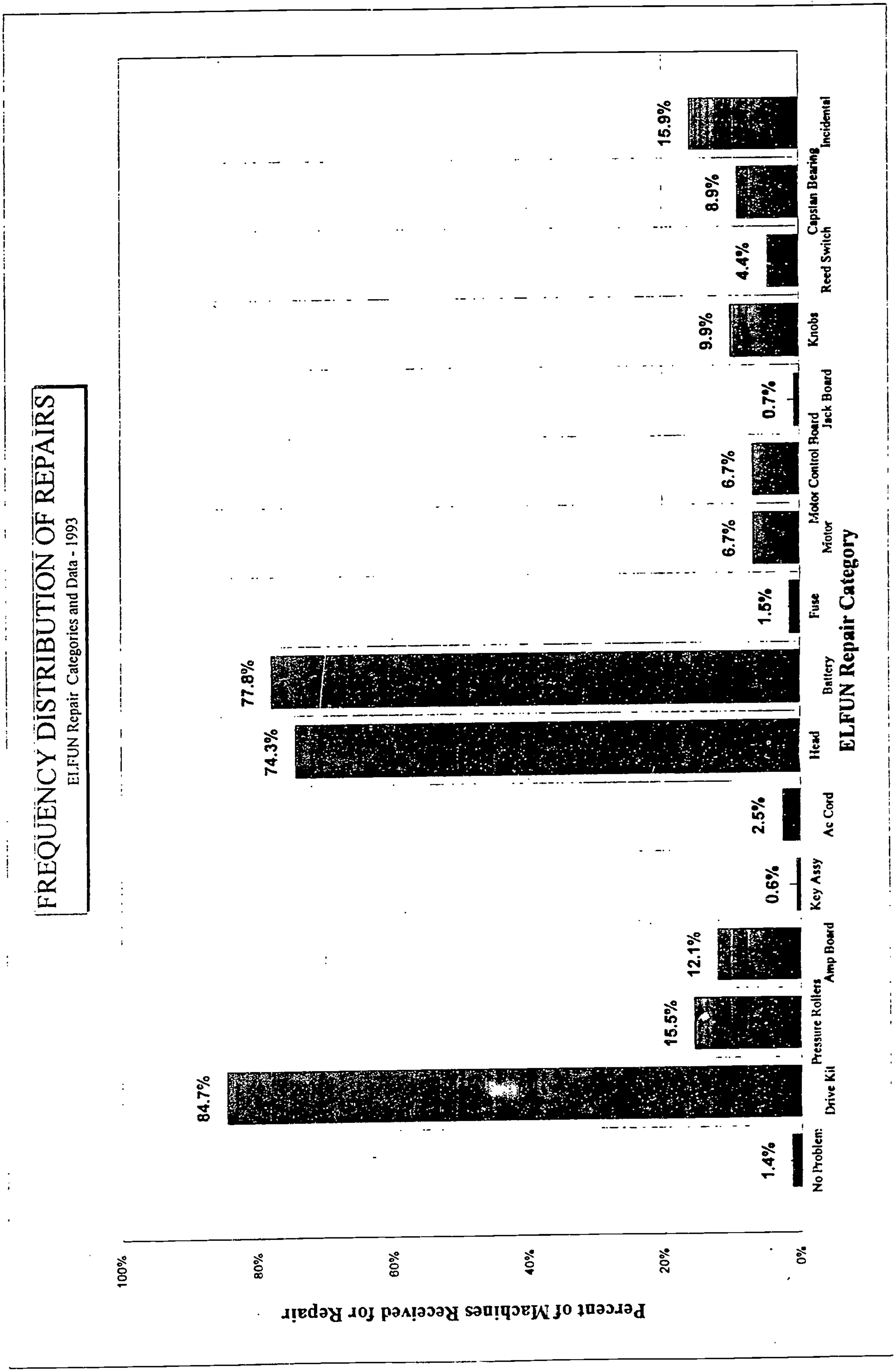
CASSETTE MACHINE DEFECT CARD

Model/Serial Number: C　　　　**Repair Group:**

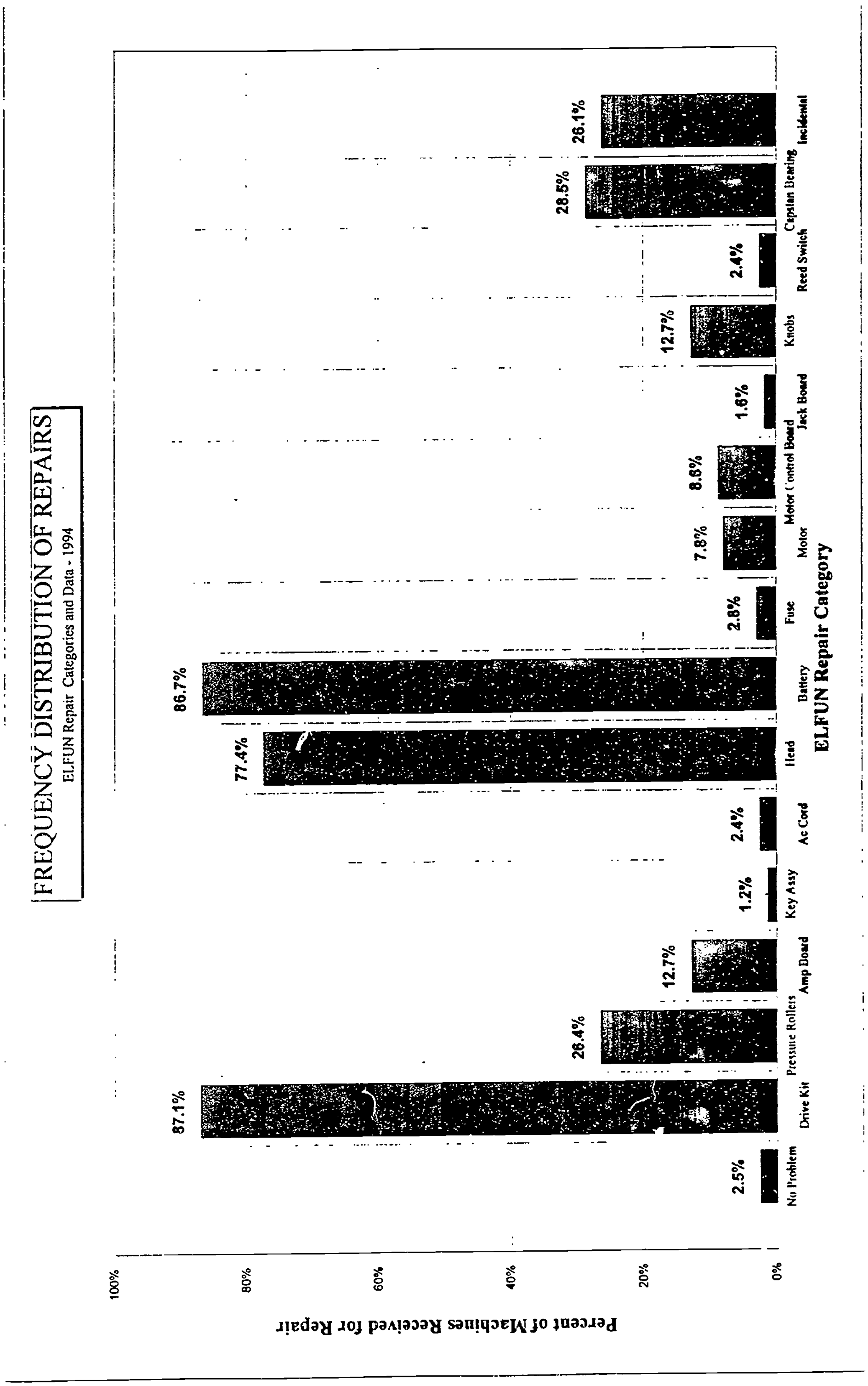
(Defects Sorted in Logical/Like Groupings)

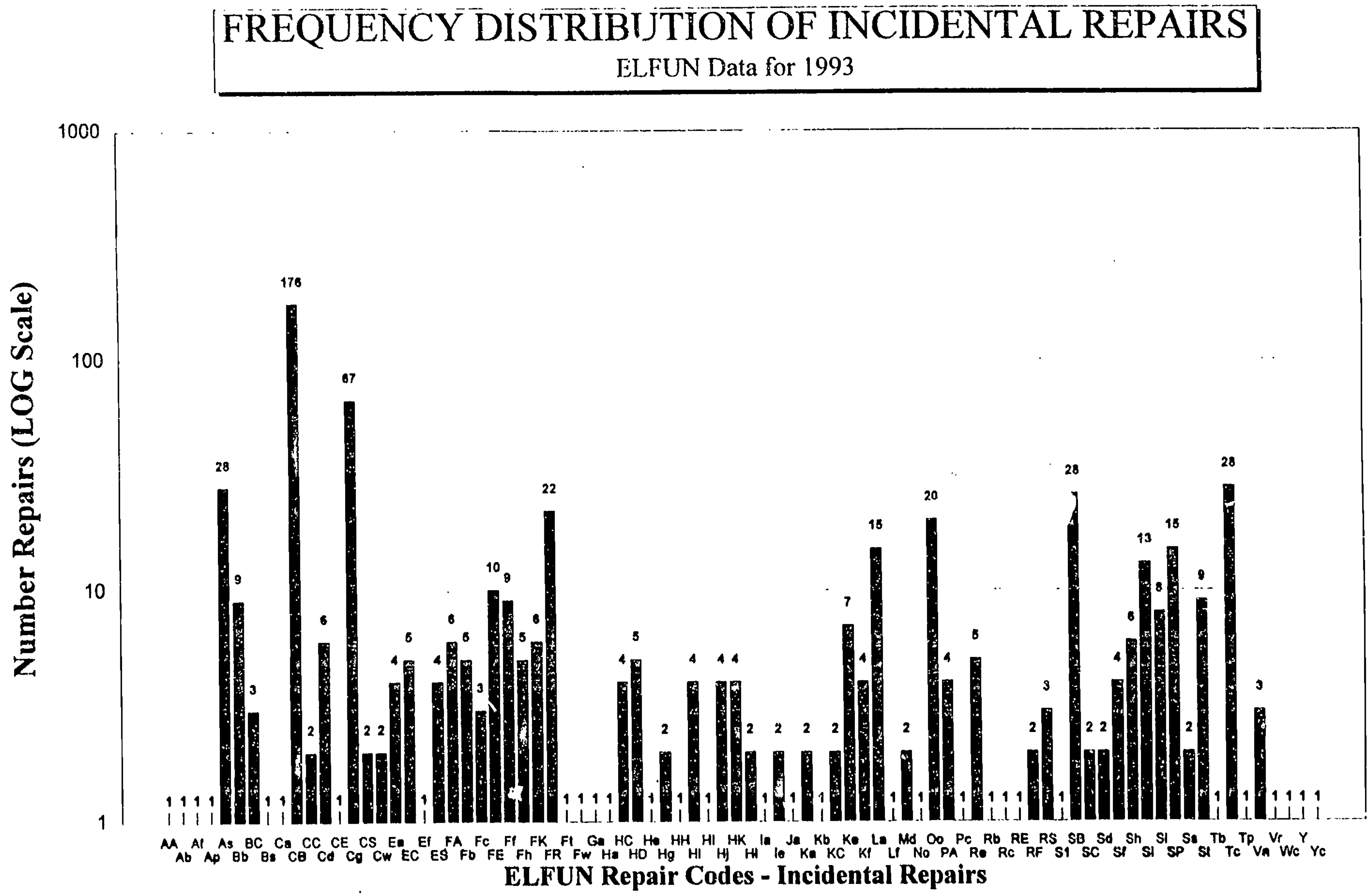
1 ☐ Fast frwrd idler	15 ☐ Battery contacts	29 ☐ Tone control	43 ☐ Speaker
2 ☐ Fast frwrd idler arm	16 ☐ Power cord	30 ☐ Track switch	44 ☐ Deck corroded/bent
3 ☐ Rewind idler	17 ☐ Transformer	31 ☐ Speed switch	45 ☐ Loose object
4 ☐ Friction lever	18 ☐ Charging circuit	32 ☐ Head alignment	46 ☐ Internal spill/vermin
5 ☐ Reel assy's	19 ☐ Fuse	33 ☐ Head worn	47 ☐ Case
6 ☐ Reel table tire	20 ☐ EOT mechanism	34 ☐ Head slide	48 ☐ Handle
7 ☐ Rewind spring	21 ☐ Reed switch bd	35 ☐ Tape guide	49 ☐ Key ID plate
8 ☐ Friction lever spring	22 ☐ Wire harness/conntrs	36 ☐ Pressure roller	50 ☐ Switch ID plate
9 ☐ Drive belt	23 ☐ Motor control bd	37 ☐ Flywheel	51 ☐ Knobs
10 ☐ EOT belt	24 ☐ Motor	38 ☐ Capstan bearing	52 ☐ Battery door
11 ☐ Pushbutton assy	25 ☐ Leaf switch	39 ☐ Thrust button	53 ☐ Cassette door
12 ☐ Latch bars	26 ☐ Trim pots	40 ☐ Amplifier board	54 ☐ Rubber feet
13 ☐ Keys scratched/brkn	27 ☐ Var. speed control	41 ☐ Jack panel board	55 ☐ Replace screw/washer
14 ☐ Battery	28 ☐ Volume control	42 ☐ Jacks	56 ☐ NO TROUBLE

Appendix 3-6 (Continued)

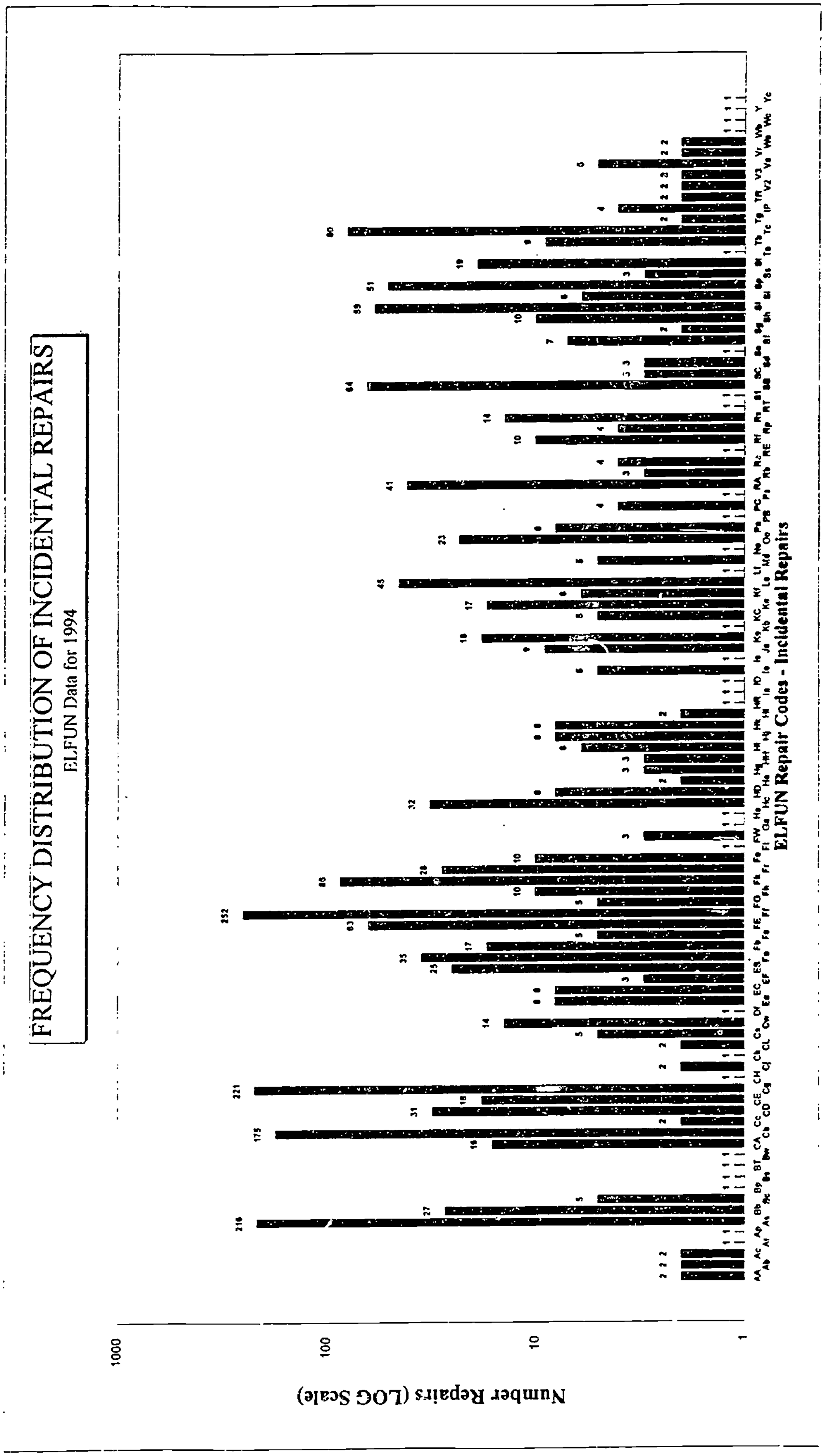


Appendix 3-6 (Continued)




FREQUENCY DISTRIBUTION OF INCIDENTAL REPAIRS
ELFUN Data for 1993
Number Repairs (LOG Scale)
1000
100
10
1
ELFUN Repair Codes - Incidental Repairs

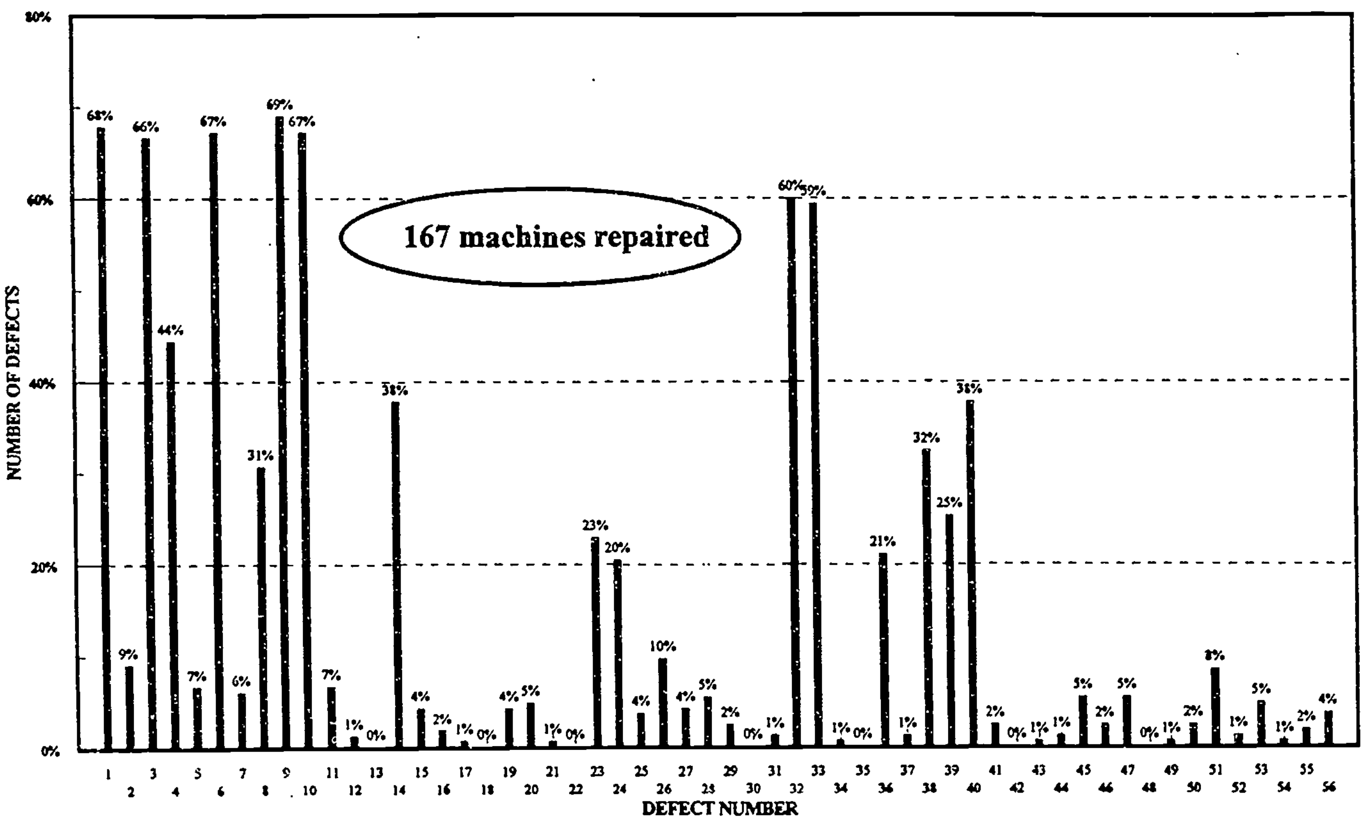
Appendix 3-6 (Continued)



ARIZONA TPs

Perce of Defects by Defect Number

SUMMARY RESULTS FOR DEFECT CARD MAILING



...correspond to these defect numbers

These defect numbers...

