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The Feasibility of an
Off-Line Electronic Benefit Transfer System
for the Food Stamp Program

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Executive Summary

For the past several years, the Food and Nutrition Service (FNS) of the U.S. Department of Agriculture has been exploring the feasibility and desirability of electronic benefit transfer (EBT) systems for the Food Stamp Program.

The paper food stamp coupon has been the traditional medium of delivering program benefits. Eligible households receive an allotment of coupons each month and can use them, much like cash, to buy eligible items from authorized food retailers. An EBT system substitutes an electronic "account" for the paper coupons. Benefit allotments are credited to the account and each purchase results in a debit to the account. Electronic funds transfers are used to give retailers dollar credits for food stamp benefits they accept.

An EBT system is analogous to commercial point-of-sale (POS) debit card systems. In those systems, customers have plastic cards which they insert in merchant terminals to make a purchase. Funds for the purchase come from the customer's bank account. Most POS systems are "on-line" in the sense that the terminal contacts a central computer for authorization before the purchase can be completed. A few systems are "off-line." In these, the terminal authorizes the purchase without contacting a central computer and holds the transaction information for subsequent initiation of a funds transfer process. These off-line systems are analogous to electronic check writing: if the customer's bank account has no funds, the funds transfer is rejected.

The most important exploration to date of the EBT concept is a demonstration system implemented in Reading, Pennsylvania, in 1984. The Reading system uses an on-line approach: the recipient's benefit card is passed through the terminal, which contacts the central computer for authorization. The central computer, which holds all recipient accounts, debits the recipient's account while the transaction is taking place. It holds information to credit the retailer later.

Some have argued that an off-line approach might be more appropriate for an EBT system. Unlike the approach used by off-line commercial systems, however, a recipient's "account" in an off-line EBT system would reside on the benefit card itself. The retailer terminal and the benefit card would

interact to authorize the purchase, without contacting a central computer, and the recipient's account would immediately be debited.

This study considers the feasibility of an off-line EBT system for the Food Stamp Program. The study mandate is to address four key elements of feasibility:

- Conceptual feasibility--i.e., is it possible to specify in the abstract a configuration of equipment and procedures that would meet the requirements of an issuance system in the Food Stamp Program?
- Technological feasibility--i.e., do the products specified in the conceptual design exist in the marketplace, and are they sufficiently tested and proven to be considered feasible for an EBT application?
- Costs--i.e., if an off-line EBT system were implemented, would its costs be competitive with those of the on-line or paper coupon approaches?
- User satisfaction--i.e., would an off-line EBT system be as acceptable to the various groups that interact with the program (program staff, recipients, retailers, and banks) as the on-line or coupon approaches?

A final question is whether these feasibility analyses suggest that FNS should proceed to conduct a demonstration of an off-line EBT system and, if so, what should be the demonstration's key characteristics.

To answer these questions, the project team interviewed representatives of over 50 organizations with special perspectives on the issue. These included vendors of major components needed for an off-line EBT system, organizations currently planning or operating off-line systems, organizations in the food retail and banking industries, and State and county food stamp agencies. The project team also reviewed existing literature and held discussions with FNS personnel to consider possible off-line system designs.

The analysis draws on all of these sources to address the four study questions. The key findings are summarized below.

An off-line EBT system is conceptually feasible.

An off-line EBT system can be conceived that carries out all functions required of a food stamp issuance system, with adequate protection of program integrity and recipient interests.

It is possible to design a system that looks very much like the Reading on-line system in the way it performs major functions and in its policies for handling special situations (system failure, damaged cards, etc.). The most important difference is the need for an additional system component or procedure to credit each month's allotment to the recipient's card. This requires either an "issuance machine," which recipients would visit to have their cards updated, or mailing out new benefit cards with each allotment.

Some important options exist in designing an off-line system. One key choice concerns the amount of information the system maintains on recipients' accounts. On the one hand, the system can be designed to maintain full account information, allowing the Food Stamp Program to reconcile benefits issued against benefits redeemed. Alternatively, an off-line system can be analogous to the coupon system, with information on benefits issued and on benefits redeemed, but no means to reconcile the two. In another option, an off-line system may be designed with either centralized or decentralized settlement procedures for crediting retailers. Transaction data may go from the retailer terminal either to the central EBT computer or to each individual retailer's bank to begin the settlement process. Each of the design choices requires tradeoffs between operating costs, security, and convenience for system users.

An off-line EBT system has somewhat different vulnerabilities than an on-line system, because purchases are authorized by checking the balance on the card rather than by checking a central computer file. Security measures in an off-line system therefore focus on protecting the integrity of the card and the information it contains. Adequate protection is available through relatively common security techniques, including the use of a Personal Identification Number (PIN) and encrypted financial data on the benefit card.

An off-line EBT system is technologically feasible.

An off-line EBT system can be assembled with currently available technology, much of which has been developed for on-line commercial POS systems. Three feasible off-line approaches are identified, based on products currently in use or components that could be produced as minor modifications of existing products. The three approaches, built around differing benefit card technologies include:

- Standard magnetic stripe card. This system stores the account balance in a rewritable field on the standard magnetic stripe card used by most credit and debit card networks. A device much like an Automated Teller Machine (ATM) would serve as the issuance machine, operating in an off-line mode.
- Chip card. This system uses a card with an embedded integrated circuit, often known as a "smart card." The issuance machine is a terminal built around a telephone, which would credit allotments during an on-line session with the EBT center.
- Mail-out non-standard magnetic stripe card. The card in this system is made of thin plastic stock, but the position and layout of the magnetic stripe is identical with the standard magnetic stripe card. A new card is mailed to the recipient with each allotment, eliminating the need for issuance machines.

All three of these systems meet the basic functional requirements of a food stamp EBT system. Beyond these requirements, the chip card system could support a multi-program application involving several assistance programs and a variety of possible functions. The magnetic stripe cards are more limited in this regard. Nonetheless, these systems could issue benefits for Aid to Families with Dependent Children (AFDC) and General Assistance (GA) as well as food stamps, and also perform a limited Medicaid authorization function. All three of the identified systems offer partial compatibility with commercial POS systems: commercial transactions could be conducted at EBT terminals, but the reverse would not generally be true.

Two other approaches are considered less promising at this time. An optical memory card, better known as the laser card, could meet all program requirements. The card has had few applications to date, however, and no major applications in electronic funds transfer systems are currently

foreseen. As a result, suitable POS terminals and related devices do not currently exist and an EBT system would have to bear much of the cost of developing such equipment. The token card is a paper card with a magnetic stripe using a different format and logic from the standard magnetic stripe card. Although the token card has been applied successfully in some environments, especially public transportation, it is the least secure card technology, it cannot store data for multiple programs and, like the coupon system, it would involve giving recipients cash change for food stamp purchases.

An off-line EBT system appears feasible in terms of its costs.

Projections developed in this study strongly suggest that an off-line EBT system can be competitive with the coupon system's costs, and might even be able to offer savings. Costs were projected for the systems identified above using a relatively high-cost design, which involves full recipient account maintenance, centralized settlement, a stand-alone central computer facility and some convenience factors like terminals at every checkout station. Alternative projections were then developed for various cost-reducing strategies.

The operating cost of off-line systems with the basic, high-cost design features is estimated at \$3 to \$4 per case month in a large city (130,000 food stamp cases), and \$3 to \$5 in a large State (400,000 cases). These figures are potentially competitive with the \$3 coupon cost estimated in the Reading evaluation. Estimates for a small city (5,300 cases) are much higher, at \$14 to \$16 per case month.

Although the choice among the three card technologies has little effect on cost, several cost reduction strategies can have substantial impact on the costs of particular systems. For example, integrating the EBT system's central computer functions with other computer operations, such as those of a State welfare department's computer facility, cuts about \$7 per case month from the small city system's cost. Restricting the number of issuance machines saves nearly \$2 in the state-wide standard magnetic stripe card system. Using decentralized settlement and maintaining minimal recipient account data saves about \$1 in the large-caseload systems. Systems

incorporating all of the cost reduction strategies together are estimated to cost \$2 to \$3 per case month with large caseloads, and \$5 to \$6 in a small city.

A multi-program EBT system potentially offers still lower costs to the Food Stamp Program, because certain of the system's costs can be shared with other agencies. Projected food stamp costs are about \$3 per case month in the small city and \$1.50 for larger caseloads for an EBT system incorporating the cost reduction strategies above and also serving the AFDC, GA, and Medicaid programs. Although it may be unrealistic to assume that all of the cost reduction strategies would be employed in a single system, it seems highly likely that an off-line system could be designed to operate with costs comparable to those of the coupon system.

An off-line EBT system's costs appear roughly comparable to those of the on-line approach. The off-line approach offers some savings, such as reduced communications between in-store terminals and the central computer, but also has some areas of higher cost, such as the issuance machine. The cost difference between any two systems is likely to depend more on the particular systems' design features and cost reduction strategies than on inherent differences between the off-line and on-line approaches.

An off-line system is feasible in terms of its expected impact on the Food Stamp Program's participant groups.

State and local food stamp staff, recipients, retailers, and banks all responded very positively to the Reading on-line system, preferring it to the coupon system. For the most part, an off-line system could expect the same response.

Food stamp recipients are the group most strongly affected by the difference between on-line and off-line systems. The off-line system may require them to visit an issuance machine to obtain each allotment, a requirement equivalent to most coupon issuance systems. On-line systems are more convenient, however, automatically posting allotments to recipient accounts.

Retailers might experience faster checkout times and fewer transaction failures with an off-line than an on-line system, an advantage from their point of view. Banks would not notice a difference unless the off-line system

involved decentralized settlement, in which case their participation costs would be higher than in an on-line system, but still lower than the coupon system. State and local food stamp staff would also see only minor differences, with the extent of the differences depending largely on which account maintenance strategy the off-line system uses.

An off-line EBT system has substantial advantages over the paper coupon systems for food stamp issuance, and is comparable to the on-line approach.

The Reading evaluation found that the EBT system offers increased program integrity and more positive impacts on program participants than the coupon system. Analysis here indicates an EBT system can also be cost competitive with coupons.

The differences between the off-line and on-line EBT approaches are small. The two approaches involve comparable levels of operating cost, program integrity, and user satisfaction. On-line systems are more compatible with commercial POS systems, but the partial compatibility of the off-line approach is sufficient in most existing environments, where only a small proportion of food stamp establishments participate in POS networks. Off-line systems more readily accommodate retailers without telephones, but on-line systems can also solve the problem.

Based on these considerations, FNS might reasonably pursue either of two policies. The agency might concentrate on developing on-line EBT systems on the grounds that the off-line approach offers no overwhelming advantages, and thereby avoid the cost of developing a second approach. On the other hand, FNS might pursue both on-line and off-line approaches in order to allow State agencies to select among an array of techniques, just as they now select among coupon issuance approaches.

If FNS wishes to make the off-line approach available as a tool for issuing food stamp benefits, the next logical step is a demonstration.

The off-line approach entails enough uncertainties that a demonstration will be desirable before FNS allows widespread or State-initiated implementation. A major purpose of the demonstration would simply be to obtain more conclusive evidence about the feasibility of the approach than an abstract study can offer. In addition, the demonstration should provide more

concrete information about how specific functional problems can best be solved (e.g., what equipment is used for issuance machines, and how many are needed), and serve as a guidepost for future implementations. Finally, the demonstration should provide information about the costs and impacts of the potential cost reduction strategies.

Although any of the three systems identified earlier might be tested in a demonstration, the chip card system would have highest priority. The card's greater security and capacity may make it preferable to the magnetic stripe alternatives in the long run. Moreover, because the chip card has been less broadly applied, a demonstration will produce more kinds of new information than a demonstration using magnetic stripe cards. If two systems could be tested, the second choice would be the mail-out non-standard magnetic stripe card, to obtain information on the costs and effects of the mail-out approach.

Any demonstration should be designed to produce as much information as possible about cost reduction strategies. For example, recipients can be assigned in varying numbers to issuance machines to learn about the appropriate density of these devices. Centralized settlement with full account maintenance can provide direct measures of the costs and effects of this approach, while providing data to estimate the impacts of decentralized settlement and more limited account maintenance. For cost reasons and for clarity of findings, any demonstration system should initially serve a small to medium caseload and should serve the Food Stamp Program only. It would be desirable to plan for subsequent expansion to test the system at a larger scale, to incorporate other assistance programs, or to integrate EBT and commercial POS transactions.

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Chapter One

INTRODUCTION

1.1 BACKGROUND

The Food Stamp Program provides financial assistance to low-income households to allow them to purchase food. The program currently relies on paper coupons as the medium for delivering benefits to eligible households. Although each household's benefits have a specific dollar value, coupons are used to " earmark " the benefits so they can be used to purchase only authorized items.

The Food and Nutrition Service (FNS) of the U.S. Department of Agriculture, which has overall responsibility for administering the Food Stamp Program, continually seeks ways to enhance the program's efficiency and integrity. As part of this mission, FNS is exploring the use of electronic funds transfer (EFT) technology to replace the paper food stamp coupon.

Many types of payment systems in the United States currently rely on EFT technology. Most interesting from the perspective of the Food Stamp Program are point-of-sale (POS) debit card systems that have been introduced in recent years in retail establishments, including some supermarkets and convenience stores. In these systems, customers use magnetic stripe cards in terminals at the checkout counters, electronically transferring funds from their bank accounts to the stores' accounts to pay for their purchases.

FNS has taken several steps to examine the applicability of this technology to the Food Stamp Program. The agency first sponsored a feasibility study of electronic benefit transfer (EBT) systems.¹ It then funded a demonstration EBT system in Reading, Pennsylvania. In that

¹Report on the Feasibility of an Electronic Benefit Transfer System for the Food Stamp Program. Silver Spring, Maryland: Birch & Davis Associates Inc. and The Orkand Corporation, 1982.

demonstration, a private firm designed the EBT system and operated it from October 1984 through December 1985.¹ The Commonwealth of Pennsylvania then took over responsibility for system operations and further development under a new demonstration. FNS intends to sponsor one or more additional demonstrations in the near future.

The Reading EBT system and most commercial POS systems are considered "on-line" systems. When the customer's card is entered into the retailer's terminal, the terminal establishes an on-line connection with a central computer to obtain authorization for the purchase.

A few commercial systems authorize purchases without contacting a central computer, and some people have argued that an analogous "off-line" approach would be suitable for the Food Stamp Program. Eliminating the immediate connection with a central computer might speed up the purchase, eliminate substantial communications costs, and allow the central computer hardware and software to be simpler and consequently less expensive.

The initial EBT feasibility study considered the possibility of an off-line system using a "smart" plastic card with a built-in microprocessor. The study concluded that such an EBT system was not feasible in the short term, because the "chip card" technology had not been sufficiently tested or accepted in the marketplace.

Significant developments have occurred since the initial feasibility

electronically and, in some cases, appear to have subsidized electronic entries into point-of-sale. Finally, the EFT market, which previously had been the domain of financial institutions has now been entered by merchants, groups of merchants, and third parties. These third parties offer price alternatives to the pure bank networks and must be viewed as significant players in POS, EFT, or EBT.

- Industry standards. The American Bankers Association is currently in the process of supplying point-of-sale guidelines to its members for on-line POS; the National Automated Clearinghouse Association (NACHA) will soon present its guidelines for off-line POS. While this process is going on, MasterCard and VISA have announced an agreement for an on-line point-of-sale service to be called "ENTREE"; the wide sphere of influence of these organizations means that ENTREE is likely to set further de facto standards. Other standards currently in place involve such things as the placement of microchips on smart cards, the composition and characteristics of bank cards, and various communications specifications. These standards are discussed further in Appendix D.

This study re-opens the question of the feasibility of an off-line EBT system, taking a broader view of the possible card technologies that might be employed and the possible system configurations.

1.2 STUDY OBJECTIVES

The objectives of the present study are:

- to describe the range of off-line system applications to the Food Stamp Program;
- to assess the technical feasibility of different off-line technologies when applied to food stamp delivery and redemption;
- to estimate the developmental and operational costs of an off-line electronic benefit transfer system;
- to examine any other operational issues that may be critical to the successful implementation of an electronic benefit transfer system; and
- to examine the linking of electronic benefit transfer delivery to currently-established EFT networks.

In assessing the feasibility of the applications selected, the project team considered three critical factors:

- The maturity and availability of the technology. In order to be considered feasible, an off-line EBT system must rely on technology that is proven and products that are reasonably available. Components of an EBT system are assessed in terms of whether they have "off the shelf" availability, restricted availability (e.g., currently only in prototype), availability with modification to existing products, or no current or planned availability.
- Cost. Cost is clearly a central issue in the feasibility of an EBT approach. The cost of each system component is assessed based on vendor quotes for available products or estimates for those not fully available. Component costs are assembled into estimates of overall operating costs for a variety of system technologies, and compared to coupon and on-line EBT system costs.
- Effects on program participants. The desirability of any food stamp issuance approach depends partly on how it affects the people who must deal with the system: the program staff who must operate it, the recipients who must follow its procedures to obtain benefits, and the food retailers and financial institutions involved in redeeming the benefits. These effects are considered for major alternative configurations of an off-line EBT system.

1.3 STUDY APPROACH

The first phase of the present study was devoted to identifying a set of potentially interesting applications of off-line technology to the Food Stamp Program. This included not only EBT systems, but off-line systems that might aid in other aspects of program operations, such as certification.

Potential applications were presented and discussed in meetings with FNS staff. Brief descriptions of the applications were then forwarded to a group of State and local Food Stamp Program officials, who were interviewed to determine their reactions to the various possibilities.