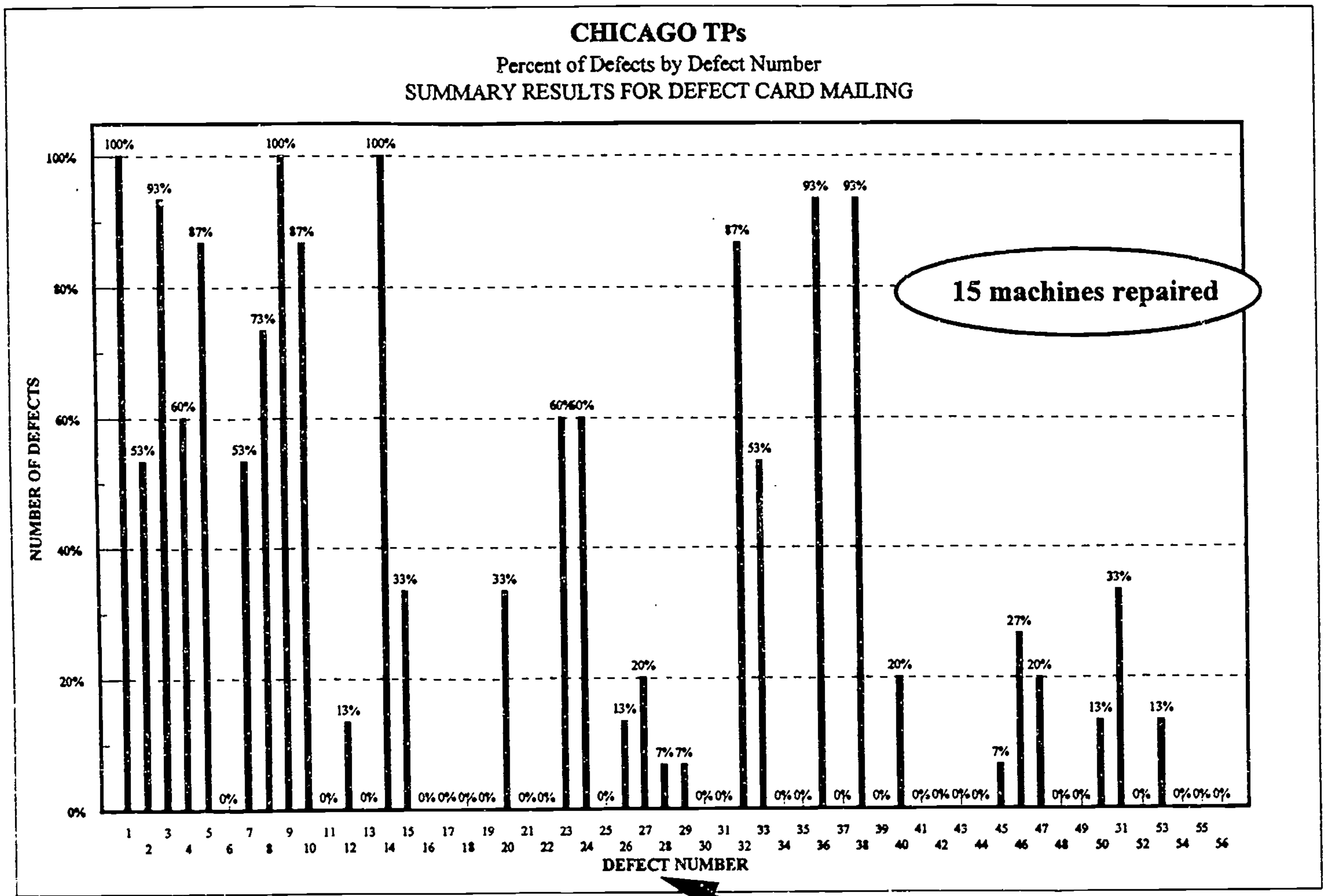
CASSETTE MACHINE DEFECT CARD

Model/Serial Number: C

Repair Group:

(Defects Sorted in Logical/Like Groupings)

1 ☐ Fast frwrd idler	15 ☐ Battery contacts	29 ☐ Tone control	43 ☐ Speaker
2 ☐ Fast frwrd idler arm	16 ☐ Power cord	30 ☐ Track switch	44 ☐ Deck corroded/bent
3 ☐ Rewind idler	17 ☐ Transformer	31 ☐ Speed switch	45 ☐ Loose object
4 ☐ Friction lever	18 ☐ Charging circuit	32 ☐ Head alignment	46 ☐ Internal spill/vermin
5 ☐ Reel assy's	19 ☐ Fuse	33 ☐ Head worn	47 ☐ Case
6 ☐ Reel table tire	20 ☐ EOT mechanism	34 ☐ Head slide	48 ☐ Handle
7 ☐ Rewind spring	21 ☐ Reed switch bd	35 ☐ Tape guide	49 ☐ Key ID plate
8 ☐ Friction lever spring	22 ☐ Wire harness/conntrs	36 ☐ Pressure roller	50 ☐ Switch ID plate
9 ☐ Drive belt	23 ☐ Motor control bd	37 ☐ Flywheel	51 ☐ Knobs
10 ☐ EOT belt	24 ☐ Motor	38 ☐ Capstan bearing	52 ☐ Battery door
11 ☐ Pushbutton assy	25 ☐ Leaf switch	39 ☐ Thrust button	53 ☐ Cassette door
12 ☐ Latch bars	26 ☐ Trim pots	40 ☐ Amplifier board	54 ☐ Rubber feet
13 ☐ Keys scratched/brkn	27 ☐ Var. speed control	41 ☐ Jack panel board	55 ☐ Replace screw/washer
14 ☐ Battery	28 ☐ Volume control	42 ☐ Jacks	56 ☐ NO TROUBLE



...correspond to these defect numbers

These defect numbers...

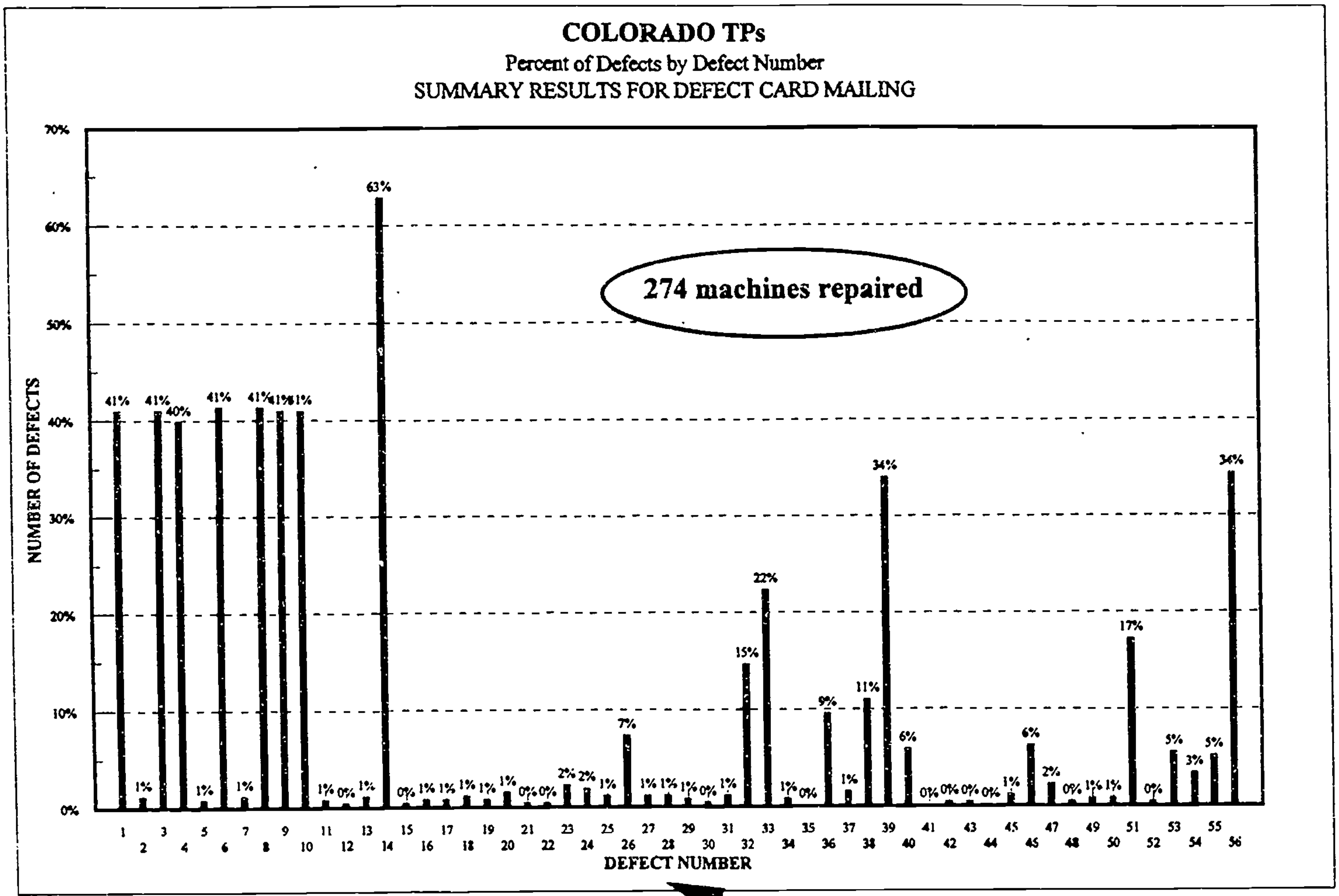
CASSETTE MACHINE DEFECT CARD

Model/Serial Number: C

Repair Group:

(Defects Sorted in Logical/Like Groupings)

1 Fast frwrd idler	15 Battery contacts	29 Tone control	43 Speaker
2 Fast frwrd idler arm	16 Power cord	30 Track switch	44 Deck corroded/bent
3 Rewind idler	17 Transformer	31 Speed switch	45 Loose object
4 Friction lever	18 Charging circuit	32 Head alignment	46 Internal spill/vermin
5 Reel assy's	19 Fuse	33 Head worn	47 Case
6 Reel table tire	20 EOT mechanism	34 Head slide	48 Handle
7 Rewind spring	21 Reed switch bd	35 Tape guide	49 Key ID plate
8 Friction le[illegible] spring	22 Wire harness/conntrs	36 Pressure roller	50 Switch ID plate
9 Drive belt	23 Motor control bd	37 Flywheel	51 Knobs
10 EOT belt	24 Motor	38 Capstan bearing	52 Battery door
11 Pushbutton assy	25 Leaf switch	39 Thrust button	53 Cassette door
12 Latch bars	26 Trim pots	40 Amplifier board	54 Rubber feet
13 Keys scratched/brkn	27 Var. speed control	41 Jack panel board	55 Replace screw/washer
14 Battery	28 Volume control	42 Jacks	56 NO TROUBLE



...correspond to these defect numbers

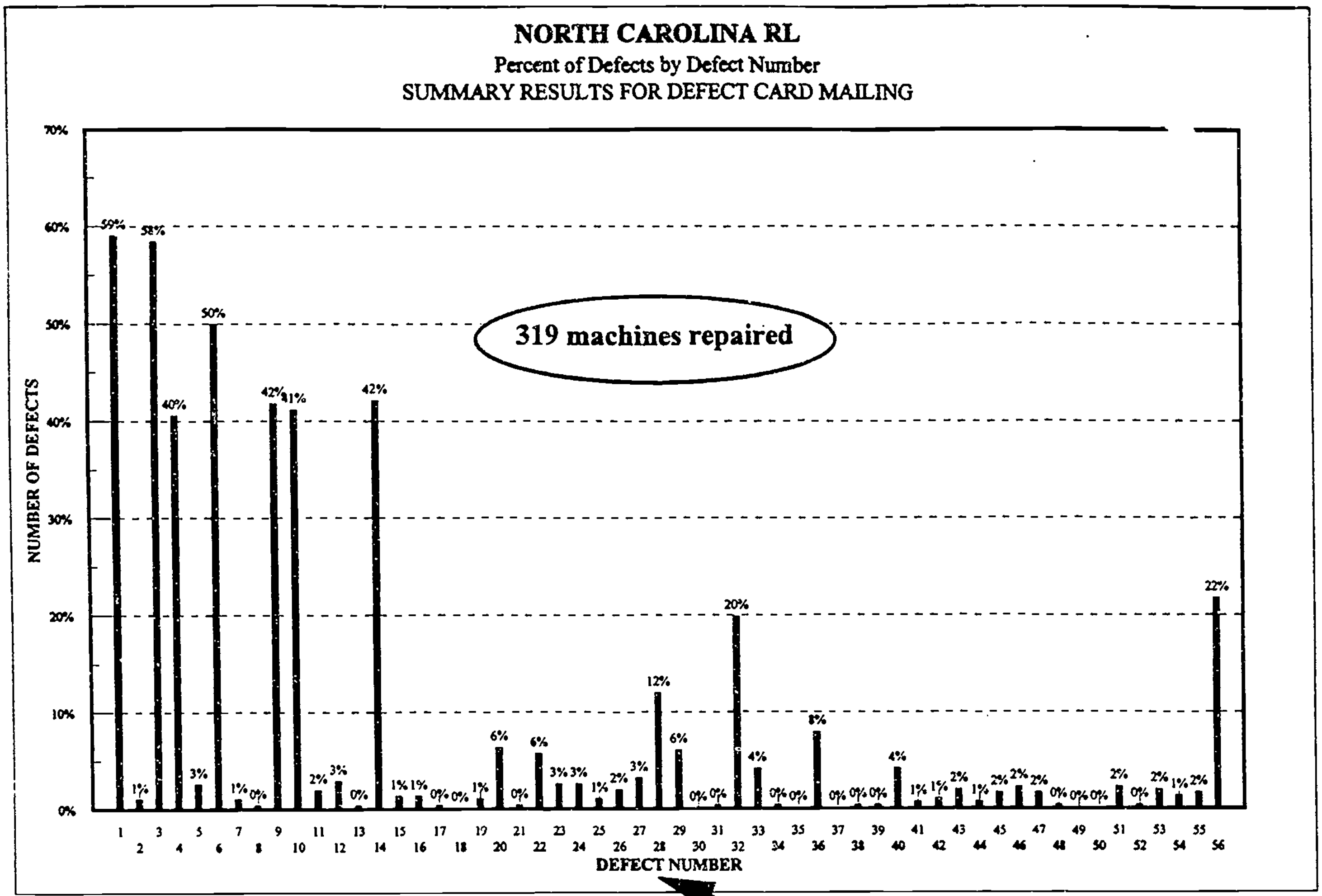
These defect numbers...

CASSETTE MACHINE DEFECT CARD

Model/Serial Number: C ______________ **Repair Group:** ______________

(Defects Sorted in Logical/Like Groupings)

1	☐ Fast frwrd idler	15	☐ Battery contacts	29	☐ Tone control	43	☐ Speaker
2	☐ Fast frwrd idler arm	16	☐ Power cord	30	☐ Track switch	44	☐ Deck corroded/bent
3	☐ Rewind idler	17	☐ Transformer	31	☐ Speed switch	45	☐ Loose object
4	☐ Friction lever	18	☐ Charging circuit	32	☐ Head alignment	46	☐ Internal spill/vermin
5	☐ Reel assy's	19	☐ Fuse	33	☐ Head worn	47	☐ Case
6	☐ Reel table tire	20	☐ EOT mechanism	34	☐ Head slide	48	☐ Handle
7	☐ Rewind spring	21	☐ Reed switch bd	35	☐ Tape guide	49	☐ Key ID plate
8	☐ Friction lever spring	22	☐ Wire harness/conntrs	36	☐ Pressure roller	50	☐ Switch ID plate
9	☐ Drive belt	23	☐ Motor control bd	37	☐ Flywheel	51	☐ Knobs
10	☐ EOT belt	24	☐ Motor	38	☐ Capstan bearing	52	☐ Battery door
11	☐ Pushbutton assy	25	☐ Leaf switch	39	☐ Thrust button	53	☐ Cassette door
12	☐ Latch bars	26	☐ Trim pots	40	☐ Amplifier board	54	☐ Rubber feet
13	☐ Keys scratched/brkn	27	☐ Var. speed control	41	☐ Jack panel board	55	☐ Replace screw/washer
14	☐ Battery	28	☐ Volume control	42	☐ Jacks	56	☐ NO TROUBLE



...correspond to these defect numbers

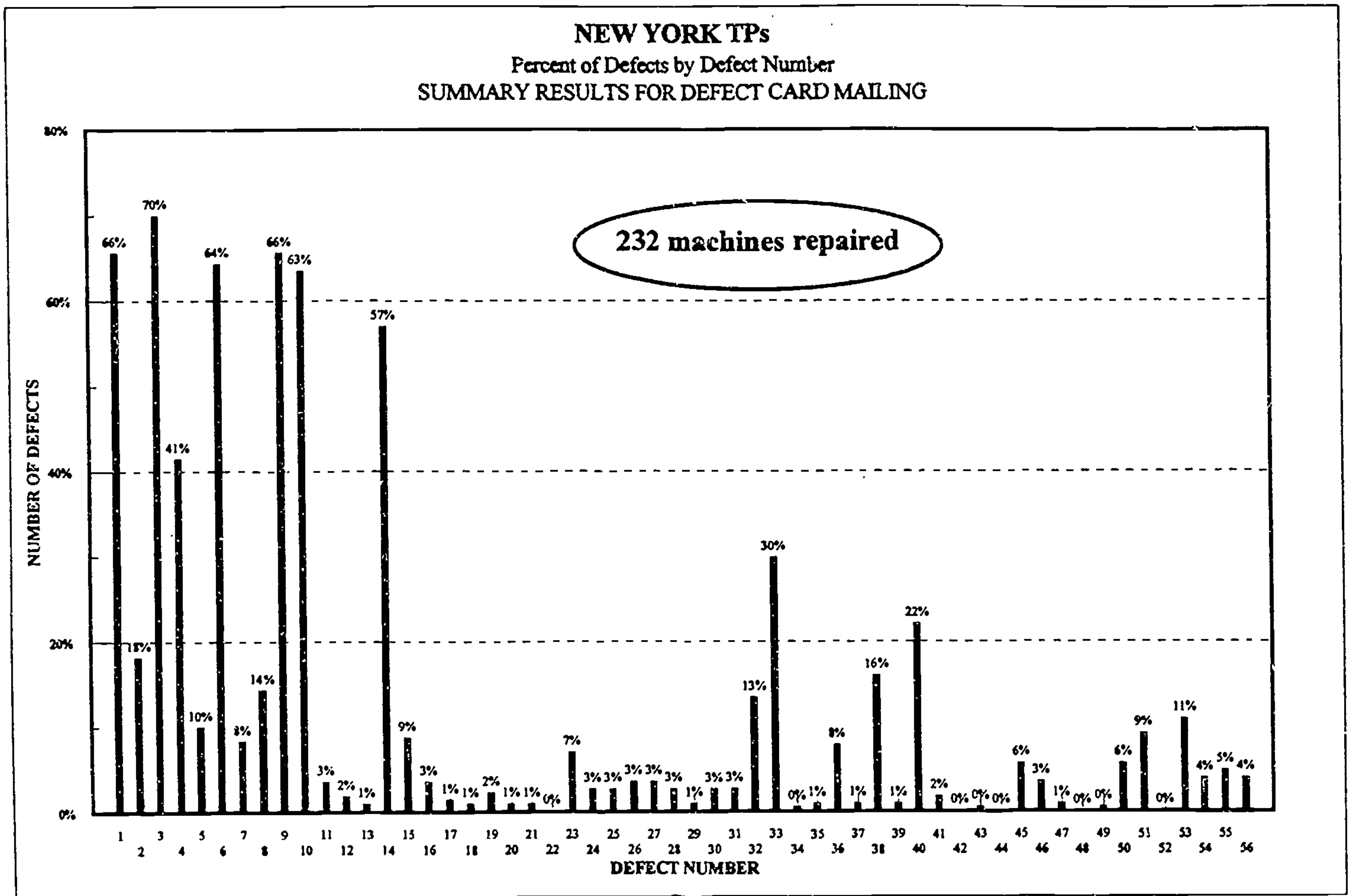
These defect numbers...

CASSETTE MACHINE DEFECT CARD

Model/Serial Number: C **Repair Group:**

(Defects Sorted in Logical/Like Groupings)

1	☐ Fast frwrd idler	15	☐ Battery contacts	29	☐ Tone control	43	☐ Speaker
2	☐ Fast frwrd idler arm	16	☐ Power cord	30	☐ Track switch	44	☐ Deck corroded/bent
3	☐ Rewind idler	17	☐ Transformer	31	☐ Speed switch	45	☐ Loose object
4	☐ Friction lever	18	☐ Charging circuit	32	☐ Head alignment	46	☐ Internal spill/vermin
5	☐ Reel assy's	19	☐ Fuse	33	☐ Head worn	47	☐ Case
6	☐ Reel table tire	20	☐ EOT mechanism	34	☐ Head slide	48	☐ Handle
7	☐ Rewind spring	21	☐ Reed switch bd	35	☐ Tape guide	49	☐ Key ID plate
8	☐ Friction lever spring	22	☐ Wire harness/conntrs	36	☐ Pressure roller	50	☐ Switch ID plate
9	☐ Drive belt	23	☐ Motor control bd	37	☐ Flywheel	51	☐ Knobs
10	☐ EOT belt	24	☐ Motor	38	☐ Capstan bearing	52	☐ Battery door
11	☐ Pushbutton assy	25	☐ Leaf switch	39	☐ Thrust button	53	☐ Cassette door
12	☐ Latch bars	26	☐ Trim pots	40	☐ Amplifier board	54	☐ Rubber feet
13	☐ Keys scratched/brkn	27	☐ Var. speed control	41	☐ Jack panel board	55	☐ Replace screw/washer
14	☐ Battery	28	☐ Volume control	42	☐ Jacks	56	☐ NO TROUBLE



...correspond to these defect numbers

These defect numbers...

CASSETTE MACHINE DEFECT CARD

Model/Serial Number: C **Repair Group:**

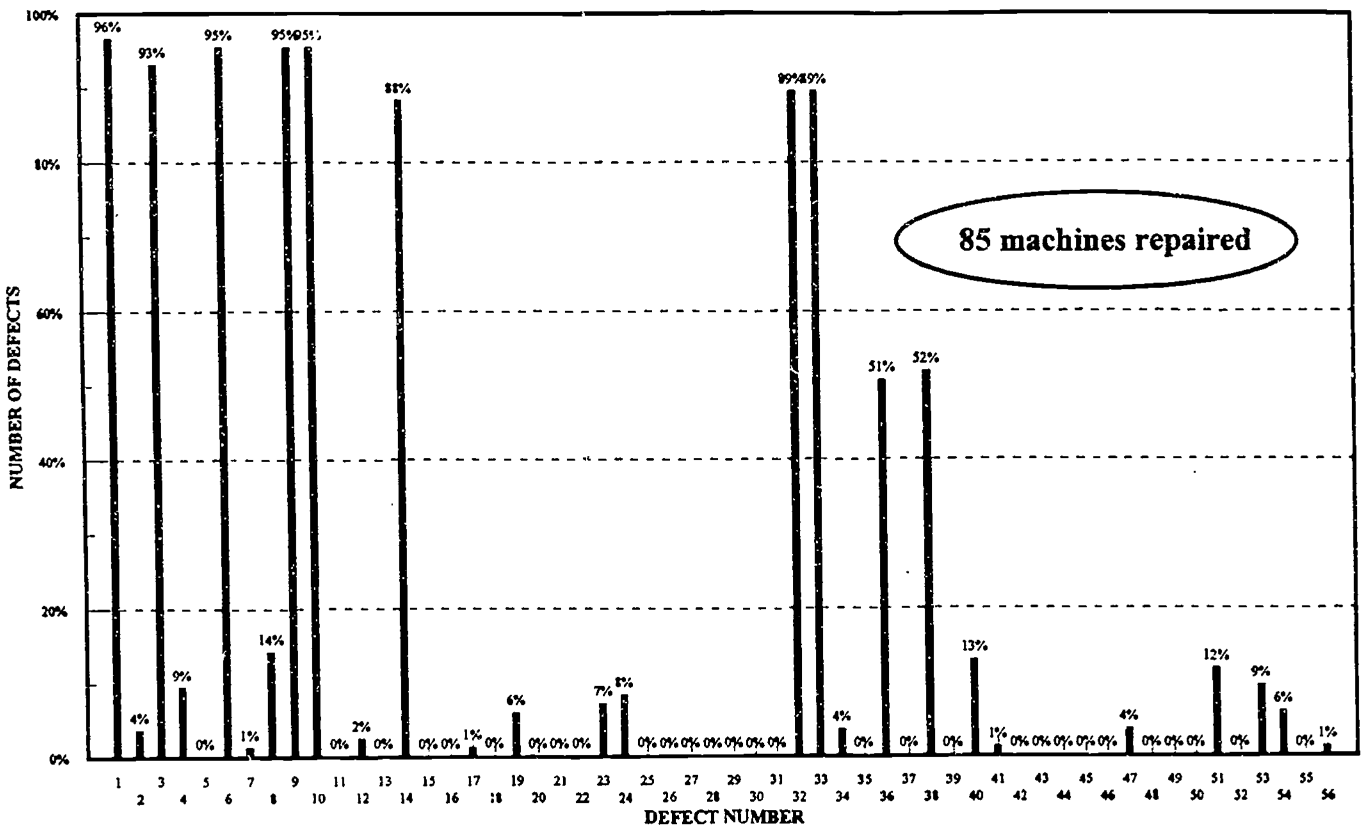
(Defects Sorted in Logical/Like Groupings)

1 ☐ Fast frwrd idler	15 ☐ Battery contacts	29 ☐ Tone control	43 ☐ Speaker
2 ☐ Fast frwrd idler arm	16 ☐ Power cord	30 ☐ Track switch	44 ☐ Deck corroded/bent
3 ☐ Rewind idler	17 ☐ Transformer	31 ☐ Speed switch	45 ☐ Loose object
4 ☐ Friction lever	18 ☐ Charging circuit	32 ☐ Head alignment	46 ☐ Internal spill/vermin
5 ☐ Reel assy's	19 ☐ Fuse	33 ☐ Head worn	47 ☐ Case
6 ☐ Reel table tire	20 ☐ EOT mechanism	34 ☐ Head slide	48 ☐ Handle
7 ☐ Rewind spring	21 ☐ Reed switch bd	35 ☐ Tape guide	49 ☐ Key ID plate
8 ☐ Friction lever spring	22 ☐ Wire harness/conntrs	36 ☐ Pressure roller	50 ☐ Switch ID plate
9 ☐ Drive belt	23 ☐ Motor control bd	37 ☐ Flywheel	51 ☐ Knobs
10 ☐ EOT belt	24 ☐ Motor	38 ☐ Capstan bearing	52 ☐ Battery door
11 ☐ Pushbutton assy	25 ☐ Leaf switch	39 ☐ Thrust button	53 ☐ Cassette door
12 ☐ Latch bars	26 ☐ Trim pots	40 ☐ Amplifier board	54 ☐ Rubber feet
13 ☐ Keys scratched/brkn	27 ☐ Var. speed control	41 ☐ Jack panel board	55 ☐ Replace screw/washer
14 ☐ Battery	28 ☐ Volume control	42 ☐ Jacks	56 ☐ NO TROUBLE

OHIO TPs

Percent of Defects by Defect Number

SUMMARY RESULTS FOR DEFECT CARD MAILING



...correspond to these defect numbers

These defect numbers...

CASSETTE MACHINE DEFECT CARD

Model/Serial Number: C **Repair Group:**

(Defects Sorted in Logical/Like Groupings)

1 Fast frwrd idler	15 Battery contacts	29 Tone control	43 Speaker
2 Fast frwrd idler arm	16 Power cord	30 Track switch	44 Deck corroded/bent
3 Rewind idler	17 Transformer	31 Speed switch	45 Loose object
4 Friction lever	18 Charging circuit	32 Head alignment	46 Internal spill/vermin
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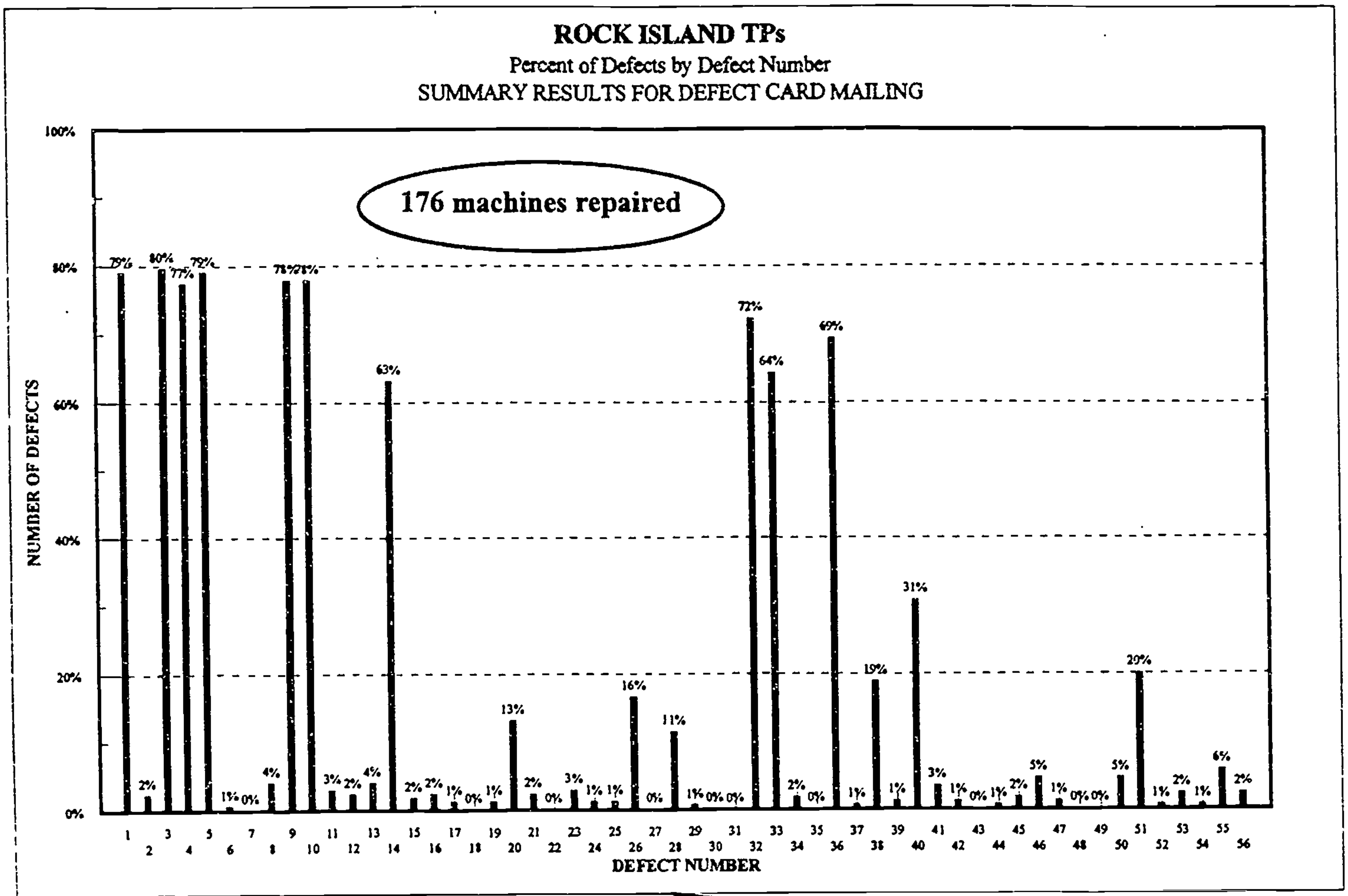
6 Reel table tire	20 EOT mechanism	34 Head slide	48 Handle
7 Rewind spring	21 Reed switch bd	35 Tape guide	49 Key ID plate
8 Friction lever spring	22 Wire harness/conntrs	36 Pressure roller	50 Switch ID plate
9 Drive belt	23 Motor control bd	37 Flywheel	51 Knobs
10 EOT belt	24 Motor	38 Capstan bearing	52 Battery door
11 Pushbutton assy	25 Leaf switch	39 Thrust button	53 Cassette door
12 Latch bars	26 Trim pots	40 Amplifier board	54 Rubber feet
13 Keys scratched/brkn	27 Var. speed control	41 Jack panel board	55 Replace screw/washer
14 Battery	28 Volume control	42 Jacks	56 NO TROUBLE



These defect numbers...

...correspond to these defect numbers

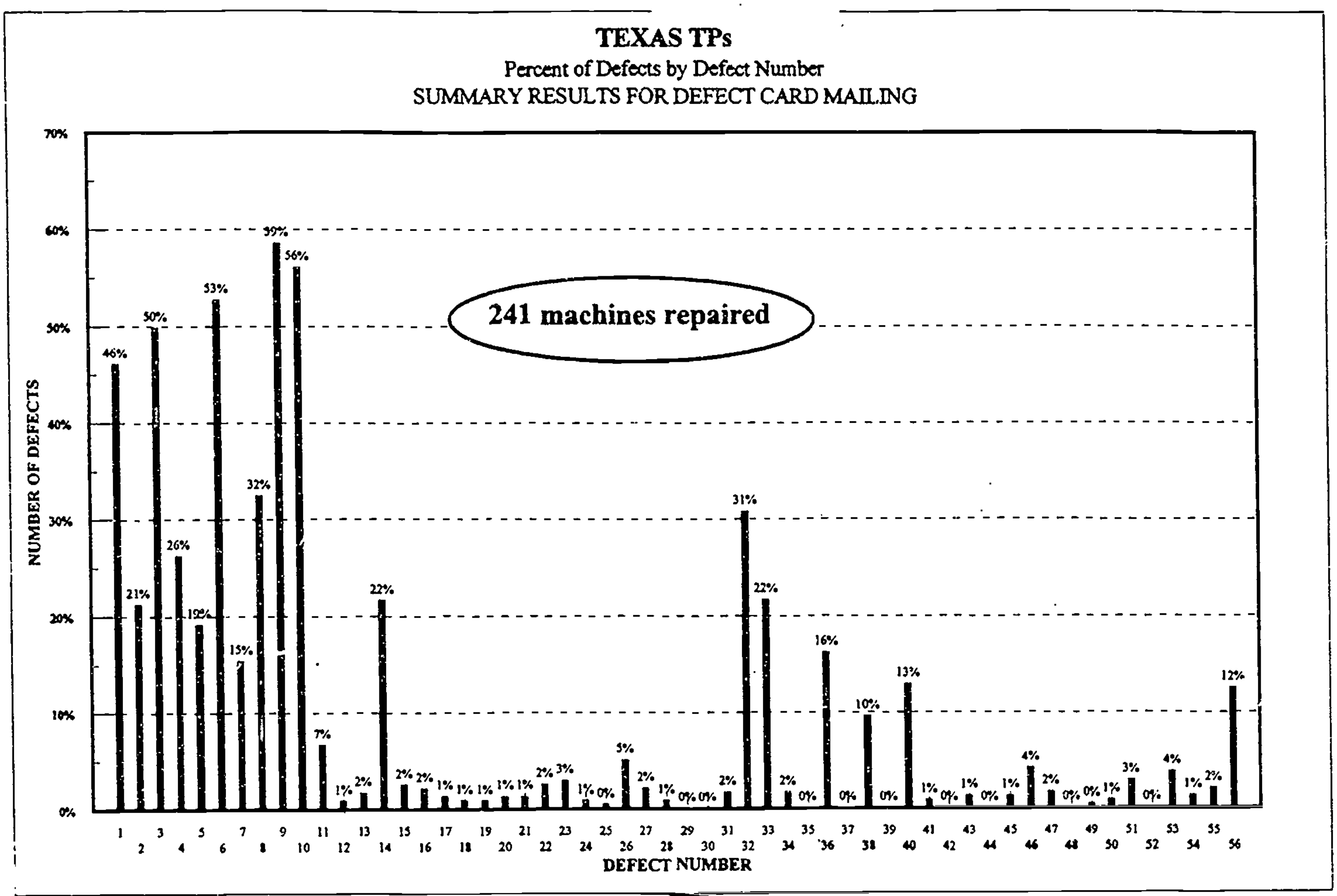
CASSETTE MACHINE DEFECT CARD

Model/Serial Number: C ____________ **Repair Group:** ____________

(Defects Sorted in Logical/Like Groupings)

1 ☐ Fast frwrd idler	15 ☐ Battery contacts	29 ☐ Tone control	43 ☐ Speaker
2 ☐ Fast frwrd idler arm	16 ☐ Power cord	30 ☐ Track switch	44 ☐ Deck corroded/bent
3 ☐ Rewind idler	17 ☐ Transformer	31 ☐ Speed switch	45 ☐ Loose object
4 ☐ Friction lever	18 ☐ Charging circuit	32 ☐ Head alignment	46 ☐ Internal spill/vermin
5 ☐ Reel assy's	19 ☐ Fuse	33 ☐ Head worn	47 ☐ Case
6 ☐ Reel table tire	20 ☐ EOT mechanism	34 ☐ Head slide	48 ☐ Handle
7 ☐ Rewind spring	21 ☐ Reed switch bd	35 ☐ Tape guide	49 ☐ Key ID plate
8 ☐ Friction lever spring	22 ☐ Wire harness/conntrs	36 ☐ Pressure roller	50 ☐ Switch ID plate
9 ☐ Drive belt	23 ☐ Motor control bd	37 ☐ Flywheel	51 ☐ Knobs
10 ☐ EOT belt	24 ☐ Motor	38 ☐ Capstan bearing	52 ☐ Battery door
11 ☐ Pushbutton assy	25 ☐ Leaf switch	39 ☐ Thrust button	53 ☐ Cassette door
12 ☐ Latch bars	26 ☐ Trim pots	40 ☐ Amplifier board	54 ☐ Rubber feet
13 ☐ Keys scratched/brkn	27 ☐ Var. speed control	41 ☐ Jack panel board	55 ☐ Replace screw/washer
14 ☐ Battery	28 ☐ Volume control	42 ☐ Jacks	56 ☐ NO TROUBLE

Appendix 3-7 (Continued)



These defect numbers...