On the basis of this first stage of activity, it was decided to focus the second-stage research exclusively on EBT applications -- that is, applications in which off-line electronic transactions replace paper coupons as the means for delivering at least some food stamp benefits. (Appendix A describes the applications that were considered in the first stage of the research but not pursued in the second.) Three types of system were identified:

- the "pure" off-line EBT system, which serves only the Food Stamp Program and in which all benefits are delivered through electronic transactions at the point of sale;
- the "point-of-sale/automatic coupon dispensing" (POS/ACD) system, in which some benefits are redeemed through electronic transactions and some through the traditional paper coupons, which are dispensed mechanically; and
- the "multi-program POS" system, which is like the pure system in delivering food stamp benefits but also serves other public assistance programs, such as Aid to Families with Dependent Children (AFDC) and Medicaid.

The feasibility analysis of these three systems involved structured interviews with a variety of respondent groups, including:

- vendors of off-line access devices, including magnetic stripe cards, chip cards, and optical memory cards (commonly known as laser cards);
- vendors of off-line POS terminals;
- organizations conducting or planning off-line applications, including two operational systems;
- food industry organizations, including trade associations and major supermarket and convenience store chains;
- banking industry organizations, including credit card organizations, electronic funds transfer networks, and a proprietary provider of electronic funds transfer and banking service software;
- State and local food stamp agencies that have contemplated alternative issuance systems or related applications; and
- other organizations, including consulting organizations, standards organizations, and trade associations.

For each type of organization, the selection of respondents attempted to reflect a diversity of products and perspectives. Six to nine organizations were interviewed in most of the above categories, for a total of 57 responding organizations. Appendix B provides more detail on the selection criteria and the specific organizations interviewed.

The analysis presented in this report uses both the interview responses and data available through the evaluation of the Reading demonstra-

tion. Most of the analyses are not quantitative in nature, but are instead qualitative summaries of opinion and important points made by individual respondents.

The analysis includes detailed cost projections, which rely heavily on the results of the Reading demonstration's evaluation. Although that is an on-line system, the evaluation provides detailed data on many individual elements of an EBT system's functioning that are also applicable in an off-line context, such as the average number of purchases a household makes in a month. Incorporating the Reading cost elements is useful for comparing the off-line cost estimates to those of the on-line system. It is important to recall, however, that the Reading demonstration reflects only a single system, operating in special circumstances; some judgement must therefore be exercised in interpreting the projected cost figures.

The report begins by reviewing the functional requirements of a food stamp issuance system and the way those requirements are met by the coupon system and the on-line EBT system in Reading (Chapter 2). It then describes the approach that an off-line system would take to meet these same requirements, and points out some of the major design choices to be made in formulating such a system (Chapter 3). The next three chapters present the results of assessing the technology, the costs, and the participant impacts of the various alternative off-line systems. Chapter 7 concludes with a review of the key findings of the analysis and recommendations for FNS' next steps.

Chapter Two

THE COUPON AND ON-LINE EBT APPROACHES TO BENEFIT ISSUANCE

The basic purpose of the Food Stamp Program is to help needy people obtain food. Rather than providing the food directly, the program provides benefits that have nearly the same flexibility as cash. The flexibility has limits: recipients must use food stamp benefits only in establishments authorized to participate in the program, and the benefits must be used only to pay for eligible items. Within these boundaries, however, the program has set up shopping and payment procedures to resemble the normal patterns as closely as possible.

Any alternative issuance system for the Food Stamp Program, then, must provide recipients with benefits in a form that they can use to purchase eligible items at authorized establishments. Most activity of the issuance system is devoted to getting the benefits into recipients' possession and, after retailers accept the benefits as payment, translating the benefits into dollar credits to the retailers.

In order to provide eligible households with benefits that they can use to buy food, the Food Stamp Program must perform five central functions:

- authorizing recipient access to benefits;
- allowing recipients to use benefits;
- crediting retailers for benefits accepted;
- reconciling and monitoring benefit flows and system activity; and
- managing retailer participation.

As background to considering an off-line EBT approach, this chapter describes how the current paper coupon system and the Reading on-line system perform the five functions above.

2.1 COUPON-BASED ISSUANCE SYSTEMS

In coupon-based systems, the food stamp coupon is the medium of benefit delivery. States establish widely varying procedures for getting

coupons into the recipients' possession. Nevertheless, the procedures by which recipients use coupons to buy food and retailers redeem the coupons they accept are uniform across the United States.

This section describes how the coupon system carries out the five major functions defined above. It uses program operations in Reading as an example, but briefly describes some of the approaches to benefit authorization used in other locations.

Authorizing Recipient Access to Benefits

The coupon system provides recipients access to benefits by issuing identification cards and paper food stamp coupons. Most of the system's activity is directed toward getting monthly allotments of coupons to the recipients, for which several approaches exist.

Under the ATP/coupon system in Pennsylvania, the State welfare department authorizes a certain allotment of benefits for each recipient each month. This involves three steps: placing household data and current issuance authorization information on the Food Stamp Master File, printing Authorization-to-Participate cards (ATPs), and distributing ATPs. In Reading, ATPs are mailed directly to recipients.

When a household is certified eligible for food stamp benefits, the local welfare office gives the head of household an identification card. This paper card, containing the recipient's name, case number, and signature, is valid through the period of certified eligibility (typically six months). The recipient uses the ID card in obtaining food stamp coupons and in buying groceries. In some circumstances, a household receives additional ID cards to allow other household members or authorized representatives to shop with food stamp coupons.

The computer-generated ATP that the household receives each month contains the recipient's name, address, and case number, and an expiration date. The ATP normally expires at the end of the month in which it is issued. The ATP specifies the amount of the food stamp allotment for the month. ATPs for the regular monthly benefits are currently issued to food stamp recipients in Berks County on two days. ATPs are mailed to half the recipients on the fourth working day of the month, and to the other half on

the ninth working day. Recipients whose ATPs are lost or stolen may apply at the local welfare office for a replacement.

Special "non-recurring" allotments are issued to individual households throughout the month. Most of these are for newly certified households who are receiving a pro-rated portion of a full month's allotment. Certain households qualifying for "expedited service" must, by program regulations, receive their allotment within five days of applying for benefits.

The Food and Nutrition Service contracts with outside vendors to print and distribute coupons. Two companies currently have printing contracts. Coupons are printed in denominations of \$1, \$5, and \$10, and packaged in "books" with values of \$2, \$7, \$10, \$40, \$50, and \$65. The coupons have serial numbers, but carry no personal identification or expiration date.

The Pennsylvania welfare department contracts with a number of local banks to serve as issuance agents. (In other States, this function is sometimes performed by local food stamp offices, post offices, or other private organizations.) The banks generally maintain a two- to six-month inventory of coupons, in secure storage with limited access. Banks report monthly on the value of coupons received, issued, and in inventory.

At specified times, recipients may exchange their ATPs for food stamp coupons. The recipient must present the ID card to the bank teller and sign the ATP. The teller checks the signature against that on the ID card, and then records the name, case number, and amount and serial numbers of coupons issued. The teller keeps the ATP and gives the recipient the coupon books, which the recipient signs. Once recipients have their coupons, they are responsible for keeping them secure; lost or stolen coupons are not replaced.

Alternative approaches to authorization. Although the ATP approach is the most common means of getting coupons to recipients, several other approaches exist. All of the systems involve issuing an identification card, and program regulations require this to be a photo identification card in large project areas.

Two kinds of systems, direct delivery and on-line coupon issuance, are conceptually quite similar to the ATP approach. These systems are designed to avoid the problems of lost and stolen ATPs (and false claims of ATP loss). Direct delivery systems typically use ATPs, but these are mailed to issuance

agents rather than to the recipients' homes. On-line coupon issuance systems have no ATPs, but issuance agents have access to a computer file listing all authorized allotments. Recipients in both systems go to the issuance agency each month and present their identification cards (which are sometimes magnetic stripe cards in on-line systems). The issuance agent then determines the appropriate allotment and gives the coupons to the recipient.

The Household Issuance Record (HIR) also requires recipients to visit the issuance point, usually the local food stamp office, to pick up their coupons. Paper HIR forms show the allotment amount, and recipients sign them to indicate receipt of coupons.

Direct mail issuance is the most distinct approach, requiring no recipient action to obtain coupons. Instead, the coupon allotment is sent directly to recipients' homes by either regular or certified mail.

Allowing Recipients To Use Benefits

Recipients may use food stamp coupons at any food retail establishment authorized to participate in the Food Stamp Program.¹ They may use coupons only to purchase eligible items; this excludes a number of non-food products and some prepared food items that many grocery stores sell.

The cashier may (but is not required to) ask recipients to present their food stamp ID cards before accepting coupons in payment. When the cashier announces the amount of the purchase, the recipient tears the appropriate amount of coupons out of the books or hands over entire books. Cashiers may not accept coupons previously torn out of the books, except for \$1 coupons.