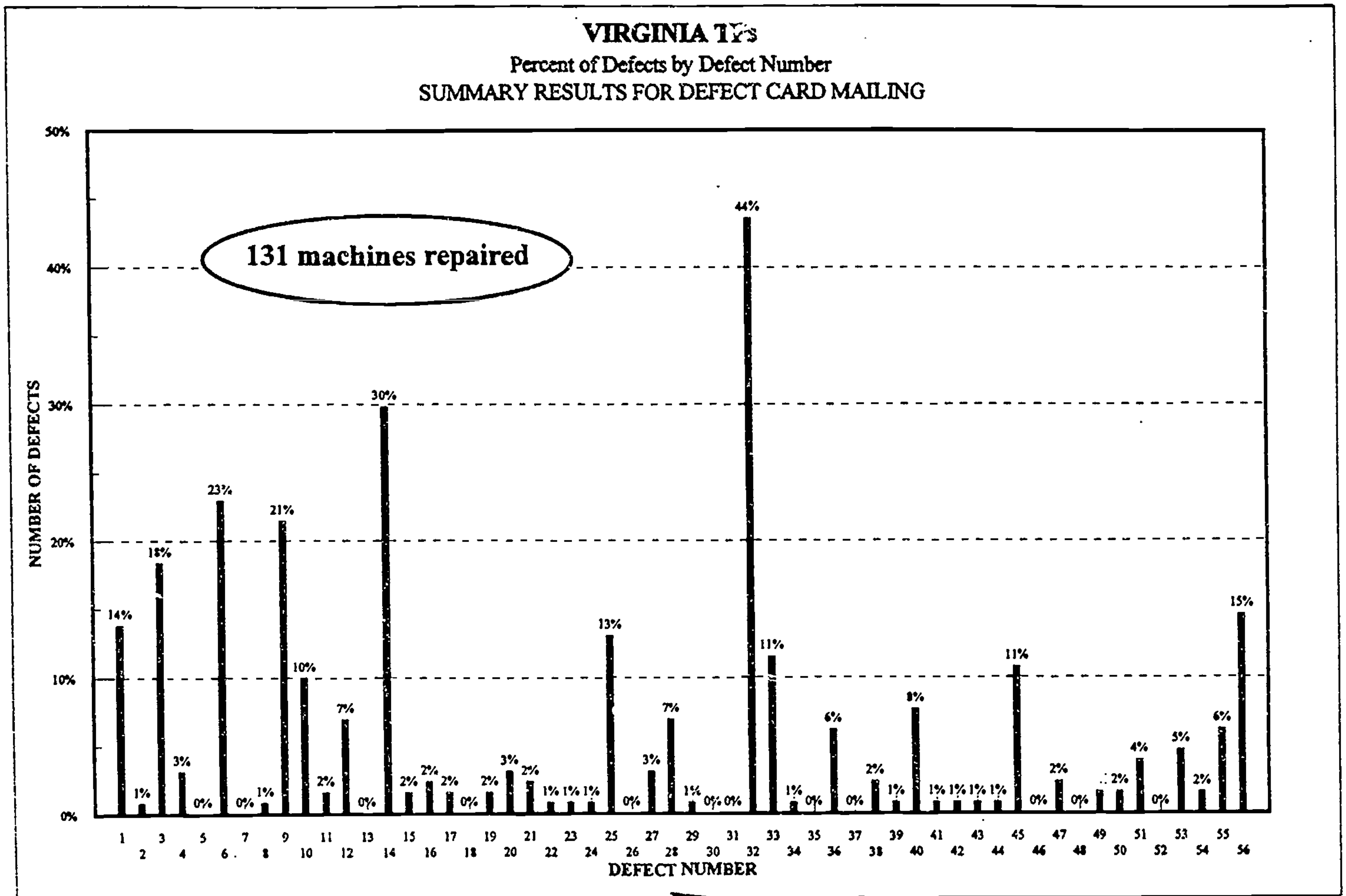
...correspond to these defect numbers

CASSETTE MACHINE DEFECT CARD

Model/Serial Number: C ______ **Repair Group:** ______

(Defects Sorted in Logical/Like Groupings)

1 ☐ Fast frwrd idler	15 ☐ Battery contacts	29 ☐ Tone control	43 ☐ Speaker
2 ☐ Fast frwrd idler arm	16 ☐ Power cord	30 ☐ Track switch	44 ☐ Deck corroded/bent
3 ☐ Rewind idler	17 ☐ Transformer	31 ☐ Speed switch	45 ☐ Loose object
4 ☐ Friction lever	18 ☐ Charging circuit	32 ☐ Head alignment	46 ☐ Internal spill/vermin
5 ☐ Reel assy's	19 ☐ Fuse	33 ☐ Head worn	47 ☐ Case
6 ☐ Reel table tire	20 ☐ EOT mechanism	34 ☐ Head slide	48 ☐ Handle
7 ☐ Rewind spring	21 ☐ Reed switch bd	35 ☐ Tape guide	49 ☐ Key ID plate
8 ☐ Friction lever spring	22 ☐ Wire harness/conntrs	36 ☐ Pressure roller	50 ☐ Switch ID plate
9 ☐ Drive belt	23 ☐ Motor control bd	37 ☐ Flywheel	51 ☐ Knobs
10 ☐ EOT belt	24 ☐ Motor	38 ☐ Capstan bearing	52 ☐ Battery door
11 ☐ Pushbutton assy	25 ☐ Leaf switch	39 ☐ Thrust button	53 ☐ Cassette door
12 ☐ Latch bars	26 ☐ Trim pots	40 ☐ Amplifier board	54 ☐ Rubber feet
13 ☐ Keys scratched/brkn	27 ☐ Var. speed control	41 ☐ Jack panel board	55 ☐ Replace screw/washer
14 ☐ Battery	28 ☐ Volume control	42 ☐ Jacks	56 ☐ NO TROUBLE



...correspond to these defect numbers

These defect numbers...

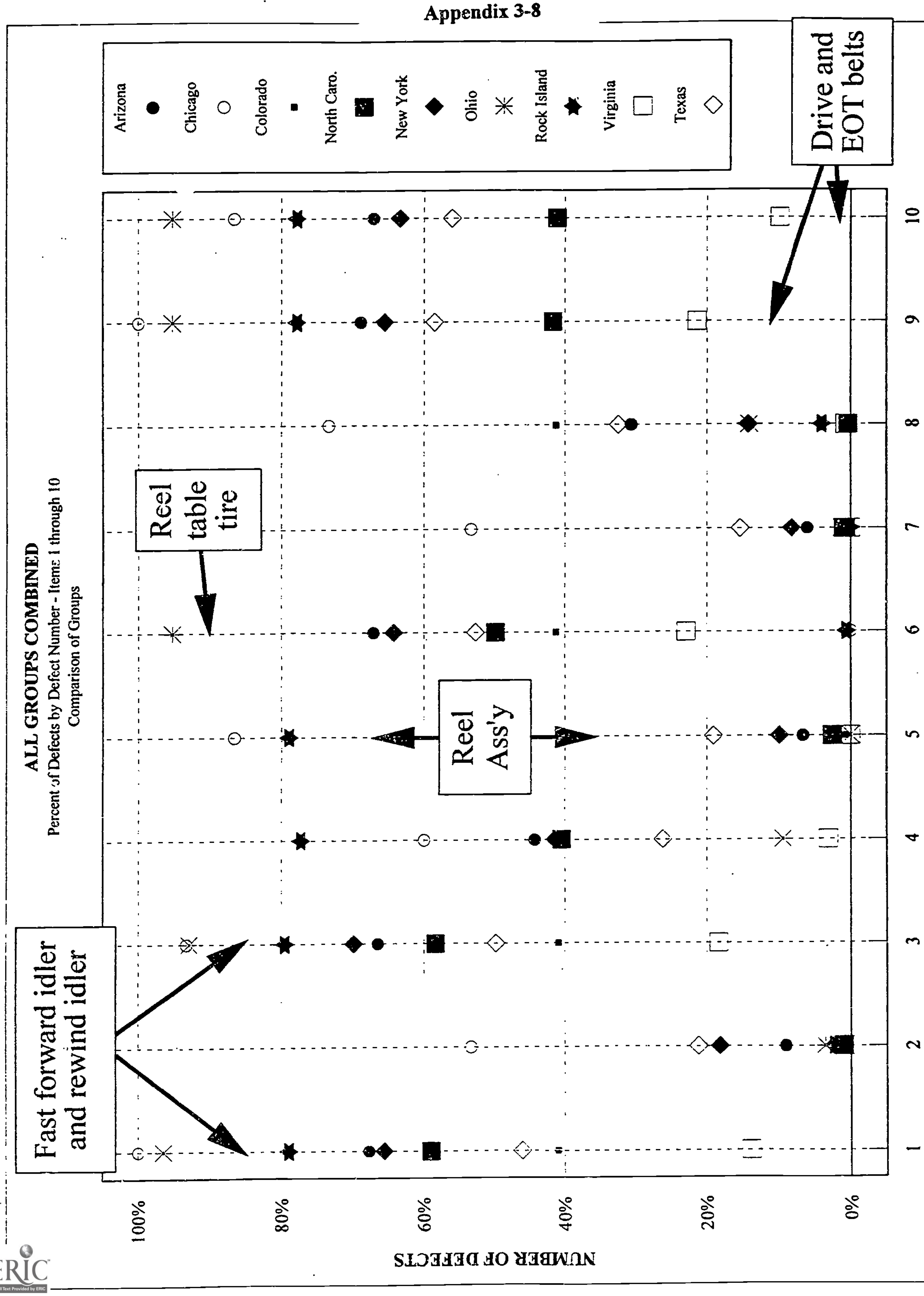
CASSETTE MACHINE DEFECT CARD

Model/Serial Number: C

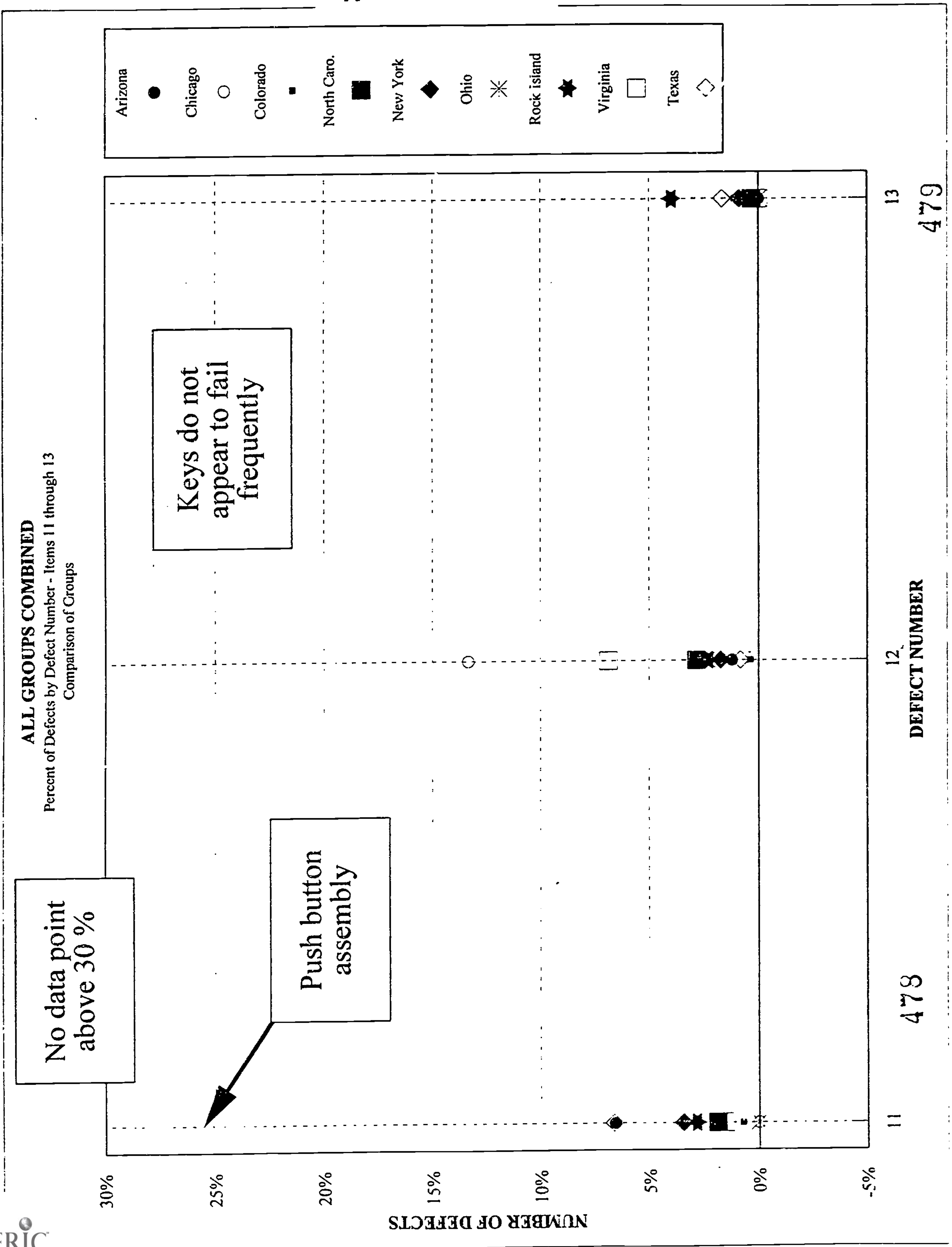
(Defects Sorted in Logical/Like Groupings)

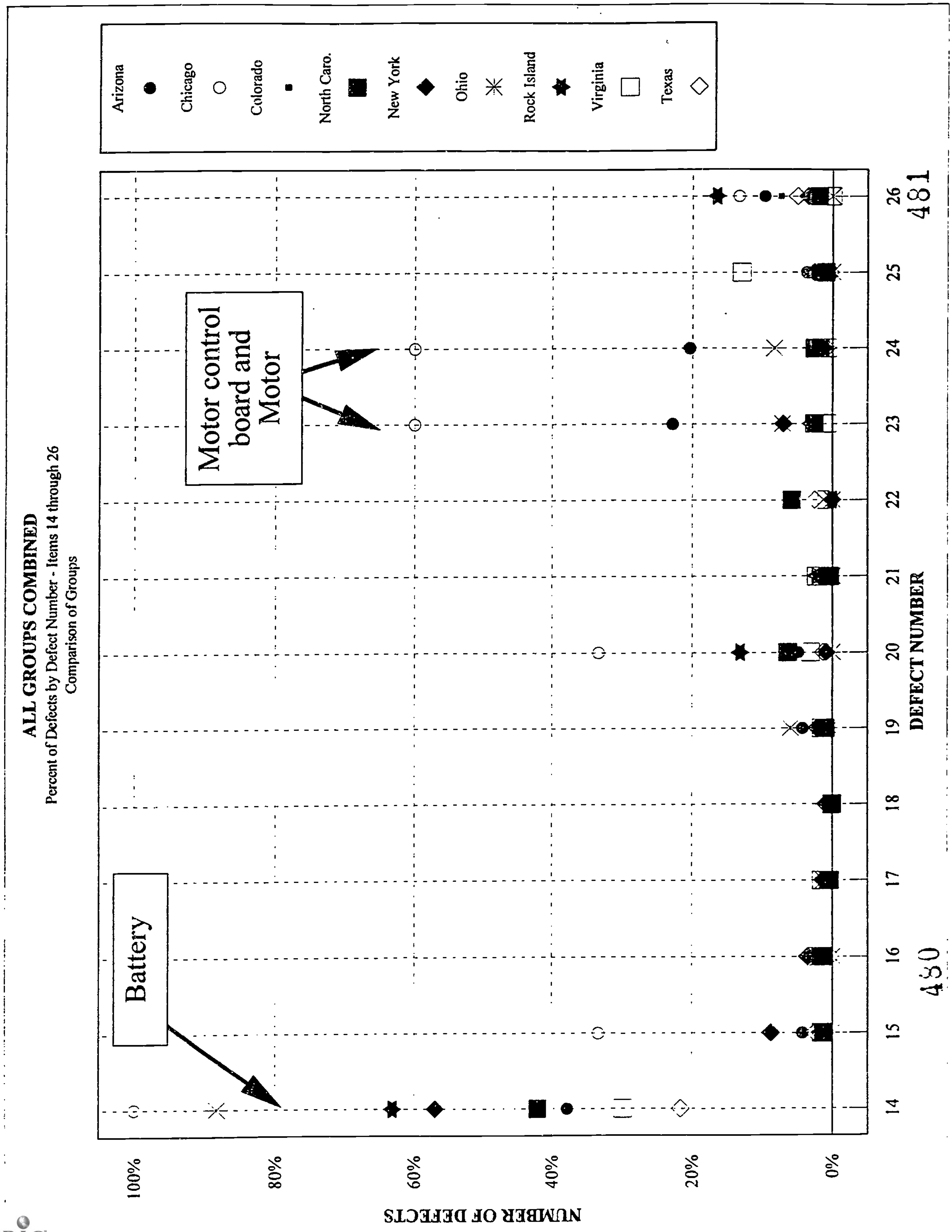
Repair Group:

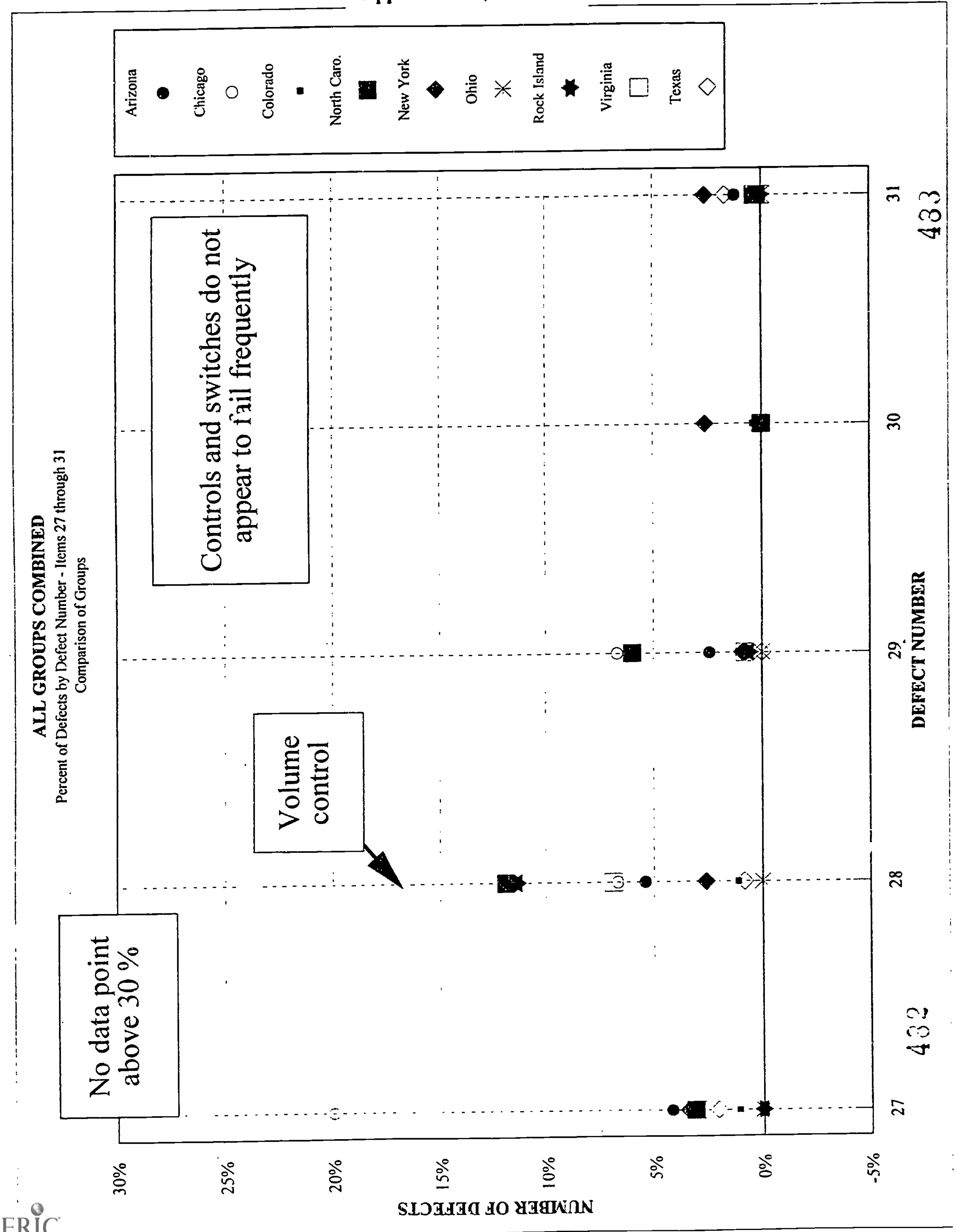
1	Fast frwrd idler	15	Battery contacts	29	Tone control	43	Speaker
2	Fast frwrd idler arm	16	Power cord	30	Track switch	44	Deck corroded/bent
3	Rewind idler	17	Transformer	31	Speed switch	45	Loose object
4	Friction lever	18	Charging circuit	32	Head alignment	46	Internal spill/vermin
5	Reel assy's	19	Fuse	33	Head worn	47	Case
6	Reel table tire	20	EOT mechanism	34	Head slide	48	Handle
7	Rewind spring	21	Reed switch bd	35	Tape guide	49	Key ID plate
8	Friction lever spring	22	Wire harness/conntrs	36	Pressure roller	50	Switch ID plate
9	Drive belt	23	Motor control bd	37	Flywheel	51	Knobs
10	EOT belt	24	Motor	38	Capstan bearing	52	Battery door
11	Pushbutton assy	25	Leaf switch	39	Thrust button	53	Cassette door
12	Latch bars	26	Trim pots	40	Amplifier board	54	Rubber feet
13	Keys scratched/brkn	27	Var. speed control	41	Jack panel board	55	Replace screw/washer
14	Battery	28	Volume control	42	Jacks	56	NO TROUBLE