The cashier may give up to 99 cents change in cash. If more change or a refund is required, it must be given in \$1 coupons. Food stamp coupons may not be used to pay for previously purchased items, nor for advance payment. Retailers must accept coupons at their face value, and no price increases or special fees for food stamp purchases are permitted.

¹Current rules allow virtually any establishment to participate if staple food items make up over 50 percent of eligible food sales. Approximately 230,000 establishments are authorized nationwide.

Program regulations prohibit retail stores from discriminating in any way against food stamp recipients. For example, stores may not refuse to accept food stamp benefits at certain times of day. They may not require food stamp recipients to use a particular checkout lane unless other types of customers, such as those paying by check, are also required to use that lane.

Crediting Retailers for Benefits Accepted

To obtain dollar credit for coupons, store personnel must first endorse them with a stamp identifying the store. They then count the coupons and complete a Redemption Certificate. The grocer takes the coupons and the Redemption Certificate to the store's usual bank. The bank generally receives the coupon deposit as if it were cash, usually crediting the grocer's account immediately. First, however, the teller counts the coupons and writes in the verified amount and his or her initials on the Redemption Certificate.

Crediting banks. The bank cancels the coupons and marks them with a bank name or number. It then bundles coupons from all of its grocer customers, fills out a Food Coupon Deposit Document, and ships the coupons, Redemption Certificates, and Deposit Documents to the Federal Reserve branch bank, which credits the bank.

The Federal Reserve Bank receives the coupons, verifies that the amount is consistent with the bank's Deposit Document, and checks for counterfeits. The coupons are then destroyed, and the Deposit Documents and Redemption Certificates are sent to the Food Stamp Program's national data processing center in Minneapolis. The Federal Reserve Bank credits the local banks and debits the Department of Agriculture's account at the U.S. Treasury.

Reconciliation and Monitoring

Three main reporting systems exist to identify losses of food stamp benefits. First, the State agency matches the issuance offices' records of redeemed ATPs against its own records of ATPs issued. This identifies multiple ATPs cashed for the same household and invalid ATPs that were cashed. Second, issuance offices file coupon inventory reports that reconcile coupons received, authorized and actual issuances, and coupons in inventory. Analogous procedures reconcile issuances in direct mail systems. Third, the FNS data processing center in Minneapolis reconciles Redemption Certificates,

Deposit Documents, and debit vouchers from the Treasury Department. The center also does a statistical analysis of retailer data in the redemption reports. The purpose of the analysis is to identify stores that redeem more coupons than would be expected for their size and location. Stores identified as high redeemers are monitored for several months. If redemptions remain excessive, an FNS representative may make a compliance visit to determine the cause.

Managing Retailer Participation

Retailers are authorized to participate in the Food Stamp Program by FNS Field and Regional Offices. Interested establishments apply to these offices for authorization. An office representative provides initial instructions to retailers and visits them periodically to monitor compliance with FNS regulations. This office also investigates allegations of non-compliance; retailers found to violate regulations may lose their authorization.

2.2 THE ON-LINE EBT APPROACH

On-line EBT systems replace food stamp coupons with a benefit "account" maintained in a central computer file. When a recipient wants to make a purchase with food stamp benefits, the EBT system determines whether sufficient benefits remain in the account before authorizing the purchase.

The demonstration EBT system in Reading is an on-line system. This section describes the Reading system as the only extant example of the approach. While variations on the Reading design are possible, the basic approach to performing each function would probably be similar in any on-line system.

Although the original Reading demonstration ended in December 1985, a second phase (the "extended demonstration") was authorized. The Pennsylvania Department of Public Welfare (PDPW) assumed responsibility for operating the EBT system in the extended demonstration -- a role carried out by Planning Research Corp. (PRC) in the original demonstration -- and altered some elements of the EBT system. For simplicity, this section describes the EBT system only as it operated during the original demonstration.

Authorizing Recipient Access to Benefits

As with the ATP system, the State welfare department authorizes a certain amount of benefits for each demonstration household each month. The department places household data and current allotment information on the Food Stamp Master File, a process unchanged by the introduction of the EBT system.

Benefit Issuance. The computer file that the PDPW normally uses to print ATPs contains an identifier on each household's record indicating whether the household is in the EBT demonstration. The records for demonstration households are extracted from the file before it is used to print ATPs.

The PDPW sends each day's file extract, containing case numbers and authorized allotment amounts, to the EBT Center.¹ It transmits supplemental, prorated, and other non-recurring allotments electronically over a commercial telephone line. For the regular monthly issuance, which involves more cases, a computer tape is physically delivered to the EBT Center.

When the EBT Center receives issuance information for new cases, it creates account records for the EBT Master File and credits the corresponding issuance amounts to the accounts. For existing cases, the issuance amounts are added to the recipients' existing balances.

Card Issuance. Under the EBT system, the recipient's encoded benefit card replaces the ATP as the document authorizing the delivery of food stamp benefits. Instead of receiving a new ATP card in the mail each month, demonstration participants receive only one benefit card (unless a lost, stolen, or damaged card needs to be replaced).

The head of household goes to the welfare office to obtain the card, although under certain circumstances, an authorized representative may make this visit. An issuance clerk takes the recipient's picture and produces a photo identification card. The recipient signs the card, which is then laminated to prevent tampering, and the clerk encodes the card's magnetic stripe.

¹For simplicity of presentation, we describe the demonstration system in the present tense, although some features changed after the end of the original demonstration.

To encode the card, the issuance clerk first queries the EBT data base with the household's case number, using a microcomputer linked by telephone line to the EBT Center. The system responds with information about the recipient and a system-generated card number. The clerk places the recipient's card in an attached encoding device and enters the card number on the microcomputer. The recipient selects a four-digit Personal Identification Number (PIN), which is entered on a PIN-pad attached to the microcomputer.

The system encodes three pieces of identifying information on the benefit card: the card number, a PIN offset number and a check-sum digit. The PIN offset number is computed by the microcomputer and is based on the card number and the PIN. The check-sum digit, also computed by the microcomputer, is based on the card number and the PIN offset and serves as an additional security feature.

After the encoding is completed, an income maintenance worker trains the recipient in how to use the card to purchase groceries, how to obtain information about his or her current account balance, and what to do and whom to call in the event of problems. The recipient practices using the card with EBT equipment like that located in the grocery stores.

To allow other members of the food stamp household or authorized representatives to purchase groceries, the recipient is given an Alternate Shopper Card. This paper card includes the recipient's name and case number, but it does not have a photo or a magnetic stripe. Using the Alternate Shopper Card together with the recipient's benefit card and PIN, a person designated by the recipient may buy groceries with the recipient's food stamp benefits.

When a card is lost or damaged, the recipient notifies the local welfare office. The welfare office passes on the information to the EBT Center, which places the recipient's EBT account on "hold" if appropriate. This prevents any further transaction activity for the account, although any benefits used before the recipient reports the card loss are not replaced. A new card is then assigned to the recipient using the process described above. If the recipient's PIN has been compromised, the recipient chooses a new PIN. The household's EBT account is updated with the new card number and PIN offset, and the hold status is removed.

Recipients who are moving from Reading may convert EBT benefits to coupons. This requires a visit to the local welfare office. An income maintenance worker gives the recipient an ATP for an amount equal to the remaining EBT balance, and registers the transaction on the central computer. The recipient then exchanges the ATP for coupons as through normal coupon system procedures.

Allowing Recipients To Use Benefits

Recipients may use their EBT benefits at any retail outlet participating in the EBT system. Only recipients in the four central ZIP code areas of Reading have EBT cards. All food stamp authorized stores in that area and within a five mile radius were offered the opportunity to participate in the EBT system, and nearly all chose to do so. In most stores, all checkout stations are equipped for EBT transactions.

Two methods are available for a recipient to buy food with EBT benefits. When the central computer system and the retailer's EBT equipment are working, payment for food is handled electronically. If either the system or the store equipment fails, manual back-up procedures are used.

Verifying the Recipient's Identity. As the first step in an electronic purchase, cashiers are expected to check the photo on the benefit card before attempting an EBT purchase. If someone other than the recipient uses the card to purchase groceries, that person must present the recipient's Alternate Shopper Card.

The EBT system also verifies the identity of the recipient through the four-digit PIN. A Benefit Transaction Terminal (BTT), located at the checkout counter, performs the check. The cashier passes the recipient's card through the BTT's card reader and instructs the recipient to enter his or her PIN on a PIN-pad attached to the BTT. The BTT internally computes a PIN offset number based on the card's number and the entered PIN. It then compares the computed number with the PIN offset number encoded on the card. If the offsets do not match, the recipient must re-enter the PIN. If the recipient fails to enter the correct PIN in three tries, the BTT will accept no further attempts to use the card until another recipient's card has been used at that BTT. After the third incorrect entry, the BTT automatically transmits information about the unsuccessful PIN entry to the EBT Center.