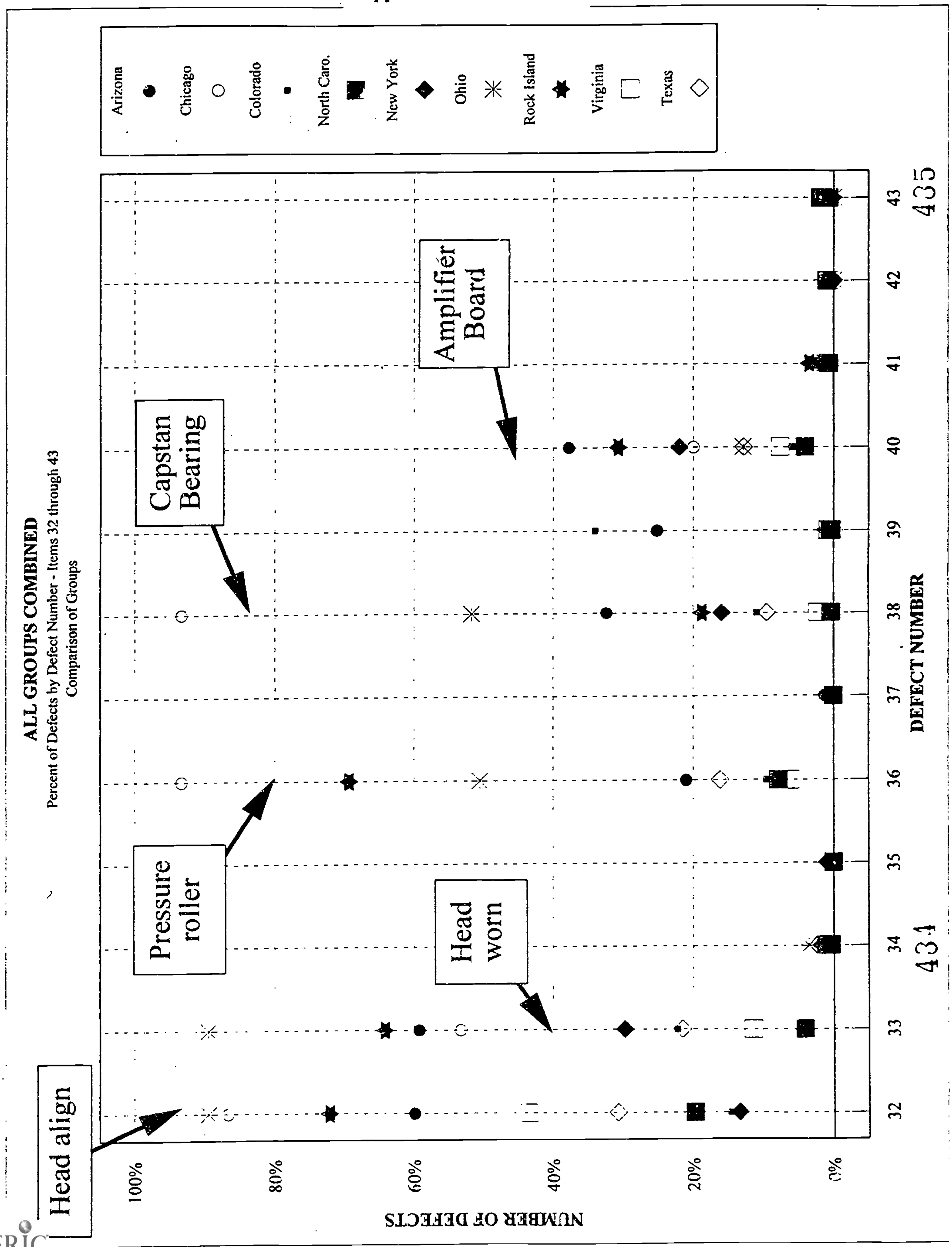

ALL GROUPS COMBINED
Percent of Defects by Defect Number - Items 1 through 10
Comparison of Groups
Arizona
Chicago
Colorado
North Caro.
New York
Ohio
Rock Island
Virginia
Texas
Fast forward idler and rewind idler
Reel Ass'y
Reel table tire
Drive and EOT belts
100%
80%
60%
40%
20%
0%
NUMBER OF DEFECTS
1
2
3
4
5
6
7
8
9
10
DEFECT NUMBER

Appendix 3-8 (Continued)




ALL GROUPS COMBINED
Percent of Defects by Defect Number - Items 14 through 26
Comparison of Groups
Arizona
Chicago
Colorado
North Caro.
New York
Ohio
Rock Island
Virginia
Texas
Battery
Motor control board and Motor
NUMBER OF DEFECTS
100%
80%
60%
40%
20%
0%
DEFECT NUMBER
14
15
16
17
18
19
20
21
22
23
24
25
26

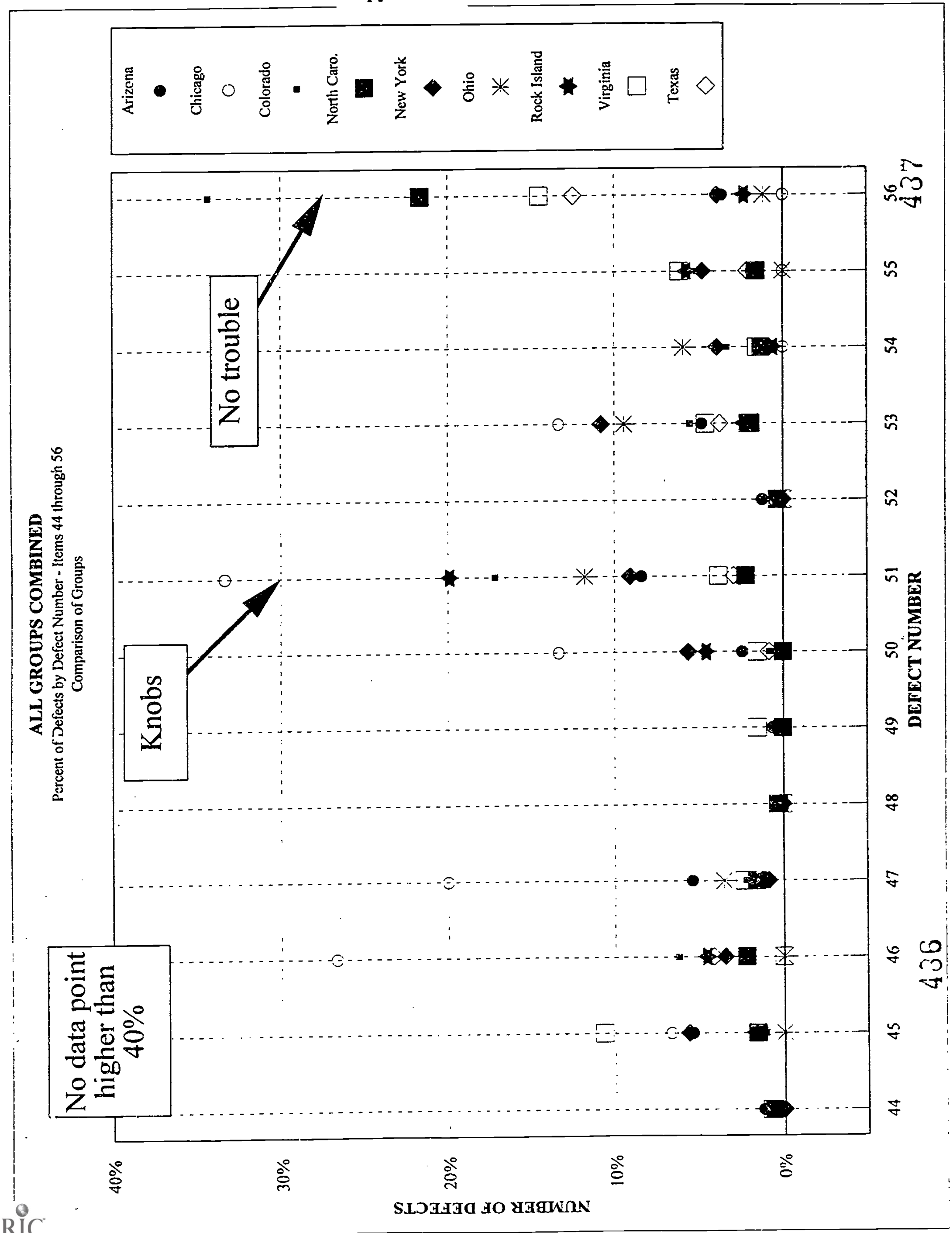

ALL GROUPS COMBINED
Percent of Defects by Defect Number - Items 27 through 31
Comparison of Groups
Arizona
Chicago
Colorado
North Caro.
New York
Ohio
Rock Island
Virginia
Texas
No data point above 30 %
Volume control
Controls and switches do not appear to fail frequently
30%
25%
20%
15%
10%
5%
0%
-5%
NUMBER OF DEFECTS
27
28
29
30
31
DEFECT NUMBER


ALL GROUPS COMBINED
Percent of Defects by Defect Number - Items 32 through 43
Comparison of Groups
Arizona
Chicago
Colorado
North Caro.
New York
Ohio
Rock Island
Virginia
Texas
Head align
Pressure roller
Head worn
Capstan Bearing
Amplifiér Board
100%
80%
60%
40%
20%
0%
NUMBER OF DEFECTS
32
33
34
35
36
37
38
39
40
41
42
43
DEFECT NUMBER

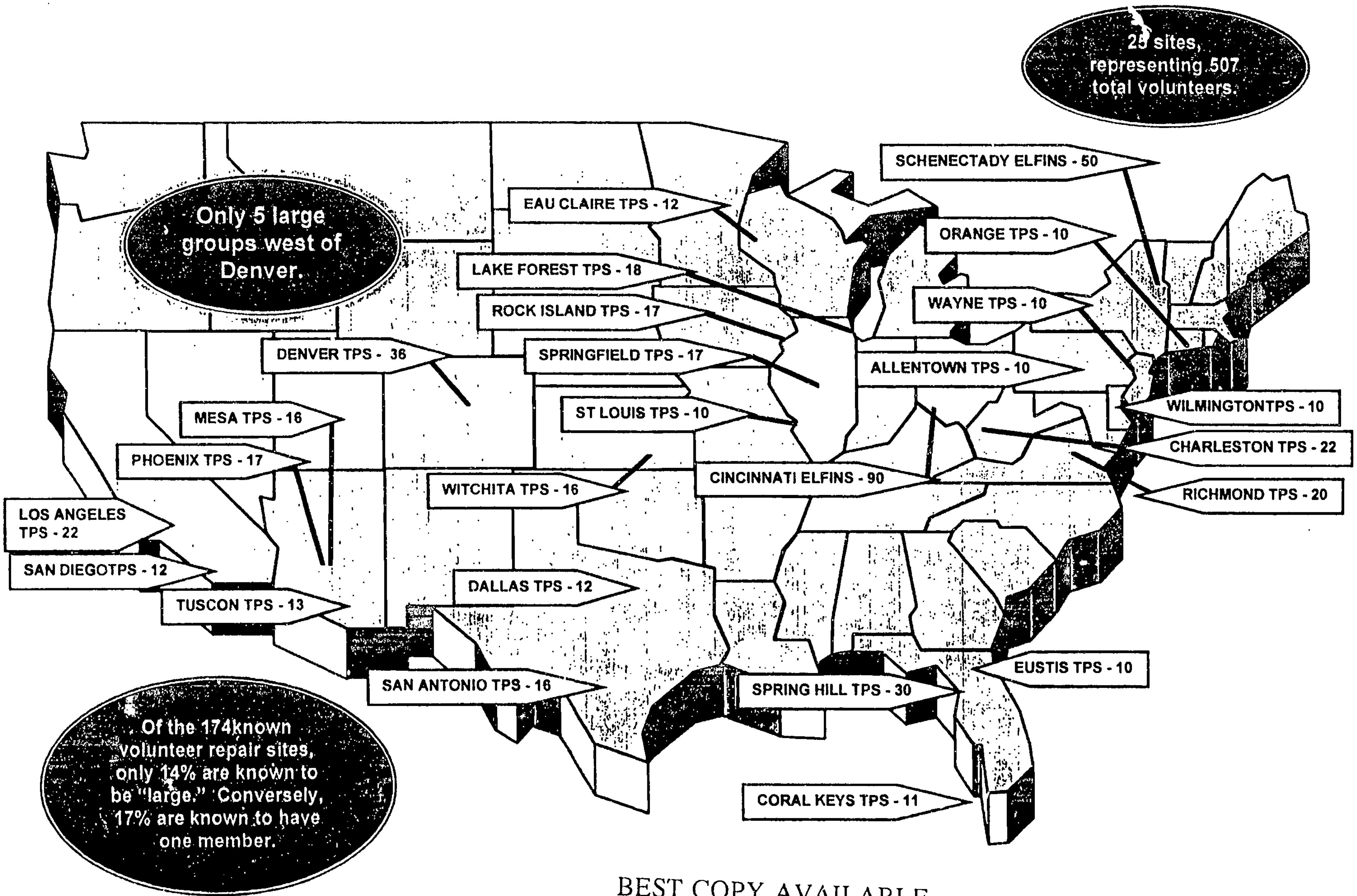
434

435

Appendix 3-8 (Continued)



LOCATION OF KNOWN "LARGE" VOLUNTEER REPAIR SITES (10 OR MORE VOLUNTEERS)



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Appendix 3-10
Repairs Performed Per Thousand Patrons, by MLA

CODE	AGENCY	REPAIRS/ 1000 CIR	REPAIRS/ 1000 RDS
OH6	MSCE	0.0	
UT6	MSCW	0.0	
DC6	NLS	0.0	0.0
ND9	NORTH DAKOTA	3.7	66.0
MA9	MASSACHUSETTS	3.6	67.2
AK9	ALASKA	3.6	83.3
LA9	LOUISIANA	2.6	85.6
DE9	DELAWARE	2.2	111.5
NY9	NEW YORK ALBA.	6.0	133.6
TX9	TEXAS	8.0	138.2
CO9	COLORADO	6.8	156.0
GA9	GEORGIA	5.7	160.1
KY9	KENTUCKY	4.7	164.6
PR9	PUERTO RICO	5.4	165.5
SD9	SOUTH DAKOTA	9.7	170.8
CA9	CALIFORNIA SC	4.3	172.8
NJ9	NEW JERSEY	4.3	176.2
VA9	VIRGINIA	5.0	184.5
OR9	OREGON	4.3	189.5
IA9	IOWA	7.6	191.2
PA8	PENNSYLVANIA PI	6.0	197.5
WA9	WASHINGTON	4.9	199.6
IN9	INDIANA	6.0	205.4
NY8	NEW YORK NY	5.0	211.8
MO9	MISSOURI	6.9	214.1
UT9	UTAH	8.1	241.6
ME9	MAINE	5.6	254.2
OH9	OHIO	5.8	260.8
WI9	WISCONSIN	7.5	280.7
WY9	WYOMING	7.3	282.9
CT9	CONNECTICUT	10.9	283.2
NH9	NEW HAMPSHIRE	6.5	285.4
SC9	SOUTH CAROLINA	8.4	287.0
AR9	ARKANSAS	8.3	293.6
PA9	PENNSYLVANIA PH	10.8	295.0
MD9	MARYLAND	6.9	295.6
RI9	RHODE ISLAND	7.6	298.8
NE9	NEBRASKA	6.9	299.4
CA8	CALIFORNIA LA	8.8	304.6
OK9	OKLAHOMA	7.6	305.7
MS9	MISSISSIPPI	8.2	320.3
MI9	MICHIGAN LANS.	11.3	327.5
AL9	ALABAMA	10.9	334.3
MT9	MONTANA	7.3	337.2
NC9	NORTH CAROLINA	9.5	340.4
MI8	MICHIGAN WAYNE	11.7	341.7
KS9	KANSAS	12.8	373.0
IL9	ILLINOIS	11.2	374.7
TN9	TENNESSEE	8.4	380.1
FL9	FLORIDA	11.5	387.1
AZ9	ARIZONA	12.4	401.2
VT9	VERMONT	7.8	402.5
ID9	IDAHO	9.0	435.9
NV9	NEVADA	9.0	457.3
WV9	WEST VIRGINIA	15.5	485.2
MN9	MINNESOTA	17.2	504.0
NM9	NEW MEXICO	21.9	514.5
DC9	DIST. OF COL.	29.4	567.8
HI9	HAWAII	21.6	657.5
VI9	VIRGIN ISLANDS	43.2	885.5
	TOTAL	9	285.2
		(AVERAGE	AVERAGE

Appendix 3-11

Cassette Machine Repair Statistics for June 1993

Agency Code	Agency or Library	# Out of Service	% Out of Service	Available	Net Inventory	Backlog in Months	FY 92 Repairs
AK9	Alaska	44	4.3%	283	1,012	6	85
AL9	Alabama	442	6.2%	207	7,145	3	1,792
AR9	Arkansas	93	2.2%	430	4,262	1	1,325
AZ9	Arizona	478	5.0%	1,300	9,599	1	5,096
CA8	CA, Los Angeles	885	3.9%	148	22,970	2	5,444
CA9	CA, Sacramento	1,694	9.3%	90	18,129	7	3,069
CO9	Colorado	119	1.7%	277	6,950	1	1,604
CT9	Connecticut	0	0.0%	314	6,880	0	2,185
DC9	Washington, DC	0	0.0%	284	2,303	0	1,289
DE9	Delaware	24	1.8%	210	1,349	2	137
FL9	Florida	1,211	3.1%	2,876	39,612	1	13,680
GA9	Georgia	461	4.2%	509	11,051	2	2,464
HI9	Hawaii	58	5.3%	186	1,102	1	595
IA9	Iowa	1,238	14.9%	521	8,295	10	1,521
ID9	Idaho	214	7.8%	125	2,755	2	1,081
IL9	Illinois	796	3.9%	800	20,241	1	9,439
IN9	Indiana	649	6.7%	338	9,671	4	2,150
KS9	Kansas	245	4.6%	523	5,358	1	3,126
KY9	Kentucky	860	12.4%	706	6,963	10	1,013
LA9	Louisiana	94	1.8%	67	5,144	3	345
MA9	Massachusetts	252	1.9%	336	13,253	3	1,058
MD9	Maryland	1,013	14.3%	798	7,104	6	1,889
ME9	Maine	45	1.3%	948	3,395	1	685
MI8	MI, Wayne	71	2.5%	61	2,835	1	942
MI9	MI, Lansing	406	2.8%	2,355	14,428	1	5,730
MN9	Minnesota	903	9.5%	129	9,540	3	4,282
MO9	Missouri	542	4.5%	1,857	12,083	3	2,523
MS9	Mississippi	491	18.1%	240	2,711	8	738
MT9	Montana	35	1.1%	559	3,070	0	926
NC9	N. Carolina	1	0.0%	192	8,915	0	2,649
ND9	N. Dakota	309	11.8%	131	2,617	27	138
NE9	Nebraska	73	1.7%	766	4,270	1	1,307
NH9	New Hampshire	364	16.2%	232	2,242	7	597
NJ9	New Jersey	773	7.4%	386	10,497	6	1,614
NM9	New Mexico	211	6.4%	198	3,312	2	1,680
NV9	Nevada	32	2.1%	62	1,547	1	697
NY8	NY, NYC	1,045	5.2%	614	20,043	4	2,961
NY9	NY, Albany	1,052	4.5%	1,606	23,270	4	3,380
OH9	Ohio	2,493	11.4%	3,984	21,868	6	5,246
OK9	Oklahoma	0	0.0%	341	4,740	0	1,624
OR9	Oregon	392	5.1%	683	7,654	4	1,313
PA8	PA, Pittsburgh	0	0.0%	538	6,929	0	1,773
PA9	PA, Philadelphia	931	7.1%	1,700	13,169	3	3,544
PR9	Puerto Rico	171	13.5%	21	1,268	10	197
RI9	Rhode Island	54	2.9%	292	1,878	1	496
SC9	S. Carolina	410	5.5%	863	7,456	2	1,994
SD9	S. Dakota	447	11.1%	932	4,045	9	610
TN9	Tennessee	93	1.1%	272	8,844	1	2,017
TX9	Texas	438	2.2%	898	20,089	1	4,040
UT9	Utah	74	1.2%	933	6,283	1	1,173
VA9	Virginia	604	7.3%	601	8,269	4	1,620
VI9	Virgin Islands	25	10.6%	35	235	2	147
VT9	Vermont	128	6.4%	150	2,008	3	586
WA9	Washington	0	ERR	0	0	0	1,910
WI9	Wisconsin	423	5.0%	1,052	8,427	3	1,690
WV9	West Virginia	56	1.6%	8	3,477	0	1,798
'9	Wyoming	16	1.2%	260	1,348	1	327

National Figures

National AVG Backlog (months)
2.33

FY 92 Annual No. of Repairs
126,020

C-1 & C-79 CBM Total Inventory
463,910

% Out of Service
5.17%

Out of Service
23,978

Available
34,607

IMPORTANT NOTE:

Data reporting methods have been changed this year.