Electronic Purchases. Nearly all checkout counters in participating stores are equipped with BTTs, PIN-pads, and printers. Each BTT has a handset which may be used to call the EBT Center for assistance, and a card reader. Recipients may make food stamp purchases at any counter that is so equipped.

After the cashier rings up the sale, the BTT verifies the recipient's identity as described above. The cashier then enters the total food stamp purchase amount on the BTT and presses a "Send" key. The BTT automatically dials the EBT Center computer and transmits information to identify the recipient and the store, the amount of the purchase, and a code to make sure that information is transmitted correctly.

The computer at the EBT Center verifies that a valid EBT account exists. It then compares the recipient's balance to the purchase total. If the balance is larger, the recipient's account is debited and the retailer's account is credited by the purchase amount.

The EBT Center then sends to the BTT a message indicating that the transaction is complete. The BTT prints a two-part receipt stating the amount of purchase, the recipient's remaining account balance, the date and time, and some identifying codes. The cashier gives the recipient one copy of the receipt. The other copy is retained on a journal tape within the printer and serves as the retailer's record of the EBT transaction.

If the recipient's balance is less than the purchase total, the BTT displays the difference. The recipient may pay this amount in cash or remove some items from the purchase. In either case, the cashier re-enters the transaction with the new purchase total.

Credits can also be transmitted through the BTT. If a cashier accidentally overcharges a recipient or if a recipient returns items for a refund, the cashier carries out a procedure very similar to that for a purchase. This results in a credit to the recipient's account and a debit to the store account. Such transactions require a "management override"; they can be processed only by individuals authorized by the store management. Each store has one store card, similar to the recipient's card, which must be used in credit transactions.

Manual Backup Purchase Procedures. If an electronic transaction cannot be processed at the EBT Center because its computers are down, a recipient may still purchase up to \$35 worth of groceries each day.

To accomplish a purchase in this situation, the cashier first scans

The EBT Master File at the EBT Center contains information on each recipient's current balance. The EBT Center credits or debits recipients' accounts for issuances, purchases, and refunds as they occur. In the event of system failure, the EBT Center uses the latest daily recipient balance report to maintain each recipient's current balance. Operators log manual transactions on a log sheet and maintain ongoing client balances.

Recipients may determine their current EBT account balance by any of three methods. First, every time the recipient makes a purchase, the BTT receipt shows the remaining balance. Therefore, the most recent receipt usually shows the recipient's current balance. If the recipient's account has been credited with an issuance or debited with a manual sale since the last EBT transaction, however, the balance shown on the last receipt will be incorrect.

Second, recipients may check their current account balance by using a BTT. In addition to the regular terminals located at checkout counters, recipients may use balance-only terminals located in the larger stores or a terminal located at the welfare office. To obtain a balance, the recipient or cashier passes the recipient's card through the reader and the recipient enters the PIN. After PIN verification, the operator presses a "Balance" key on the BTT to send a balance request to the EBT Center. The Center sends the recipient's account balance to the BTT, which displays it.

Third, recipients can learn their account balance by using a touch-tone telephone to dial a special EBT Center number. This connects to the EBT computer. A synthesized voice answers, "Hello, please enter your case number" in both English and Spanish. After the recipient enters the case number, the voice unit responds (again, in both English and Spanish), "Please enter your Personal Identification Number." The recipient enters the PIN, and the voice unit responds (in either English or Spanish, depending upon the recipient's preferred language), "Your current benefits are . . ."

Crediting Retailers for Benefits Accepted

The EBT system credits retailers through an electronic transfer of funds to the retailer's bank accounts. Every afternoon, except weekends and legal holidays, the EBT Center totals each retailer's transactions for the prior banking day, which runs from 2:00 PM to 2:00 PM. The Center translates

the retailers' account numbers and total transaction amounts into the standard format for electronic funds transfers through the Automated Clearing House (ACH). An EBT Center operator then physically delivers a tape containing this information and data on each retailer's bank to a local bank that acts as the interface with the ACH. The interface bank requires that the delivery occur by 8:30 PM so that the bank can meet its Federal Reserve processing deadline of 12:00 midnight.

Each night, the interface bank removes the deposit information for retailers who have accounts with the bank, and credits them directly. The remaining deposit items are transmitted to the Third District Federal Reserve Bank in Philadelphia. The Federal Reserve Bank debits the interface bank's account by the sum of all retailer credits and distributes the retailer credits to the retailers' bank accounts. Thus, the system is designed to credit retailers' accounts within one banking day after an EBT transaction. The time cutoff for the banking day, however, means that a sale made after 2:00 p.m. on Monday is not credited to the retailer's account until Wednesday.

Crediting Banks. Bank redemption of benefits in the EBT system involves only the ACH interface bank rather than all of the retailers' banks. Reimbursement of the interface bank's Federal Reserve account occurs when the bank initiates a wire funds request through the Treasury Financial Communications System network. This request, which goes to the Federal Reserve Bank in New York (FRBNY), is made the morning after the interface bank's account is debited by the Federal Reserve Bank in Philadelphia. FRBNY draws down USDA's letter of credit with the United States Treasury, a special account established for the EBT demonstration. FRBNY simultaneously credits the interface bank for the sum of the previous day's retailer credits.

Finally, the Treasury provides USDA with a daily report of the amount of the drawdown on USDA's letter of credit. USDA is also able to check its account activity by computer at any time.

Reconciliation and Monitoring

Account balances and benefit transfers are reconciled at numerous points in the EBT system. As described below, the major reconciliations occur when benefits are issued by PDPW, when accounts and daily EBT purchase transactions are balanced, and when retailer accounts are credited through the

ACH funds transfer network. In addition, retailers may balance their sales receipts against deposits to their bank accounts, and retailer deposits are checked against drawdowns of USDA's letter of credit with Treasury.

Reconciliation of Issuances. The EBT Center and PDPW take two steps to reconcile benefit issuances to the EBT Center. First, daily transmissions from PDPW to the EBT Center are checked when received. The last record of each transmission contains totals for the number of cases and the dollar amount of benefits to be updated. The EBT Center rejects the transmitted file and notifies PDPW if the issuance records do not sum to the case total and the dollar total. PDPW and the EBT Center immediately investigate and resolve the discrepancy.

For the second step, the EBT Center creates a file of all issuances placed in recipient accounts. This file has the same format as the tape files that PDPW produces when local issuance offices submit information on ATPs that have been redeemed. The PDPW calls the EBT Center about twice each month to request that these files be combined, copied to tape, and delivered to Harrisburg. PDPW then combines the EBT tape with its own tapes to conduct a state-wide reconciliation of issuances to each household.

Account and Transaction Reconciliation. The EBT Center reconciles all account balances and transaction activity each day after 2:00 PM. The Center produces a three-part System Daily Reconciliation Report using information in the EBT Master File and History File. The report covers recipient activity, retailer activity, and PDPW and interface bank activity.

The section covering recipient activity checks each account and the total for all accounts. It computes the recipient's current balance by combining the beginning-of-month balance with all debit and credit transactions for the month. Retailer accounts are reconciled by an analogous procedure. The reconciliation compares this balance to the balance recorded in the EBT Master File.

The reconciliation for recipients and retailers produces totals for the current day as well as for the month to date. Each day's total net debits (purchases minus refunds) for all recipient accounts are balanced against each day's total net deposits (sales minus refunds) for all retailer accounts.

The third section of the reconciliation report compares total funds received from PDPW to the sum of total funds remaining in recipient's accounts and total funds that have exited the system. Funds exit the EBT system either through transmission of deposits to the ACH interface bank or through conversion of benefits to ATPs.

EBT Center staff investigate and resolve any discrepancies discovered in the System Daily Reconciliation Report.

Deposit Reconciliation. When the EBT Center delivers the retailer bundle-up tape to the interface bank, the bank checks the tape format and prepares a listing of all retailer accounts and deposit amounts on the tape. The bank returns the tape and listing to the EBT Center after the deposit information is entered into the ACH network. The EBT Center verifies the accuracy of the deposit information by comparing the hard copy listing with its own records of store deposits for the day.

Other Reconciliation Activities. Once they enter the ACH network, deposits from the EBT demonstration are subject to the same reconciliation procedures as any other fund transfers. Retailers reconcile BTT transaction receipts with deposit information provided by their banks. The Food and Nutrition Service reconciles retailer redemptions against drawdowns of its letter of credit at its Regional Data Center in Minneapolis. FNS also reconciles monthly issuances in the EBT system by comparing EBT Center reports to information provided by PDPW.

Management Reports. In addition to reconciliation reports, the EBT system produces a number of management reports. These include statistical summaries of monthly activities, system trouble reports, and logs of problems reported by retailers.

Managing Retailer Participation

Management of retailer participation under the EBT system is similar to this function under the ATP/coupon system. The FNS Field Office in Philadelphia authorizes new retailers and monitors compliance. Upon authorizing a new retailer, however, the Field Office notifies the EBT Center that equipment installation can take place. Upon learning of a store closure or disqualification, the Field Office notifies the EBT Center to remove the

EBT equipment. Retailer management functions in an EBT system would normally include investigatory visits to stores suspected of non-compliance with program regulations. Because of the complex issues involved in establishing EBT accounts for investigators, and because the demonstration system was expected to operate for only about a year, no such visits were scheduled during the original demonstration. With the extension of the demonstration, investigatory visits were resumed.

Chapter Three

CONCEPTUAL DESIGN OF AN OFF-LINE EBT SYSTEM

The first major question about an off-line EBT system is whether such an approach is conceptually feasible: can one imagine a system built around the principle of off-line authorization that would meet all requirements and constraints of the Food Stamp Program?

This chapter addresses the question by describing in general terms the system components and procedures needed to handle each function of a food stamp issuance system. It is no surprise that the general conclusion is affirmative: the previous feasibility study and most policy discussion in recent years have assumed that the obstacles to an off-line system are technological maturity and component costs, not conceptual feasibility. Nonetheless, examining the individual functions suggests that designing an off-line system will not be an easy, automatic application of the principles underlying established systems. The Food Stamp Program context poses some distinct design alternatives and important challenges to an off-line system.

Before examining how an off-line EBT system might perform individual program functions, it is important to note three key features that distinguish such an approach from a coupon-based or on-line EBT system:

- available benefits take the form of an account balance rather than a physical stock of paper coupons;
- the account balance resides on the recipient's benefit card rather than in a central computer file; and
- a purchase using food stamp benefits involves electronic interaction between the benefit card and a retailer's terminal, but no immediate communication with an external computer.

The assumption that the account balance resides on the recipient's card deserves some elaboration. An off-line food purchase transaction must, by definition, be authorized without immediate contact with a central computer. Theoretically, this could happen by other means than carrying the account balance in the card. The other approaches seem to entail unacceptable costs or risks, however. For example:

- Purchases up to a specified limit could be authorized solely on the basis of verifying the recipient's eligibility. This is analogous to the procedure used in off-line commercial POS systems, and is equivalent to allowing the recipient to write a check against an unknown benefit balance. In this approach, the Food Stamp Program would bear the risk of authorizing purchases for recipients who had already used all their benefits. Neither the coupon nor the on-line systems entail such risks.
- Each retailer terminal could maintain information on all recipients' benefit balances, with periodic transmissions from a central computer to update the information. This approach would lead to prohibitively high costs for retailer terminals and communications, and still entail some risk of overdrafts.

Based on these considerations, the presence of the benefit balance on the recipient card is taken as a fundamental element of an off-line EBT system.

It is difficult to describe a "typical" off-line EBT system, because none have yet been implemented and commercial payment systems offer no clear parallel model. The following discussion therefore presents our best current understanding of how an off-line system would be likely to carry out the five major functions identified in Chapter 2. Where important alternative approaches exist -- and there are several -- they are noted and the implications of the choice are discussed briefly.

A State implementing an off-line EBT system might contract with an outside entity to operate some or all parts of the system, or might integrate the EBT system with a commercial POS payment system. For simplicity, the discussion below ignores these possibilities and assumes that the State retains full operating responsibility. Alternative operating arrangements would not change the basic logic of how the functions are performed, although they would presumably affect system costs or performance.

Three general types of off-line systems have been defined, as indicated in Chapter 1: the pure point-of-sale (POS) system, the system with automatic coupon dispensing as well as POS transactions (POS/ACD), and the multi-program POS system. The discussion below first describes how the pure POS system would approach each issuance function, and then briefly highlights the ways that the POS/ACD and multi-program POS approaches would differ from the pure POS system.

3.1 AUTHORIZING RECIPIENT ACCESS TO BENEFITS

As in the on-line system, an off-line system authorizes recipients' access to benefits by issuing a benefit card to each household and crediting benefits to an account. In an off-line system, however, the account resides in the card itself, rather than a central computer.

Issuing the benefit card. Several different card construction technologies are potentially available for the benefit card, including standard or non-standard magnetic stripe cards, chip cards, decrementing value (token) cards, and optical memory (laser) cards. Chapter 4 describes these technologies and discusses their varying advantages and disadvantages for an off-line EBT system. For present purposes, we shall simply assume that the card has some data storage capacity that can be read and rewritten by machine. The card contains all information needed to authorize purchases off line, such as identifying information, security information, and an account balance.

The procedures for issuing the card are essentially the same as those of the Reading system. Each household newly approved for food stamp benefits receives a card. This occurs in the local food stamp office, either as part of the certification visit or in a subsequent visit. Two situations could call for a subsequent visit. First, the normal certification process may not yield an eligibility decision until after the visit, so a follow-up visit is the only way to avoid providing cards and training to some households who are not found eligible. Second, a system might be designed with procedures for card preparation or account initialization that take more than one day (for example, cards might be sent to a central location for embossing). Either of these situations could apply to on-line as well as off-line systems. Similarly, when either type of system is first implemented, all on-going households make a special visit to the office to receive their cards.

Local food stamp staff then take whatever steps are necessary to prepare the benefit card. These might include lamination, especially if a photo ID is used. Existing food stamp regulations require a photo ID in large project areas (over 100,000 participants). For purposes of this discussion, it is assumed that the photo ID requirement is linked to features of the coupon issuance system and that alternative verification devices, such as a PIN or biometric verification, could meet program requirements. Accordingly, a photograph is not envisioned as part of the benefit card.

Card preparation may involve embossing or printing the recipient's name and account number on the card. It will also include placing the machine-readable identification information on the card and establishing an initial account balance. This initialization process creates an electronic record indicating the account status, identification and control information, and the initial issuance amount.

The record of a new account initialization is transmitted to a central computer. The central facility maintains an audit trail of all benefit transactions for which the Food Stamp Program is directly responsible. These data could be stored locally, but issuance records are more commonly maintained at the State level.

New account records could be stored temporarily at the local office workstation and transmitted to a central computer file in a daily batch transmission of all such account activity. Alternatively, the initialization and record transmission procedure could be carried out through an on-line connection with the central computer. The choice is likely to depend on the design of the State's existing data processing system (in particular, whether new households are registered through on-line transactions) and the extent to which the EBT system is linked to the certification data system. In either case, the recipient leaves the office with a card that can be used immediately to buy food.

During card issuance, local office staff train recipients in using the card. Recipients and/or their authorized representatives receive hands-on practice in using the card as well as general information about how to interact with the EBT system.

Crediting allotments. Once recipients have their benefit cards, each new allotment must be credited to the account balance on the card. How to accomplish this is a major issue in designing an off-line system.

The most likely design involves an "issuance machine." As in the Reading system, each day the State prepares a file of all new regular or special allotments. It transmits these data to the issuance machine, which maintains a file for each household containing all allotments transmitted during the month.

In an issuance transaction, the issuance machine posts to the recipient's card the combined value of all outstanding allotments, and records the amount and date of the last allotment credited. The amount and date are recorded for security reasons. Other data could be substituted for this purpose, such as a serial number of the allotment.

To obtain an allotment credit, the recipient inserts the benefit card into the issuance machine, which verifies the recipient's identity and reads the date and amount of the last allotment credited to the recipient's card. It then examines its file to see whether any subsequent allotments have been received. If so, it writes the latest allotment amount and date onto the card and increases the card's account balance by the amount of the new allotment(s). The issuance machine stores a record of the transaction, and sends this to the central computer during the daily transmission.

Crediting allotments to the benefit card will require security procedures to prevent card tampering. For example, in addition to writing the allotment amount on the card, the issuance machine could write an "offset" to the allotment amount -- i.e., a number created by applying a secret algorithm to the allotment amount. The algorithm would be changed periodically, perhaps monthly. Before posting an allotment to a card, the issuance machine would verify the legitimacy of the previous offset.

Several design decisions concerning the issuance machines involve a compromise between system costs and convenience to the recipient. These decisions, and the specific assumptions made for cost estimates in Chapter 5, include:

- Number and distribution of issuance machines. Basic cost estimates assume one issuance machine for each issuance office existing in the current coupon system. This means that recipients would have to travel the same distance to get their allotments. Alternatives to this assumption are considered in the cost analysis.
- Caseload covered by each issuance machine. Each household's issuance data are stored in the three issuance machines located closest to the household's residence (unless the project area has fewer than three issuance machines). The recipient may have new allotments credited to the card at any of these three machines, but not at any others. This redundancy assures the availability of benefits when a machine is out of service.

- Time period for allotment records in issuance machine. When the issuance machine receives a new month's regular allotment for the household, it destroys those records in the household's file referring to the last regular allotment and any prior allotments. The file retains any supplemental or other allotments that have occurred since the last regular allotment, plus the new regular allotment. Thus the household has one month in which to claim benefits issued in a regular allotment, and between one and two months for a supplemental. This policy is analogous to that in the ATP/coupon system, where regular ATPs expire at the end of the issuance month and supplemental ATPs are similarly valid for about a month. The choice of an availability period for EBT benefits is a matter of policy. Varying the period has only minor implications for system design, affecting storage requirements for issuance machines.