Obsolete machines are now no longer included in any category.

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Appendix 3-12

Variation of Required Machine Inventory with Number of Sites

1. Assumptions: Existing National IOH = 65,322 CBMs
   50% Safety Stock, 50% Working Stock
   Average Safety Stock per Distributed Site = 65,322/2/57 = 573
   Average Working Stock per Distributed Site = 65,322/2/57 = 573

2. Required National Inventory if Consolidated at One Site

   $573 \times 57 + 573 \times 57^{1/2} = \underline{36{,}987 \text{ CBMs}}$

3. Net Reduction in Regional Inventory = 28,300 CBMs

Appendix 3-13

Variation of Required Parts Inventory at Repair Sites with Number of Sites

Assumptions: Annual Parts Consumption, National = \$2,000,000
Average Safety Stock Target = 6 months supply
Average Working Stock Target = 6 months supply
Current Estimated Number of Repair Sites = 400
Current Number of MLAs = 57

(1.) Current Scenario, 400 Sites
Average Safety Stock Per Distributed Site = \$1,000,000/400 = \$2,500
Average Working Stock Per Distributed Site = \$1,000,000/400 = \$2,500
Total National Requirement = 2,500x400 + 2,500x400 = <u>\$2,000,000</u>

(2.) Alternative #1, 57 Repair Sites
Average Consolidation = 400/57 = 7 distributed sites/consolidated site
Total National Requirement = \$2,500 x (400/57) x 57 + \$2,500 x $7^{1/2}$ x 57 = <u>\$1,377,000</u>

(3.) Alternative #2, 1 Repair Site
Average Consolidation = 400/1 = 400 distributed sites/consolidated site
Total National Requirement = \$2,500 x (400/1) x 1 + (\$2,500 x $400^{1/2}$) x 1 = <u>\$1,050,000</u>

Appendix 3-14
BPHICS TRANSACTION & STATUS CODES

TRANSACTION CODES		
CODE	SYSTEM CODE *	DEFINITION
AMC	A11	Acquisition of a machine by a lending agency, MSC or NLS from the manufacturer.
ALM	A21	Add a machine to an agency's inventory that has been deleted or otherwise removed from the BPHICS database.
CST	C11	Change the status of an inventory record. Used to change the status to CO.
COR	C21	Correct the status of an inventory record. Used to change the status to SL or RL.
CDN	C31	Change the document number of an inventory record.
CLA	J12	Transfer to or from another lending agency. Status codes of SL or RL are used with this transaction.
DPA	L11	Delete an entire inventory record.

STATUS CODES		
CODE	SYSTEM CODE *	DEFINITION
SM	11	Sent by manufacturer to a lending agency.
LM **	21	Lost en route from manufacturer to lending agency.
RM **	31	Received by agency from manufacturer.
SL	41	Sent from a lending agency to another lending agency.
LL **	51	Lost, stolen or misplaced while being transferred.
RL	61	Received by a lending agency from a lending agency via transfer.
CO	71	A lending agency has confirmed that they have the machine.

(bph_trcd.wk1)

* System Code - Codes used to instruct computer program to perform a particular function.
** Current methods of operation eliminate the need for these codes. Codes not being used.

Appendix 3-15

EXAMPLE BPHICS AUDIT REPORT

1 BPHICS AUDIT REPORT DATE: 08/11/9
RECONCILIATION & MATCH RESULTS FOR VA9 PAGE:
0THE FOLLOWING MACHINES WERE REFLECTED IN YOUR INVENTORY AND THE
BPHICS MASTER FILE.

0	A1 00000130	A1 00000417	A1 00000456	A1 00000461	A1 00000469
0	A1 00000600	A1 00000618	A1 00000624	A1 00000638	A1 00000642
0	A1 00000658	A1 00000663	A1 00000685	A1 00000695	A1 00000727
0	A1 00000756	A1 00000810	A1 00000812	A1 00000815	A1 00000817
0	A1 00000824	A1 00000829	A1 00000839	A1 00000849	A1 00000855
0	A1 00000857	A1 00000859	A1 00000860	A1 00000861	A1 00000863
0	A1 00000866	A1 00000867	A1 00000868	A1 00000869	A1 00000873
0	A1 00000875	A1 00000878	A1 00000880	A1 00000884	A1 00000886
0	A1 00000896	A1 00000924	A1 00000937	A1 00000966	A1 00000968
0	A1 00000974	A1 00000976	A1 00001007	A1 00001022	A1 00001027
0	A1 00001041	A1 00001048	A1 00001051	A1 00001058	A1 00001059
0	A1 00001061	A1 00001064	A1 00001076	A1 00001082	A1 00001091
0	A1 00001097	A1 00001102	A1 00001106	A1 00001108	A1 00001109
0	A1 00001115	A1 00001117	A1 00001118	A1 00001119	A1 00001122
0	A1 00001123	A1 00001848	A1 00001858	A1 00001872	A1 00001912
0	A1 00001942	A1 00002115	A1 00002400	A1 00002492	A1 00002513
0	A1 00002619	A1 00002641	A1 00002664	A1 00002667	A1 00002693
0	A1 00002702	A1 00002711	A1 00002719	A1 00002733	A1 00002734
0	A1 00002819	A1 00003856	A1 00003861	A1 00004613	A1 00004710
0	A1 00005768	A1 00005796	A1 00005797	A1 00005804	A1 00005808
0	A1 00005823	A1 00005828	A1 00005884	A1 00005889	A1 00005896
0	A1 00005898	A1 00005901	A1 00005910	A1 00005949	A1 00005989
0	A1 00006047	A1 00006304	A1 00006316	A1 00006433	A1 00006446
0	A1 00006543	A1 00006636	A1 00006640	A1 00006641	A1 00006687
0	A1 00006696	A1 00006760	A1 00006771	A1 00006790	A1 00006839
0	A1 00006852	A1 00006861	A1 00006867	A1 00006868	A1 00006885
0	A1 00006897	A1 00006931	A1 00006940	A1 00006943	A1 00006946
0	A1 00006962	A1 00006965	A1 00006966	A1 00006969	A1 00006970
0	A1 00006973	A1 00006989	A1 00007003	A1 00007013	A1 00007018

1 BPHICS AUDIT REPORT DATE: 08/11/9
RECONCILIATION & MATCH RESULTS FOR VA9 PAGE:
0THE FOLLOWING MACHINES WERE REFLECTED IN YOUR INVENTORY AND THE
BPHICS MASTER FILE.

0	A1 00007022	A1 00007028	A1 00007225	A1 00007278	A1 00007303
0	A1 00007304	A1 00007308	A1 00007317	A1 00007326	A1 00007327
0	A1 00007331	A1 00007361	A1 00007366	A1 00007378	A1 00007426
0	A1 00007428	A1 00007433	A1 00007456	A1 00007458	A1 00007460
0	A1 00007466	A1 00007537	A1 00007575	A1 00007583	A1 00007604
0	A1 00007605	A1 00007614	A1 00007621	A1 00007643	A1 00007678
0	A1 00007683	A1 00007705	A1 00007725	A1 00007729	A1 00007802
0	A1 00007841	A1 00007888	A1 00007914	A1 00007931	A1 00008090
0	A1 00008103	A1 00008578	A1 00008586	A1 00008649	A1 00008657
0	A1 00008687	A1 00008691	A1 00008695	A1 00008707	A1 00008726
0	A1 00008727	A1 00008816	A1 00008825	A1 00009022	A1 00009548
0	A1 00010305	A1 00010320	A1 00010351	A1 00010353	A1 00010360
0	A1 00010434	A1 00010439	A1 00010441	A1 00010465	A1 00010505
0	A1 00010507	A1 00010508	A1 00010519	A1 00010536	A1 00010538
0	A1 00010543	A1 00010730	A1 00010731	A1 00010784	A1 00016744
0	A1 00017022	A1 00017024	A1 00017026	A1 00017035	A1 00017037
0	A1 00017039	A1 00017047	A1 00017051	A1 00017063	A1 00017091
0	A1 00017095	A1 00017097	A1 00017106	A1 00017108	A1 00017112
0	A1 00017117	A1 00017124	A1 00017145	A1 00017158	A1 00017175
0	A1 00017180	A1 00017181	A1 00017182	A1 00017188	A1 00017191
0	A1 00017194	A1 00017196	A1 00017200	A1 00017383	A1 00017418
0	A1 00017654	A1 00017665	A1 00017719	A1 00017740	A1 00017773
0	A1 00017829	A1 00017886	A1 00017933	A1 00017938	A1 00017974
0	A1 00017981	A1 00017983	A7800000966	A7800001525	A7800002976

Appendix 3-16

BPHICS MONTHLY MACHINE REPORT LOG RECAP

(% of MMRs Received from Agencies by Month)

Agency	Code	OCT 93	NOV93	DEC 93	JAN 94	FEB 94	MAR 94	APR 94	MAY 94	JUN 94	JUL 94	AUG 94	SEP 94	TOTAL	% PARTIC
Anchorage, AK	AK9	1	1	1	1	1	1	1	1	1	1	1	1	12	100%
Montgomery, AL	AL9	1	1	1	1	1	1	1	1	1	1	1	1	12	100%
Little Rock, AR	AR9	1	1	1	1	1	1	1	1	1	1	1	1	12	100%
Phoenix, AZ	AZ9	1	1	1	1	1	1	1	1	1	1	1	1	12	100%
Los Angeles, CA	CA8	1	1	1	1	1	1	1	1	1	1	1	1	12	100%
Sacramento, CA	CA9		1	1	1	1	1	1	1	1	1	1	1	11	92%
Denver, CO	CO9				1		1	1	1	1	1	1		7	58%
Rocky Hill, CT	CT9								1	1	1	1	1	5	42%
NLS *	DC6													0	0%
Washington, DC	DC9	1	1	1	1	1		1	1	1	1	1	1	12	100%
Dover, DE	DE9	1	1	1	1	1	1	1	1	1	1	1	1	12	100%
Daytona Beach, FL	FL9		1	1	1	1	1	1	1	1	1	1	1	11	92%
Atlanta, GA	GA9	1	1	1	1	1	1	1	1	1		1	1	11	92%
Honolulu, HI	HI9		1		1	1	1	1	1	1	1	1	1	10	83%
Des Moines, IA	IA9	1		1	1		1		1	1	1	1	1	9	75%
Boise, ID	ID9	1	1	1	1	1	1	1	1	1	1	1	1	12	100%
Chicago, IL	IL9	1	1	1		1	1	1	1	1	1	1	1	11	92%
Indianapolis, IN	IN9				1		1		1	1	1	1	1	7	58%
Emporia, KS	KS9	1	1	1	1	1	1	1	1	1	1	1	1	12	100%
Frankfort, KY	KY9	1	1	1	1	1	1	1	1	1	1	1		11	92%
Baton Rouge, LA	LA9	1	1	1	1	1	1	1	1	1	1	1	1	12	100%
Watertown, MA	MA9	1	1	1	1	1	1	1	1	1	1	1	1	12	100%
Baltimore, MD	MD9	1	1	1	1	1	1			1	1	1	1	10	83%
Augusta, ME	ME9	1	1	1	1	1	1	1	1		1	1	1	11	92%
Wayne ,MI	MI8	1	1	1	1	1	1	1	1	1	1	1	1	12	100%
Lansing, MI	MI9	1	1	1	1	1		1	1	1	1	1	1	11	92%
St Paul, MN	MN9				1	.	1					1	1	4	33%
Jefferson City, MO	MO9	1	1		1	1	1	1	1	1	1	1	1	11	92%
Jackson, MS	MS9	1	1	1	1	1	1	1	1	1	1	1	1	12	100%
Helena, MT	MT9	1	1	1	1	1	1	1	1	1	1	1	1	12	100%
Raleigh, NC	NC9	1	1		1	1	1	1	1	1	1	1	1	11	92%
Grand Forks, ND	ND9	1	1	1	1	1	1	1	1		1	1	1	11	92%

Appendix 3-16 (Continued)

BPHICS MONTHLY MACHINE REPORT LOG RECAP

(% of MMRs Received from Agencies by Month)

Agency	Code	OCT 93	NOV93	DEC 93	JAN 94	FEB 94	MAR 94	APR 94	MAY 94	JUN 94	JUL 94	AUG 94	SEP 94	TOTAL	% PARTIC
Lincoln, NE	NE9	1		1	1	1	1	1	1	1	1	1	1	11	92%
Concord, NH	NH9	1	1	1	1	1	1	1	1	1	1	1	1	12	100%
Trenton, NJ	NJ9	1	1	1	1	1	1	1	1	1	1	1	1	12	100%
Santa Fe, NM	NM9	1	1	1	1	1	1	1	1	1	1	1	1	12	100%
Carson City, NV	NV9	1	1	1		1	1	1	1	1	1	1	1	11	92%
New York, NY	NY8		1	1	1	1	1	1	1	1	1	1	1	11	92%
Albany, NY	NY9	1	1		1	1	1	1	1	1	1	1	1	11	92%
MSCE	OH6	1	1	1	1	1	1	1	1	1	1	1	1	12	100%
Columbus, OH	OH9	1	1	1	1	1	1		1	1	1	1	1	11	92%
Oklahoma City, OK	OK9		1	1	1	1		1	1	1	1		1	9	75%
Salem, OR	OR9		1	1	1	1	1	1	1	1	1	1	1	11	92%
Pittsburgh, PA	PA8	1	1	1	1	1	1	1	1	1	1	1	1	12	100%
Philadelphia, PA	PA9						1			1	1	1	1	5	42%
Puerto Rico	PR9					1	1	1	1	1	1	1	1	8	67%
Providence, RI	RI9	1	1	1	1	1	1	1	1	1	1	1	1	12	100%
Columbia, SC	SC9	1	1	1	1	1	1	1	1	1	1	1	1	12	100%
Pierre, SD	SD9	1	1	1	1	1	1	1	1	1	1	1	1	12	100%
Nashville, TN	TN9	1	1	1	1	1	1	1	1	1	1	1	1	12	100%
Austin, TX	TX9	1	1	1	1			1	1	1	1	1	1	10	83%
MSCW	UT6	1	1	1	1	1	1	1	1	1	1	1		11	92%
Salt Lake City, UT	UT9	1	1	1	1	1	1	1	1	1	1	1	1	12	100%
Richmond, VA	VA9	1	1		1	1	1	1	1	1		1	1	10	83%
Virgin Islands	VI9	1	1	1	1	1	1		1	1	1	1	1	11	92%
Montpelier, VT	VT9			1			1			1		1	1	5	42%
Seattle, WA	WA9				1	1	1	1	1	1	1	1	1	9	75%
Milwaukee, WI	WI9	1	1			1	1	1	1	1	1	1	1	10	83%
Charleston, WV	WV9	1	1	1	1	1	1	1	1	1	1	1	1	12	100%
Cheyenne, WY	WY9	1		1	1	1	1	1	1	1	1	1	1	11	92%
TOTAL	60	45	48	46	52	51	55	50	55	56	55	58	56	52	
Participating % *		76%	81%	78%	88%	86%	93%	85%	93%	95%	93%	98%	95%	89%	AVG

* Based on 59 Participating Agencies

(mmr_rec.wk4)

Appendix 3-17

Comparison of MMR and BPHICS Inventories

End of FY93

MODEL	REPORTED IN MMR END FY93	REPORTED "TOTAL" IN BPHICS END FY93	REPORTED "XX1" IN BPHICS END FY93	CALCULATED "NET" IN BPHICS END FY93	DIFFERENCE MMR - BPHICS END FY93	PERCENT BPHICS GREATER END FY93
A2						
A1	20,401	18,596	586	18,010	2,391	-11.7%
A80	55,550	71,728	15,328	56,400	(850)	1.5%
A79	39,388	60,687	16,062	44,625	(5,237)	13.3%
A78	34,104	63,898	18,242	45,656	(11,552)	33.9%
TOTALA	149,443	214,909	50,218	164,691	(15,248)	10.2%
CT1	9,974	10,458	63	10,395	(421)	4.2%
E1	34,066	39,878	2,244	37,634	(3,568)	10.5%
C2		4		4	(4)	N/A
C1	429,199	490,408	63,824	426,584	2,615	-0.6%
C80	7,015	22,523	5,642	16,881	(9,866)	140.6%
C79	49,856	85,493	27,763	57,730	(7,874)	15.8%
C78	21,189	54,968	19,470	35,498	(14,309)	67.5%
C77	5,795	32,814	12,522	20,292	(14,497)	250.2%
TOTALC	557,094	736,546	131,528	605,018	(47,924)	8.6%
GRAND TOTAL	706,537	951,455	181,746	769,709	(63,172)	8.9%

NOTE: MODELS NOT REPORTED IN BPHICS ARE NOT INCLUDED IN COMPARISION.
THESE MODELS INCLUDE A74s-A77s, ACCESSORIES AND C76s.