There are at least four major alternatives to the above approach to crediting new allotments to the recipient card.

First, allotments for a complete certification period might be posted to the recipient's card at certification, potentially eliminating the need for issuance machines. The problem with this approach is that many recipients' circumstances change during their certification period, increasing or reducing their allotment amount or making them ineligible for further benefits. A study of caseload dynamics in a large welfare office in the Chicago area found that about 22 percent of the households experienced a change in allotment amount in an average month, and another 7 percent stopped receiving benefits.¹ Thus, if several months' allotments were placed on the card at certification, changes in circumstances would render about half of the allotments incorrect by the third month. Some changes require the recipient to visit the food stamp office, but many changes result from mailed-in information, from telephone calls, or from information the food stamp office generates internally (e.g., through a computer wage match or a general change in benefit levels). Without an office visit, no easy mechanism exists for adjusting the allotment recorded on the card. Hence, the certification period approach entails a risk that many people will use allotments to which they are no longer entitled, or be unable to use some benefits to which they are entitled.

¹John A. Kirlin and Sally R. Merrill, A Longitudinal Study of Participation Patterns in the Food Stamp Program, Cambridge, Massachusetts: Abt Associates Inc., 1985.

The second approach modifies the first by adding a change list, a file identifying households whose allotment has changed since the last posting to their card. Issuance machines could maintain the file. (Alternatively, the change list could be maintained in store terminals, avoiding the need for issuance machines but adding substantially to terminal and communications costs.) The recipient would visit an issuance machine at the beginning of each issuance month. The machine would instruct those recipients on the change list to visit the food stamp office. For others, the machine would simply "release" the recorded allotment, crediting it to the account balance. The drawback of this approach is that it increases the number of recipient visits to the food stamp office -- visits which involve relatively high administrative cost as well as an additional burden to the recipient -- without substantially reducing issuance machine requirements from the level in the basic design.

The third approach substitutes a screening function for a change list in the issuance machine. The machine would ask the recipient a few questions, such as, "Has your income changed since last month?" If any of the responses indicate a potential change in eligibility or allotment, the recipient is sent to the food stamp office. Otherwise the issuance machine simply credits the pre-recorded allotment to the card balance. This approach avoids the need to transmit allotment files to the issuance machines and to maintain the files, reducing communications and equipment cost. Nevertheless, like the change list approach, it generates additional visits to the food stamp office. It has no easy means for posting changes generated internally by the food stamp agency, however. Finally, the approach entails some risk that recipients will deliberately give answers that allow their benefits to be posted. It is unclear whether this risk differs from the risk of deliberate misrepresentation in other procedures where recipients give information, such as certification or monthly reporting. The level of risk may depend partly on whether responses to the issuance machine query, plus the PIN entry, can constitute a legal basis for fraud prosecution.¹

¹In legal actions concerning the use of a PIN in financial transactions, the PIN has not been held equal to a signature as proof that the individual conducted the transaction.

A logical extension of the screening approach would include further data collection and immediate determination of a revised eligibility status or allotment amount. Ultimately, such an approach might replace paper-based procedures for monthly reporting or interim change reporting. At present, these procedures nearly always involve some eligibility worker action, such as reviewing documents submitted as verification of reported income amounts, although substantial progress toward automation has been accomplished. Thus, this remote eligibility determination approach cannot be considered feasible for the immediate future.

The three alternatives just described -- the certification period approach, the change list approach, and the screening approach -- all seem less desirable than the basic issuance machine approach, given the current nature of Food Stamp Program operations. These approaches are not considered further in later chapters.

The final alternative approach to crediting allotments uses a disposable card. The disposable card could use either of two magnetic stripe technologies, as discussed in Chapter 4. The disposable card contains a single allotment's benefits. When those are used, the card is destroyed. Color of the card stock, printed information, and other physical characteristics can be changed periodically to reduce the threat of counterfeiting. Either of two procedures could be used to generate the disposable card:

- Issuance machine. Issuance machines could dispense disposable cards. Each household would have a "permanent" identification card and PIN, which they would use to gain access to the issuance machine as in the primary approach described above. Instead of posting the allotment to the identification card, however, the issuance machine would encode the allotment on one or more disposable cards.
- Mail-out. Disposable cards would be prepared at a central location and mailed to recipients, just as ATPs or coupons are currently mailed. One of the two card technologies allows the disposable card to contain a PIN offset, which would make it less vulnerable to mail theft than ATPs or coupons. The no-PIN disposable card would be approximately as vulnerable as directly mailed coupons.

Both versions of the disposable card approach are generally consistent with the structure of Food Stamp Program operations, and neither involves obviously untenable security risks. Accordingly, these are explored further in subsequent chapters.

Lost and stolen cards. In an off-line system, recipients report lost or stolen benefit cards to the local food stamp office, which replaces the cards. Benefits remaining in the card's account balance are not replaced, however. The recipient has no positive balance on the card until the next regular or special allotment is issued.

This policy differs from the Reading system, which closes the account associated with the lost or stolen card and transfers any remaining benefits to a new account. It is equivalent to the coupon system policy, however, in

which lost or stolen coupons are not replaced.

If policy makers wished an off-line system to approximate the Reading policy, a "hot list" approach could be used. Account numbers for lost or stolen cards would be transmitted to hot list files in store terminals each night; the terminals would reject any subsequent attempts to use those cards. Adding this function would be quite expensive, however, because it would require additional storage capacity in the store terminals and additional communications between those terminals and the central computer. A hot list feature may also require retailers to keep the problem cards rather than returning them to the user, a role that retailers have often resisted in commercial systems.

A variation on the hot list approach would have retailer terminals obtain on-line authorization for a subset of purchases. For example, terminals might call for authorization for a random two percent of all purchases. Alternatively, the probability of on-line authorization could be differentiated by value of purchase, by store, or by some other criterion. Such measures would tend to limit the use of cards reported lost or stolen, but would not guarantee that all the benefits on a particular card could not be improperly used.

Another possible replacement policy would be to replace benefits based on the amount a household would be expected to have spent since issuance. For example, the average Reading household spent about 20 percent of their allotment on issuance day, and 50 percent within four days of issuance.¹

¹Susan H. Bartlett and Margaret M. Hart, Food Stamp Recipients' Patterns of Benefit Redemption. Cambridge, Massachusetts: Abt Associates, Inc., May 1987.

Thus, a household reporting a lost card four days after issuance might have half of its benefits replaced. Such a policy would clearly be responsive to recipient needs, but would substantially increase the program's vulnerability to loss and abuse of benefits.

Damaged and destroyed cards. Damaged and destroyed cards must also be replaced. The food stamp office issues a new card to the recipient, crediting the card with the balance remaining on the old card.

If the card is damaged in such a way that the remaining balance cannot be read, the local office accesses account balance information in the central computer file. This file shows the balance recorded on the recipient's card at the close of the previous business day (as discussed in more detail later, the retailer terminal records the card balance after each transaction, and this information goes to the central computer as part of the process for crediting retailers). Accordingly, the recipient must wait one business day to obtain the replacement card to allow all outstanding transactions to clear.

The benefit replacement procedure for unreadable cards depends to some degree on the nature of the account balance information maintained in the central computer, which is discussed in Section 3.4. The main alternatives to the above procedure are:

- Not replacing benefits on unreadable cards. This is more stringent than the current coupon policy, which calls for replacement of damaged coupons. In effect, it holds the recipient liable for defects in card manufacture and for card aging as well as for mistreatment of the card.
- Crediting the recipient with a standard amount rather than referring to an actual balance. For example, the amount replaced could be based on the number of days since the allotment was issued, as described above for lost and stolen cards.
- Crediting the recipient with the known balance at the time the problem is reported (which will be the previous day's balance). This allows the recipient to have benefits immediately, at the potential cost of some "extra" benefit issuance.

Coupon conversion. The off-line system allows recipients to convert EBT to coupon benefits just as the on-line system does. The recipient requests the conversion at the local food stamp agency. The worker deducts the appropriate amount from the card balance and transmits a transaction record to the central computer file, using the same equipment that initializes cards. A corresponding amount of food stamp coupons is issued through any of the normally allowed coupon issuance procedures.

Security. Many of an off-line system's defenses are similar to those of the on-line system. Because the off-line system maintains the account balance in the recipient's card, however, it has two vulnerabilities that differ substantially from those of the on-line system:

- Card tampering. Someone might attempt to alter a card in such a way as to inflate the available balance. For example, they might try to re-write the balance field directly, to "protect" the issuance field or balance field from being rewritten, or to emulate a legitimate issuance or refund transaction.
- Counterfeiting. Someone might attempt to counterfeit a card, either by duplicating an existing card with a substantial balance or by creating a card with a fictitious account number and balance.