COMPARISON OF COSTS BETWEEN THE THREE REPAIR SCENARIOS
Includes Cost Estimate for Machine Replacement

Scenario	Item	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Ten Year Totals
Replace broken machines with new machines		$13,600,000	$14,144,000	$14,709,760	$15.298,150	$15,910,076	$16,546,479	$17,208,339	$17,896,672	$18,612,539	$19,357,041	$163,283,057
Decentralized	Salaries	$348,000	$361,920	$376,397	$391,453	$407,111	$423,395	$440,331	$457,944	$476,262	$495,313	$4,178,125
	Travel	$522,720	$543,629	$565,374	$587,989	$611,508	$635,969	$661,408	$687,864	$715,378	$743,994	$6,275,832
	Equipment	$96,000	$99,840	$103,834	$0	$0	$0	$0	$0	$0	$0	$299,674
	Telex Trip	$100,040	$104,042	$108,203	$112,531	$117,033	$121,714	$126,583	$131,646	$136,912	$142,388	$1,201,091
	Overhead	$28,400	$29,536	$30,717	$31,946	$33,224	$34,553	$35,935	$37,372	$38,867	$40,422	$340,973
	Total	$1,095,160	$1,138,966	$1,184,525	$1,123,919	$1,168,876	$1,215,631	$1,264,256	$1,314,826	$1,367,419	$1,422,116	$12,295,696
Regionalized	Salaries	$137,000	$142,480	$148,179	$154,106	$160,271	$166,681	$173,349	$180,283	$187,494	$194,994	$1,644,837
	Travel	$45,600	$47,424	$49,321	$51,294	$53,346	$55,479	$57,699	$60,006	$62,407	$64,903	$547,478
	Equipment	$40,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$40,000
	Telex Trip	$13.700	$14,248	$14,818	$15,411	$16,027	$16,668	$17,335	$18,028	$18,749	$19,499	$164,484
	Overhead	$13,700	$14,248	$14,818	$15,411	$16,027	$16,668	$17,335	$18,028	$18,749	$19,499	$164,484
	Total	$250,000	$218,400	$227,136	$236,221	$245,670	$255,497	$265,717	$276,346	$287,400	$298,895	$2,561,282
Centralized	Facility	$523,600	$0	$0	$0	$0	$0	$0	$0	$0	$0	$523,600
	Salaries	$1,817,390	$1,890,086	$1,965,689	$2,044,317	$2,126,089	$2,211,133	$2,299,578	$2,391,561	$2,487,224	$2,586,713	$21,819,779
	Equipment	$598,940	$0	$0	$0	$0	$0	$0	$0	$0	$0	$598,940
	NLS QC	$40,000	$41,600	$43,264	$44,995	$46,794	$48,666	$50,613	$52,637	$54,743	$56,932	$480,244
	Occupancy	$26,200	$27,248	$28,338	$29,471	$30,650	$31,876	$33,151	$34,477	$35,857	$37,291	$314,560
	Total	$3,006,130	$1,958,934	$2,037,291	$2,118,783	$2,203,534	$2,291,675	$2,383,342	$2,478,676	$2,577,823	$2,680,936	$23,737,123

COMPARISON OF SAVINGS BETWEEN THE THREE REPAIR SCENARIOS

SCENARIO	ITEM	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10	TEN YEAR TOTALS
DECENTRALIZED	E-1 REPAIR	$64,000	$66,560	$69,222	$71,991	$74,871	$77,866	$80,980	$84,220	$87,588	$91,092	$768,391
	CT-1 REPAIR	$25,000	$26,000	$27,040	$28,122	$29,246	$30,416	$31,633	$32,898	$34,214	$35,583	$300,153
	CINTREX ELIMINATION	$91,000	$94,640	$98,426	$102,363	$106,457	$110,715	$115,144	$119,750	$124,540	$129,521	$1,092,556
	ELIMINATION OF QC AT CINTREX	$10,000	$10,400	$10,816	$11,249	$11,699	$12,167	$12,653	$13,159	$13,686	$14,233	$120,061
	INCREASED AVAIL. OF INV. DUE TO REP. IMPACT ON W. INV.	$3,450,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$3,450,000
	TOTAL	$3,640,000	$197,600	$205,504	$213,724	$222,273	$231,164	$240,411	$250,027	$260,028	$270,429	$5,731,160
REGIONALIZED	PARTS CONSOLIDATION AT 20 LOCATIONS, NOT 200-300	$775,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$775,000
	E-1 REPAIR	$64,000	$66,560	$69,222	$71,991	$74,871	$77,866	$80,980	$84,220	$87,588	$91,092	$768,391
	CT-1 REPAIR	$25,000	$26,000	$27,040	$28,122	$29,246	$30,416	$31,633	$32,898	$34,214	$35,583	$300,153
	CINTREX ELIMINATION	$91,000	$94,640	$98,426	$102,363	$106,457	$110,715	$115,144	$119,750	$124,540	$129,521	$1,092,556
	ELIMINATION OF QC AT CINTREX	$10,000	$10,400	$10,816	$11,249	$11,699	$12,167	$12,653	$13,159	$13,686	$14,233	$120,061
	INCREASED AVAIL. OF INV. DUE TO REP. IMPACT ON W. INV.	$3,450,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$3,450,000
	TOTAL	$4,415,000	$197,600	$205,504	$213,724	$222,273	$231,164	$240,411	$250,027	$260,028	$270,429	$6,506,160
CENTRALIZED	VALUE OF IN-HOUSE REPAIR LABOR	$250,000	$260,000	$270,400	$281,216	$292,465	$304,163	$316,330	$328,983	$342,142	$355,828	$3,001,527
	PARTS CONSOLIDATION AT 1 LOCATION NOT 200-300	$950,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$950,000
	MSC EQUIPMENT OPERATIONS ELIMIN ON	$100,000	$104,000	$108,160	$112,486	$116,986	$121,665	$126,532	$131,593	$136,857	$142,331	$1,200,611
	LANDOVER OPERATION (NOW; ALL SCI RIOS SAME ELSE)	$10,000	$10,400	$10,816	$11,249	$11,699	$12,167	$12,653	$13,159	$13,686	$14,233	$120,061
	NLS PARTS OPERATION ELIMINATION	$65,000	$67,600	$70,304	$73,116	$76,041	$79,082	$82,246	$85,536	$88,957	$92,515	$780,397
	CINTREX ELIMINATION	$91,000	$94,640	$98,426	$102,363	$106,457	$110,715	$115,144	$119,750	$124,540	$129,521	$1,092,556
	E-1 REPAIR ELIMINATION	$64,000	$66,560	$69,222	$71,991	$74,871	$77,866	$80,980	$84,220	$87,588	$91,092	$768,391
	CT-1 REPAIR ELIMINATION	$25,000	$26,000	$27,040	$28,122	$29,246	$30,416	$31,633	$32,898	$34,214	$35,583	$300,153
	CONSOLIDATION OF FREE INVENTORY IN ONE LOCATION	$2,250,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$2,250,000
	ECO LABOR COSTS	$43,320	$45,053	$46,855	$48,729	$50,678	$52,705	$54,814	$57,006	$59,286	$61,658	$520,105
	ELIMINATION OF QC AT CINTREX	$10,000	$10,400	$10,816	$11,249	$11,699	$12,167	$12,653	$13,159	$13,686	$14,233	$120,061
	DISPOSAL SCREENING(INCLUDED IN CENTRAL,NOT OTH)	$52,000	$54,080	$56,243	$58,493	$60,833	$63,266	$65,797	$68,428	$71,166	$74,012	$624,318
	INCREASED AVAIL. OF INV. DUE TO REP. IMPACT ON W. INV.	$3,450,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$3,450,000
	TOTAL	$7,360,320	$738,733	$768,282	$799,013	$830,974	$864,213	$898,781	$934,733	$972,122	$1,011,007	$15,178,178

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Appendix 8-3

DECENTRALIZED SCENARIO
TRAVEL COSTS FOR NATIONAL REPAIR COORDINATION CENTER

ORGANIZATION	ITEM	NUMBER	UNIT COST	ANNUAL COST	TOTAL
QA and Testing					
	Trips by air	288	$450	$129,600	
	Hotel	288	$70	$20,160	
	Days per diem	288	$35	$10,080	
	Car	288	$50	$14,400	
	Subtotal				$174,240
Practices & Procedures					
	Trips by air	576	$450	$259,200	
	Hotel	576	$70	$40,320	
	Days per diem	576	$35	$20,160	
	Car	576	$50	$28,800	
	Subtotal				$348,480
TOTAL					$522,720

REGIONALIZED SCENARIO (20 SITES)
TRAVEL COSTS FOR NATIONAL REPAIR COORDINATION CENTER

ORGANIZATION	ITEM	NUMBER	UNIT COST	ANNUAL COST	TOTAL
PPQA & T					
	Trips by air	60	$450	$27,000	
	Hotel	120	$70	$8,400	
	Days per diem	120	$35	$4,200	
	Car	120	$50	$6,000	
TOTAL					$45,600

DECENTRALIZED SCENARIO
EQUIPMENT BUDGET FOR CAPITALIZING VOLUNTEERS

YEAR	EQUIPMENT PACKAGES FUNDED	UNIT COST	ANNUAL COST	TOTAL
One	96	$1,000	$96,000	
Two	96	$1,040	$99,840	
Three	96	$1,082	$103,872	
TOTAL	288			$299,712

Assume that each group needs one package, knowing that some do not need any and that some need more than one.

REGIONALIZED SCENARIO
EQUIPMENT BUDGET FOR CAPITALIZING VOLUNTEERS

YEAR	EQUIPMENT PACKAGES FUNDED	UNIT COST	ANNUAL COST	TOTAL
One	40	$1,000	$40,000	
TOTAL	40			$40,000

Assume that each group needs two packages

DECENTRALIZED SCENARIO
ANNUAL TELEX TRIP

ITEM	NUMBER	UNIT COST	ANNUAL COST	TOTAL
Trips by air	144	$450	$64,800	
Hotel	288	$70	$20,160	
Days per diem	288	$35	$10,080	
Ground Trans	1	$3,000	$3,000	
				$98,040

REGIONALIZED SCENARIO
ANNUAL TELEX TRIP

ITEM	NUMBER	UNIT COST	ANNUAL COST	TOTAL
Trips by air	20	$450	$9,000	
Hotel	40	$70	$2,800	
Days per diem	40	$35	$1,400	
Ground Trans	1	$500	$500	
				$13,700

Addendum A
Profile of the Typical MLA

Study II, Part 1, Phase 2

ADDENDUM A

PROFILE OF THE TYPICAL MLA

This addendum outlines the functional design requirements and mode of operation of a typical MLA. This profile is developed to quantify activity, specify proposed modes of operation and detail interfaces between MLAs and other organizations. The MLAs are the key players under any contemplated scheme of machine repair. The proposed mode of operation for an MLA will, therefore, be equally applicable to the decentralized, regionalized, and centralized repair options, or any combination thereof. Essentially, only the location of machine repair would change, and with this variation some differences in reporting requirements.

A.1 THE CONCEPT OF A TYPICAL MLA

Since the lending agencies will be the key players under any contemplated scheme of machine repair, it is important to first rationalize how the MLAs as a body could best be organized and operate. Such rationalization is greatly complicated by the variety of ADP systems used, the lack of systems development in the machine area, limits on available resources, and the unique operating philosophies of the 57 individual MLAs, and their 301 satellite SLAs.

Our conclusion was that the most practical way to address these multi-faceted issues was to develop the concept and operating mode for a hypothetical MLA that could be considered a paradigm for all MLAs in the network. The best organizational, managerial, and operational practices of all the MLAs observed in our field visits were accordingly incorporated into the proposed mode of operation for such a typical MLA. It is understood that fiscal resources and/or other constraints may preclude implementation of some, or all, recommendations at the lending agency level; however, the profile is nevertheless established as a conceptual future operation.

A.2 PRESENT MLA SIZES

An MLA or an SLA should have a patron base that is of sufficient size to justify ADP systems enhancements and other operational improvements as required. The comparative size of the present 57 MLAs and their 301 SLAs has, therefore, been of concern in framing the study recommendations.

A frequency distribution of the number of machines (TBMs and CBMs combined) assigned to patrons by the MLAs as of 30 September 1994 is presented in Appendix A-1. As noted, some 80% of all machines in service are assigned by only 27 MLAs, and 90% of all machines in service are assigned by 35 MLAs.

In making these sizing comparisons, it is assumed that all machine lending activity is centralized in each MLA, which it is not for those that use SLAs. Such consolidations provide needed economics of scale, while reducing the overall number of machines required in the network. These migrations should be fostered by the NLS. However, the use of SLAs is a local decision; in contemplated operations, SLAs will continue to have reporting responsibilities to the MLAs.

The same logic is applicable to the smaller MLAs, six of whom have no ADP system at all. Consideration should be given to having larger, neighboring MLAs provide service, on a contract basis, to these smallest operations. We, therefore, suggest that at least the concept of defining the service territory of an MLA by state or territorial boundaries be placed on the agenda for review.

A.3 TYPICAL MLA SIZE

For discussion purposes, the typical MLA is considered to have 6,700 assigned CBM and TBM machines, or approximately 1% of the national total (1,435 TBMs and 5,265 CBMs). Thirty-five of the 57 MLAs would therefore be of equal size or greater than this example. Patron service needs would be provided by a single point. This assigned machine base, its associated machine activity, and the total machine inventory that will be needed to support a viable machine lending operation for an MLA of this size are discussed below.

A.3.1 Throughput Activity

With the addition of 50,000 new machines received per year from manufacturers (approximately new CBM production, excludes CT-1s and A-1s both being stored in MSCW, but currently with no future production plans), the aforementioned repair and disposal activity will constitute the total anticipated inter-agency machine movement under all repair options, as presented in Exhibit A-1 below.

Exhibit A-1

PRESENT AND PRO FORMA INTER-AGENCY MACHINE ACTIVITY FYE 30 SEPTEMBER 1994				
MLA Activity	Present MLA	Repair Option		
		Decentralized	Regionalized	Centralized
Inputs				
From Manufacturers	50,000	50,000	50,000	50,000
From MSCs	12,000	10,000	10,000	
From Repair			80,000	80,000
From Disposal	600	4,500	4,500	4,500
From Other MLAs	5,500	10,000	5,500	5,500
Total Inputs	68,100	74,500	150,000	140,000
Outputs				
To MSCs	4,000	3,400	3,400*	
To Repair			80,000	80,000
To Disposal	16,500	16,500	16,500	16,500
To Other MLAs	5,500	10,000	5,500	5,500
Total Outputs	26,000	29,900	105,400	102,000
Total MLA Inter-Agency activity	94,100	104,400	255,400	242,000
% of Present Inter-Agency Activity	100%	+11%	+171%	+157%

* Represents E-1 and CT-1 repair volume for passthrough... may be sent directly to special regional group.

As noted, projected inter-agency machine movement under the regionalized and centralized repair options will be greater than now, placing a greater burden on all shippers for tracking and accounting for machines in transit. Automation of these processes, and automated preparation and transmission of the MIMS and CAS reports, thus emerge as practical operating necessities. The typical MLA will have a patron issue activity of approximately 64 machines per week (57 CBMs and 7 TBMs), or approximately 9.5 machines per week for every 1,000 assigned machines. With an estimated 40,000 machines (all models) written-off (not disposed of) annually (and not recovered), patron returns at the typical MLA will average 56 machines per week.

A.3.2 Repair/Disposal Activity

All machines returned by patrons would be triaged to determine their condition and to make minor repairs. Some 60% of these machines will then be returned to service the same day, and 40% will be repaired or disposed of. The repair activity generated by the model MLA will then be 16 machines per week and disposal activity will be approximately 3 machines per week.

Repair activity for the network as a whole will be 80,000 machines per year, or 1,600 machines per week (based on a 50-week year). How this repair activity will be handled in the MLAs will vary by the repair option selected, as described below:

> **Decentralized Repair** - On-site repair, either in-house or volunteer will be internal MLA transactions, and machine throughput activity will not be affected. All off-site repair facilities will be given patron-of-record status, and shipments and receipts will be handled as conventional *intra*-agency inventory transactions.
>
> **Regionalized Repair** - All regionalized repair centers will have agency status. Shipments to and from the repair centers must therefore be handled as conventional *inter*-agency inventory transactions.
>
> **Centralized Repair** - The centralized repair facility will have agency status and shipments and receipts will be handled in the same manner as under the regionalized repair option.

For all repair options, the maximum allowable time to repair machines, or to replace machines in kind, will be three weeks. This required service response includes transit time from and to the MLAs. For on-site repair, either in-house or volunteer, the targeted response time will be one week.

We recommended that all machines to be scrapped be sent to a central disposal facility, which would be Landover under the decentralized and regionalized repair options, or the central depository/repair center under the centralized repair option. Landover would have agency code DEL and shipments to Landover, or the central depository, would be handled as conventional inter-agency inventory transactions. Machines would be shipped to Landover with a condition status of repairable (R), and there will be no need for the present agency status categories of unrepairable, non-repairable, damaged beyond repair, obsolete or destroyed.

Present and *pro forma* MLA shipping activity for disposal will be 16,500 machines per year, or 330 machines per week, under all repair options. It is anticipated (unknown ... audit must be performed) that some 4,500 of these machines will be found good or repairable, and subsequently return to service. Landover, or the center, rather than the MLAs, would write-off all disposed machines. This will eliminate the problem of machines being disposed of by agencies and then resurfacing ... there were 1,275 such instances in the 2-year period ending 30 September, 1994.

A.3.3 Machine Inventory

The allotment of available machines to the MLAs will be the same under all repair options. This standard has been defined as the working inventory needed to buffer the random variations in machine receipt and disbursal, and includes both good (assignable) and repairable (in-repair) machines.

The shortfall between patron shipments, disposals, and returns must ultimately be resolved by new machine production, but can be alleviated by the allocation of free inventory stored elsewhere in the network. This free inventory will be stored in the MLAs under the decentralized and regionalized repair options (except E-1s and CT-1s, to be stored in MSCs), and in a central depository under the centralized repair option. The central depository will have full agency status, and both receipts and shipments will be handled as conventional inter-agency inventory transactions. Movements of free inventory among MLAs to improve machine availability will also be handled as conventional inter-agency transactions.

The total number of machines in MLA custody will not vary by repair alternative, but there will be few if any repairable machines under the regionalized and centralized repair options. Exhibit A-2 below details an optimum deployment of machines for the model MLA under the decentralized repair option, assuming that all machine repair will be done off-site, and after implementation of repair improvements as discussed in Sections 5 and 6.

Exhibit A-2

INVENTORY DEPLOYMENT IN THE MODEL MLA				
Custody Status	Condition Status	No. of Machines	% of Machines	Inventory Responsibility
With Patrons or in Transit	Assigned	6,700	94.0 %	Reader Advisors
On Premises	Good	330	4.6 %	Receiver/Shipper
With Repairers or in Transit	Repairable	98	1.4 %	Inventory Clerk
Total		7,128	100.0 %	

The unassigned machines shown in the table represents the future NLS standard for MLA working inventory, or 64 unassigned machines for every 1,000 assigned machines.

As is readily apparent, inventory accountability in the model MLA will be divided among three parties, but the reader advisors will be responsible for 94% of all machines. The receiver/shipper and the inventory clerk must be located on MLA premises to fulfill their responsibilities, but the reader advisors could conceivably be stationed elsewhere. In any event, all parties would ideally share a common ADP support system.

A.4 PROPOSED MODE OF OPERATION

The proposed mode of operation for the typical MLA incorporates the information support and the associated disciplines that should be provided by the agency ADP inventory module, and assumes that all machines will be bar coded. The recommended operating modes for regional repair centers, or a central depository/repair center, would also be much the same, except for the patron interface.

A.4.1 Facilities and Equipment

Receiving and Shipping Area

The receiving and shipping area in the typical MLA will be shared by machines and media under the contemplated mode of operation, and will be the designated control point for monitoring all confirmed inventory transactions. Access to the area should, therefore, be restricted to operating personnel having a well defined need to be there.

All receiving will be performed in the morning hours, and all order filling and shipping will be performed in the afternoon hours. There will be separate Post Office pickups and deliveries to accommodate this operating schedule, which will allow some 60% of machines received from patrons to be returned to service the same day. Machine repair backlogs will thereby be reduced at those agencies not currently performing triage and patron service response time will be shortened by one full day.

ADP Equipment

A computer terminal is required in the area to make receiving, repair, and shipping data entry, which is contemplated to be a basically paperless process. A printer is also required in the area for printing pick ticket/shipping labels, and the printer must be capable of printing bar codes on the labels for USPS use to expedite deliveries. These labels will be similar in design to those now used by the MLAs to ship cassette books.

Bar Code Equipment

The bar code scanning requirement in the typical MLA for machine input, repair, storage, and output transactions is not sufficient reading activity to justify the use of bar coding only for machines. However, it is highly unlikely that an RL/MLA would institute bar coding only for machines. It is recommended that the NLS promulgate a machine bar coding standard as soon as possible to network agencies, in terms of: fundamental type (e.g. 3/9); convention to be used (e.g. serial number); and, location on the machine (e.g. on the handle-end of machine).

A bar code printer and a bar code reader will be required when bar coding is adopted for machine identification by all agencies. The bar code printer could also be utilized for printing shelf labels if a computerized stock locator system is utilized throughout the RL/MLA. The bar code reader could be hard-wired if used only for machine identification, but a portable scanner will be needed if bar coding is to be used in the storage area.

Battery Charging Equipment

The batteries in all machines returned by patrons should be removed and replaced with fully charged batteries, so as to eliminate battery condition as a variable in machine triage and repair. We also recommend that all machines that are not immediately shipped be stored without batteries, so that recharging will not be needed prior to shipment. A ready supply of fully charged batteries will therefore be needed for both receiving and shipping.

We propose that automated battery charging equipment, similar to the unit designed and installed by the Engineering Department of the Minnesota MLA, be procured by or for each MLA. The Minnesota battery charger is monitored by a PC, and will automatically test, discharge, charge and retest (5 cycles) a bank of batteries in 6 hours without manual intervention. The charger design should also accommodate lithium ion batteries, which are becoming the battery-of-choice for portable PCs.

The battery charging units should be of modular design, and the suggested module size is 20 batteries. One batch of batteries should be charged on the day-shift and one batch overnight. The typical MLA will require one such module, and approximately 70 modules will be needed by the MLAs in total.

A.4.2 Receiving Mode

Receiving data entry is contemplated to eventually be a basically paperless process, and shipping manifests will be telecommunicated directly to the inventory clerk by the sender, for use in tracing errant shipments. These manifests must also be an integral part of the BPHICS, or CAS, machine custody tracking system.

To initiate the followup of errant shipments, the inventory clerk will query the database to first determine the serial numbers of the machines actually received, and forward this information to the shipper. However, the primary responsibility for tracing shipments will always reside with the shipper.

Receiving of New Machines

New CBM machines are readily identifiable from the 4-pack master carton, which has decal labels affixed that show the serial number of each machine. However, these serial numbers will eventually be replaced with bar codes when the manufacturers are required to convert to full agency status. The present serial numbers should be keyed into the inventory record without opening the master carton or the individual cartons to verify the serial numbers or to perform a QC inspection. An agency and patron-of-record code must be keyed into the database before entering the serial numbers, as the computer will otherwise reject the transaction. Upon entry, the machines will automatically be given a condition status of assignable.

New machines are now shipped to the MLAs once a month. We propose that the manufacturer ship machines at least twice a month so that transit time will be reduced and less follow up of errant shipments is required. This recommendation has nothing to do with current working inventory levels which, on a national basis, are more than adequate, but comes from our observations that local Postal Service personnel consider machine shipments to be free mail. Bulky shipments of machines can therefore be set aside when loading over-the-road trailers and delivery vehicles, if there is more than a full-load of mail.

Receiving of Repaired Machines

Machines repaired by regional repair centers, or by a central repair facility, will be allocated to the MLAs by the NLS, in conjunction with the allocation of new machines. The packaging for these used machines must be identical to that of new machines, for protection from damage in transit, but the machines will have neither instruction cassettes nor batteries. These machines should be uncartoned as received, and the bar coded serial numbers can then be scanned into the inventory record.

All machines that are received from local volunteers or that are repaired in-house in the decentralized option must be triaged before being accepted as assignable. Machines received from regional repair centers or the central depository/repair center must be entered in the inventory record as assignable without QC inspection.

Receiving of Patron Returns

Machines will be returned by patrons roughly once every three years on average, but not necessarily because the machines are defective. Some MLA's now follow the practice of classifying all returned machines as being in repair, which bloats the repair statistics and creates the impression that all returning machines are defective. This practice should therefore be immediately discontinued, and currently accounts for an estimated 20,000-to-30,000 of the 130,000 reported FY94 repairs (based on survey returns from 84% of MLAs).

We have recommended that the condition of returned machines be established by triage. Triage consists of formally assessing the condition of each machine to determine if it is in working order, could be put in working order by making minor repairs, will require major repairs, or should be scrapped. Some 60% of patron returns will be machines that are in either good condition, or can be quickly put in good condition, and can therefore be returned to service the same day. The triage function can be competently performed by ordinary people, after a very short period of on-the-job training.

Following triage, each machine should be entered in the inventory record with a condition status of either available or in-repair. Good machines should be staged on a shelf cart for transport to the storage area. Machines slated for repair, salvage or scrapping should be staged on a shelf cart awaiting transport to an in-house repair area, or for shipment to an off-premise repair or disposal facility. No machines should be left overnight in the receiving/shipping area.

A.4.3 Storage Mode

The machine storage area should be sized for the NLS working inventory target level and should be kept locked when not in use. New machines should be stored in unopened cartons. Machines that are repaired locally, or by regional repair centers, or the central facility, should be stored in plastic dust jackets.

All uncartoned machines should be stored on 1-deep shelving, with the nameplate and bar code facing the aisle, and in strict serial number sequence. Machines having the highest serial numbers can then be readily located when specified for shipping. This mandatory sequencing will insure that patrons are always provided with the latest available machines.

A.4.4 Machine Repair Area

The most favorable location for machine repair is in the MLA, and this location should be fostered by the NLS. However, some volunteer groups have their own local facilities. In either instance, the receiver/shipper will maintain liaison with the repair group. If machines must be shipped to the repairers, the inventory clerk will initiate a formal shipping transaction for each machine. The ADP system will then charge the machines to a designated patron-of-record, and the inventory clerk will maintain liaison with the repair group.

The typical MLA will generate a repair requirement of approximately 16 machines per week. Approximately one-and-a-half man-hours, on average, are required to inspect and repair, or to salvage and scrap a machine. For the typical MLA six workstations will be required, and the repair room would have an area of 200 square feet, if staffed by volunteers.

A.4.5 Machine Repair Mode

With triage, each machine needing repair will be sent to the repair area or group with a pressure-sensitive note attached that indicates what is apparently wrong with the machine. Specifying the symptoms of machine condition in the MLAs, rather than relying on the repair groups, is expected to help streamline repair operations, as this assessment is now done informally by numerous individuals of diverse motivation and talent.

Repairers will correct the designated problem on the note attached to a machine before making any further examination to determine what else could possibly be wrong with the machine. On completion of repair, good machines should go through a triage QC inspection. The condition status of the machines that pass inspection should then be changed from in-repair to available in the inventory record. Machines that fail to pass should be returned to the repair area for reworking and complete reconditioning if necessary. For offsite repair groups in the decentralized scenario, the reconditioning decision must be made by the repairers off site.

Only needed parts should be salvaged from machines that are to be scrapped, and all batteries should be removed from the machines and returned to the receiving area. The salvaged machines should then be staged in a temporary hold area awaiting disposition instructions. As noted, we have recommended that all machines slated for disposal be sent to an authorized central disposal site, for final assessment of their condition before termination.

A.4.6 Shipping Mode

A computer generated pick ticket/address label must be prepared for each machine shipped, but shipping data entry will otherwise be a paperless process. A machine must first be allocated to initiate the shipping process, and actual shipment of the machine will later be confirmed at the terminal on the shipping dock to close out the open transaction.

Allocation for Shipment

The reader advisors or other authorized staff will be solely responsible for initiating shipments to patrons and the ADP system will be programmed to allocate only new machines or the newest assignable used machines. The inventory clerk will be responsible for initiating shipments to all parties other than patrons and will be permitted to allocate any machine in any condition status.

The allocation process will consist of specifying the serial number of the machine that is to be shipped to a designated recipient, who must have an assigned patron or patron-of-record ID, or an agency code on file. This process will generate an open shipping transaction, and place the machine in allocated status, thereby reserving the machine for the designated transaction.

Shipping Paperwork

Shipping paperwork will consist of the standard 3"x5" combination pick ticket/address label that is now used for shipping cassettes. There will be one pick ticket for each machine to be shipped, and the pick tickets will be printed 1-up in strict machine serial number sequence. There will be separate batches of pick tickets printed for machines sent to patrons and institutions, machines sent to local, regional or central repair facilities, and machines sent to authorized disposal sites.

Shipping Assigned Machines

The shipper will proceed to the storage area with a string of pick tickets, pick the designated machines, and return to the dock area. An instruction cassette and battery will then be placed in all but new machines. After packing, the pick ticket should be placed in a clear plastic window envelope that will be affixed to the carton by the shipper, if required. In the future, the manufacturer should logically affix these holders. These window envelopes are reusable, and should not be removed from the cartons of machines returned by patrons.

Before closing a package, the shipper should confirm the completion of each shipping transaction by scanning the bar code on the machine and the bar code on the shipping label. This entry will delete the allocated machine from on-hand inventory, and charge the account of the patron or patron-of-record. The packed machines should then be placed in hampers or pallet boxes awaiting USPS pickup.

Shipping Machines to be Repaired

After picking machines to be repaired, the shipper will check to see that the pressure-sensitive label affixed to each machine by the triager is in place, and verify that instruction cassettes and batteries have been removed from all machines. The machines should then be cartoned with styrofoam inserts and then overpacked. These packing materials must later be re-used in shipping repaired machines to the MLAs. The shipping procedure for repairable machines is otherwise identical to the shipping procedure for assigned machines.

Shipping Machines to be Disposed

No special shipping instructions or disposal approvals will be required for machines sent to Landover or to the central depository/repair facility for disposal. The pick ticket/address labels for machines slated for scrapping will, therefore, replace the shipping labels that are now provided by the ECO, which are not compatible with the proposed mode of operation.

After picking, the shipper will place a pressure-sensitive label on each machine, indicating that the machine has been assessed as scrappable, and verify that instruction cassettes and batteries have been removed. The uncartoned machines should then be packed in any appropriate container. The shipping procedure for scrappable machines is otherwise identical to the shipping procedure for assigned machines.

A.4.7 Unconfirmed Inputs and Outputs

Unconfirmed inventory transactions consist of the transfer of a patron and machine into the service area of the MLA from another MLA, and the transfer of a patron and machine out of the service area of the MLA to another MLA. The responsibility for making these inventory entries resides solely with the reader advisors, or other supporting clerical staff.

Transfers In

While the transfer of a patron from another MLA can occasionally be discerned by the return of a machine whose serial number is not in the MLA database, the first notice received of transfer is sometimes when the new patron makes a request for reading material, or when a patron transfer form is received. This contact will require the creation of a patron record, unless a notice of transfer has been previously received from the departing MLA.

In all such instances, the reader advisor must contact the patron to determine or verify the serial number and model of the machine in the patron's possession. Such transfers should be entered in the machine and patrons records as unconfirmed receipts into MLA inventory, and as unconfirmed shipments to patrons, until validated.

Transfers Out

Transfer of a patron to another agency is most often done in retrospect, when the gaining agency advises the losing agency that the patron has moved. Such transfers should be entered in the machine and patron records as unconfirmed returns from patrons, and as unconfirmed shipments to the gaining MLA.

A.4.8 Patron Follow-Up for Machine Retrieval

Machine usage is now monitored by the frequency with which the patron orders reading material, and patrons who have not ordered reading materials in the preceding 12 months are considered to be inactive. The reader advisor then makes three attempts to contact the patron (in writing or by phone) to ask that they return the machine if they do not intend to continue using the service. If retrieval efforts fail, the machine is then classified as lost, stolen or location unknown and deleted from MLA inventory.

The recommended mode of operation provides for machines that are classified as lost, stolen or location unknown to be first placed in a recall status, rather than being quickly written-off. This change in classification would then trigger automatic follow up notices prepared by the MLA ADP system. When all efforts fail, the machines would then be written off.

We also recommend that ADP systems in MLAs be programmed to automatically prompt the reader advisors that the 12-month or other designated grace period has expired. Upon review, the reader advisors then have the option of placing a machine on recall, and the ADP system should automatically prepare follow-up notices for machine return.

The program for these follow-up notices should be run on Friday of each week, after all patron returns have been entered into the system for the work week. However, an individual patron should receive a follow-up notice only once every three weeks, so that sufficient elapsed time is allowed to respond to a previous mailing.

Appendix A-1
End FY94 Machines Assigned
(All Models)

11/10/9404:57 PM

FILENAME:	MACHSTAT.WK1				
10-Nov-94	04:56 PM				
		END FY94	END FY94	END FY94	END FY94
		TOTAL AS	TOTAL	TOTAL AS	TOTAL AS
CODE	AGENCY	RANKING	ASSIGNED	PERCENT	CUM.PER.
FL9	FLORIDA	1	57,870	8.8%	8.8%
CA8	CALIFORNIA LA	2	36,091	5.5%	14.3%
NY9	NEW YORK ALBA.	3	32,926	5.0%	19.3%
NY8	NEW YORK NY	4	31,760	4.8%	24.1%
IL9	ILLINOIS	5	27,573	4.2%	28.3%
TX9	TEXAS	6	26,688	4.1%	32.3%
CA9	CALIFORNIA SC	7	24,890	3.8%	36.1%
OH9	OHIO	8	24,849	3.8%	39.9%
MA9	MASSACHUSETTS	9	21,342	3.2%	43.1%
PA9	PENNSYLVANIA PH	10	20,349	3.1%	46.2%
MI9	MICHIGAN LANS.	11	20,088	3.0%	49.3%
GA9	GEORGIA	12	17,790	2.7%	52.0%
MO9	MISSOURI	13	17,097	2.6%	54.6%
MD9	MARYLAND	14	15,911	2.4%	57.0%
NJ9	NEW JERSEY	15	14,084	2.1%	59.1%
IN9	INDIANA	16	13,266	2.0%	61.1%
WA9	WASHINGTON	17	13,172	2.0%	63.1%
MN9	MINNESOTA	18	12,763	1.9%	65.1%
TN9	TENNESSEE	19	11,782	1.8%	66.8%
VA9	VIRGINIA	20	11,439	1.7%	68.6%
IA9	IOWA	21	11,281	1.7%	70.3%
NC9	NORTH CAROLINA	22	11,202	1.7%	72.0%
AZ9	ARIZONA	23	11,017	1.7%	73.7%
PA8	PENNSYLVANIA PI	24	10,986	1.7%	75.3%
AL9	ALABAMA	25	10,775	1.6%	77.0%
WI9	WISCONSIN	26	10,593	1.6%	78.6%
CO9	COLORADO	27	9,927	1.5%	80.1%
CT9	CONNECTICUT	28	9,420	1.4%	81.5%
OR9	OREGON	29	9,149	1.4%	82.9%
KS9	KANSAS	30	9,104	1.4%	84.3%
SC9	SOUTH CAROLINA	31	8,648	1.3%	85.6%
KY9	KENTUCKY	32	7,600	1.2%	86.8%
UT9	UTAH	33	7,147	1.1%	87.8%
OK9	OKLAHOMA	34	6,738	1.0%	88.9%
LA9	LOUISIANA	35	6,689	1.0%	89.9%
AR9	ARKANSAS	36	5,959	0.9%	90.8%
NE9	NEBRASKA	37	5,125	0.8%	91.6%
WV9	WEST VIRGINIA	38	4,620	0.7%	92.3%
ME9	MAINE	39	4,491	0.7%	92.9%
MI8	MICHIGAN WAYNE	40	4,400	0.7%	93.6%
NM9	NEW MEXICO	41	4,201	0.6%	94.2%
DC9	DIST. OF COL.	42	3,837	0.6%	94.8%
MT9	MONTANA	43	3,809	0.6%	95.4%
SD9	SOUTH DAKOTA	44	3,363	0.5%	95.9%
ID9	IDAHO	45	3,263	0.5%	96.4%
MS9	MISSISSIPPI	46	3,173	0 5%	96.9%
ND9	NORTH DAKOTA	47	2,927	0.4%	97.3%
NH9	NEW HAMPSHIRE	48	2,791	0.4%	97.8%
NV9	NEVADA	49	2,292	0.3%	98.1%
RI9	RHODE ISLAND	50	2,208	0.3%	98.4%
DE9	DELAWARE	51	2,111	0.3%	98.8%
WY9	WYOMING	52	1,963	0.3%	99.1%
PR9	PUERTO RICO	53	1,962	0.3%	99.4%
VT9	VERMONT	54	1,795	0.3%	99.6%
HI9	HAWAII	55	1,209	0.2%	99.8%
AK9	ALASKA	56	962	0.1%	100.0%
VI9	VIRGIN ISLANDS	57	216	0.0%	100.0%
UT6	MSCW	58	0	0.0%	100.0%
OH6	MSCE	59	0	0.0%	100.0%
DC6	NLS	60	0	0.0%	100.0%
	TOTAL		658,683	100.0%	

Addendum B
Disposal Audit

ADDENDUM B

DISPOSAL AUDIT

This addendum describes the steps required to perform an audit of the machines sent to Landover, Maryland for disposal. The primary objective of the disposal audit is to estimate the rate at which machines might be recovered if all disposals were screened.

B.1 HYPOTHESIS AND DECISION

The hypothesis for this analysis is that too many good machines are presently being disposed of. If too many machines are being disposed of, the NLS will be faced with deciding how to recover these machines. Two obvious choices are: 1) For the MLAs to improve their decision-making process and 2) to screen all disposals centrally and identify recoverable machines. The most expensive alternative is number two, and the disposal audit will show whether central screening can be a viable solution.

Assuming 16,000 disposals per year and 15 minutes to perform one screening, total direct screening time is 2.5 FTEs. With other tasks such as shipping, database maintenance, supervision and other functions, the total staff to screen all machines at Landover is, worst case, estimated to be 4.0 FTEs, or about $120,000 in salaries.

Given that a new machine costs about $150, the break-even point for the screening function is 800 recoveries per year ($120,000 / $150). Therefore, the NLS will know that significant action aimed at machine recovery will need to be made if the disposal audit reveals that 5% (800/16,000) or more of the machines are being improperly disposed.

B.2 AUDIT CRITERIA

Certain predefined criteria must be set before the audit is conducted to ensure that all the objectives are met. The audit will only consider CBM machines that are a C-78 model or newer. Obsolete machines will not be considered simply because the data relating to these machines is not available in the MMRs or BPHICS. The TBM machines have been exempted because they will probably be phased out. All agencies will be instructed to cease local disposal during the audit period, and send all CBMs to Landover, MD.

Every instruction/memo issued on the disposal of damaged-beyond-repair machines in the last three years will be made available to the audit team. All unrevised standard operating procedures should also be provided.

The audit team should consist of the following personnel; one project manager to coordinate the effort, a data entry clerk, and a technical group (no less than two individuals) familiar with the CBM design. The technical group should have the capability/capacity to repair machines that are deemed salvageable.

B.3 AUDIT PROCESS

The first step in conducting the audit will be to define the universe from which a sample will be drawn. The sample will be derived from a population of approximately 16,000 machines. The 16,000 represents the average annual number of CBMs disposed of during the two years, FY93/94, per MMRs. The estimated composition of these 16,000 machines is as follows:

1). 6,000 were sent to Landover, MD.
2). 2,000 were sent Phoenix, AZ.
3). 8,000 were disposed of locally.

The sampling will be stratified by year of machine, as well.

To determine the sample size at the national level, an assumption had to be made regarding the probability (P) of a machine being recovered; an initial assumption of 25% was made. The total population (N) used will be calculated using the actual number of machines submitted for disposal by the MLAs, i.e., 16,000. An error of the estimate (e) was specified at +/- 2%, and a confidence level (z) was specified at 95%. This high degree of estimation precision was specified because of the extreme possible sensitivity of the outcome, i.e. a recovery rate of 5% is possibly a break-even point. These values were entered into the following equation:

$$n = \frac{p(1-p)}{\dfrac{e^2}{z^2} + \dfrac{p(1-p)}{N}}$$

Using the example data above, the number of machines required for a national sample is computed as follows:

$$n = \frac{0.25(1-0.25)}{\dfrac{0.02^2}{1.96^2} + \dfrac{0.25(1-0.25)}{16{,}000}} = \frac{0.25(0.75)}{0.0001041 + 0.0000117} = 1{,}619$$

The total number of observations required would be 1,619. This value would be stratified by age (year) of machine. The age of the C-1 machines will be determined by the serial number and production date, and the older machines will be selected first. The sampling may be expanded to the newer machines, but the yearly stratification should be maintained. Random machine samples will be selected for each year.

In order to establish and gather audit information, a database will have to be designed. The model and serial number will act as the unique identifier for each machine. Information will be gathered for each machine audited, and each record in the data file will contain the following information:

1). Model and Serial Number
2). Year of Machine
3). Recoverable (Y/N)
4). NLS Repair Codes
5). Remarks

The "Year of Machine" will be recorded as, e.g., 89, 93, 92, etc., to show the year of production. The response for the "Recoverable" field will be a yes (Y) or no (N). If the response is (Y), this will show that the machine was repairable and that the machine has been repaired by the auditors. In this process, field 5, NLS Repair Codes, the NLS standard repair codes will be entered showing the problem with the machine. The "Remarks" will be a 60-character text field and provide the auditors a place for comments regarding the total condition of the machine, if necessary.

B.4 EVALUATION PROCESS

The sample is equal to approximately five weeks of disposal activity. We propose that the samples be drawn over an extended period of time to mitigate the efforts of seasonality, or any one MLA disposing of a large number of machines over a short period. Taking a one-week sample every four weeks should be sufficient.

The auditors will need to establish a work area in Landover. Several desks, repair parts, tools and test equipment will need to be provided. A laptop PC will need to be provided and it should have a database program with data entry screens set-up for this audit.

Approximately two man-weeks will be required to evaluate a one-week sample of machines. The data from the evaluations will be entered in the audit database on an ongoing basis.

After all results have been entered and the final data computed, a report will be produced showing the findings of the statistical analysis. From this analysis, recommendations will be made that address the complete disposal program to entail the procedures used at Landover, standard operating instructions provided to the network, and record-keeping connected with the disposal program.

Given a 5% recovery rate for break-even (based upon the full cost of a new machine), this level represents a "level of indifference", and we do not recommend proceeding with such a marginal indication. Also, the sampling error may be as much as 2%. Therefore a 7% recovery rate, at a minimum, is required to proceed with a formalized screening and recovery program. Given that these machines are not new, it can be argued that using the value of $150 per machine overstates value; however, many older machines are still in use. Given all of the above considerations, a minimum recovery rate of 7% is established as a level of indifference, but a rate of 10%, or higher, would indicate significant potential for recovery of machines from such a screening operation, and hence should be implemented.