A successfully altered or counterfeit card could potentially be used indefinitely, because an off-line system cannot close an account (assuming that it does not incorporate a hot list or similar feature). Three general kinds of countermeasures can be taken:

- User identity verification, through techniques such as the PIN or biometric measurement, that link a particular card to a particular user through partially secret procedures (e.g., an algorithm stored in the terminal that creates a number based on, but not equal to, the PIN). These procedures also identify the card as legitimate by making sure that the correct algorithm is used, thus preventing alteration of the data stored in the card;
- Data encryption of key operational information on the card, which means that information can only be entered or altered by someone who knows the encryption key. The PIN offset is an example of such encryption, and the technique is potentially applicable to any data field with no more special equipment than that required for the PIN; and

- Features that add complexity to the physical card stock and its memory device, such as holograms, watermarks on magnetic stripes, or "hard-wired" codes in integrated circuits; all of these features are used by individuals (e.g., cashiers) or by terminals to recognize legitimate cards.

The nature of the countermeasures to be taken depends on the vulnerabilities anticipated with the chosen card technology. For example, magnetic stripes can be copied much more easily than the circuitry in a chip card, so more stringent security measures will be used with magnetic stripe cards.

The security measures chosen will also depend on the value of food stamp benefit losses that might be expected. Some perspective on this issue may come from estimates of losses with food stamp coupons. The most directly analogous form of loss is coupon counterfeiting, which is estimated to amount to less than one-hundredth of one percent of benefits, or about \$.0025 per household per month. This might be considered a lower bound on the possible threat to an off-line system, however, because counterfeiting coupons is more difficult than writing new information on a magnetic stripe. Losses due to lost, stolen, altered, or counterfeit ATPs, estimated at about \$.03 per case month in Reading, may serve as an upper bound estimate. Although these estimates span a relatively wide range, they indicate that a security measure costing more than a few cents per case month is unlikely to be cost-effective.

3.2 ALLOWING RECIPIENTS TO USE BENEFITS

Normal purchases and refunds. A normal purchase transaction in an off-line EBT system involves a recipient benefit card and a retailer terminal. Although specific steps could vary from system to system, the general procedure is as follows:

- The recipient inserts the benefit card into the card reader.
- The recipient enters a Personal Identification Number (PIN) on an attached PIN-pad, or carries out some analogous identification procedure.
- The terminal interacts with the card to verify the user identification. The actual verification may occur in the card or in the terminal, depending on the card technology and terminal design.

- The terminal and card perform any other security functions. For example, the terminal may determine whether the account balance is encrypted with a key appropriate to the last transaction date, or check for the presence of a special code. These procedures depend on the exact security measures chosen, which will vary with card technology and the anticipated risk.
- After verification, the purchase amount is entered. The terminal (or card) determines whether the remaining balance is sufficient, and the terminal displays a positive authorization or insufficient balance rejection message. The latter may be followed by entry of a new purchase amount.
- When positive authorization is received, the terminal and card interact to deduct the amount of the purchase from the account balance. The new account balance is written into the card, using the current encryption procedures.
- The terminal creates a record of the transaction and stores it in a file within the terminal or in a within-store computer that holds data for all of the store's terminals.
- An attached printer produces a two-part receipt with information similar to that in the Reading system (e.g., date, time, retailer, amount of purchase, and remaining account balance). The retailer retains one copy and gives the other to the recipient.

Refund transactions involve essentially the same procedure, resulting in a credit to the card's account balance rather than a debit. Additional procedures may be required to protect the store, such as the Reading system's requirement for use of a store manager's card.

Purchases and refunds may be performed at any retailer checkout station equipped with a terminal. Although terminals are placed at virtually all checkout counters in the Reading system, this is not actually required by program regulations or the logic of the system. Regulations prohibit singling out food stamp recipients for special treatment. Equipping all checkout stations is only one way to meet the requirement, however. For example, a store may have some "cash only" stations and some accepting checks, food stamps, and other forms of payment. The basic cost estimates presented in Chapter 5 assume terminals at all checkout stations, but the analysis also explores the implications of having only two terminals in multi-terminal stores.

Manually authorized purchases. A normal EBT purchase may be impossible if either the store terminal or the benefit card fails to operate properly. In a store with more than one terminal, the transaction may be completed on a different terminal. A power outage might affect all of a store's terminals, but many currently available terminals have a backup battery power feature. Nevertheless, situations will inevitably arise in which there is no functioning terminal, or the card malfunctions, and recipients can only use their benefits through a manually authorized purchase.

One policy option would be not to allow manual transactions. Recipients would either have to pay cash or not complete their purchase. To use their benefits, they would go to another store in the case of a terminal failure, or to the food stamp office in the case of a card failure. This would be akin to the policy for damaged or mutilated food stamp coupons, which requires the recipient to visit the food stamp office for a replacement.

Such a policy would be acceptable only if terminal failures and card failures were very rare. For example, in the Reading system, manual transactions account for about 4 out of every 1,000 EBT purchases. An off-line system might have to anticipate substantially fewer failures -- perhaps in the range of 1 per 10,000 purchases -- for a policy of no manual transactions to be acceptable. Although an off-line system seems likely to require fewer manual transactions than an on-line system, it is unclear whether an off-line system can achieve this level of reliability.¹ It depends on the average number of transactions a card completes before failing, the average number of transactions before terminal failure, and the average length of time a terminal is out of service when it fails. Reliability issues are discussed further in Chapter 4.

Because it is not clear that eliminating manual transactions would be acceptable, the primary design reflected in the Chapter 5 cost estimates incorporates a manual transaction procedure. The first part of this procedure closely resembles that used in Reading:

¹Although the Reading system produces no data on the reasons for manual transactions, observers' rough estimates are that about one-fourth to one-third of the Reading manual transactions resulted from central computer problems. If an off-line system eliminate all of these problems, but not others, it would still have a manual transaction rate of about 3 per 1000 purchases.

- The retailer telephones a service "hotline" and tells the operator the recipient's name and case number (visible on the card) and the desired purchase amount.
- The operator checks the recipient's balance information from the end of the previous day. The operator will authorize purchases up to the balance amount or \$35 in any single day, whichever is smaller. (The \$35 limit corresponds to the Reading policy, but could be set by policy at another level.)
- The retailer fills out a three-part receipt, which the recipient signs. The retailer gives one copy to the recipient, keeps one, and sends one to the EBT Center. When the EBT Center receives its copy, it generates a transaction record for entry into the process that credits retailer accounts.

Once the purchase has been authorized, some action must be taken to make the recipient's card balance reflect the purchase. If the problem was caused by a card failure, the recipient must visit the food stamp office to get a new card. The card's balance is set at a level that includes the manually authorized purchase.

For manual transactions occasioned by a terminal failure, the retailer uses a special manual transaction recorder, which is essentially a limited-function terminal. Manual transaction recorders would probably be used only in stores with a single POS terminal. In stores with multiple terminals, particularly if they have battery backup, it should be acceptable to assume that the simultaneous failure of all terminals is no more likely than simultaneous failure of the terminal and the manual transaction recorder in a single-terminal store.

The manual transaction recorder reads the card and writes the amount of the purchase in a location reserved for manual transactions. Depending on the card technology, further interaction with a terminal may or may not be necessary to adjust the account balance. For example, a chip card might have the internal programming capacity to adjust the balance without further terminal interaction. If necessary, the next time the recipient enters the benefit card in a store terminal or issuance machine, the terminal reads the manual transaction amount, adjusts the balance, and clears the manual transaction field or indicates that it has been incorporated into the account balance.

This procedure for incorporating the manual transaction amount has some undesirable features. It introduces another device in many stores. If the device is rarely used, it may be lost or damaged and unavailable when needed. Depending on card technology and the amount of intelligence in the manual transaction device, it may be difficult or impossible for this procedure to handle multiple manual transactions without an intervening interaction with a functioning terminal to adjust the balance. For example, assume that only a single field can be reserved for recording the value of manual transactions, probably because of limited data storage space on a magnetic stripe. The manual transaction recorder writes the amount of the purchase into that space, and the space is later erased when that amount is deducted from the main balance. If two manual transactions occur in succession, the second simply over-writes the first, and the first is never reconciled into the balance. To overcome this problem, the manual transaction device might simply note that a manual purchase has occurred. When the card is next entered in a retailer terminal or issuance machine, presence of this indicator causes the terminal to enter an on-line mode, establishing a connection with the central computer. The central computer transmits the accumulated value of manual transactions to the terminal, which adjusts the balance accordingly before proceeding with the normal purchase or issuance transaction.

It might not be necessary to allow multiple transactions. The Reading policy puts no limit on the number of manual transactions, capping only the total daily value of such transactions. The ability to make successive manual purchases would only rarely be important in an off-line system, however. An example would be a recipient living in a remote area, with convenient access to just one store, when that store's terminal is out of service for several days.

Another undesirable feature is that there is no automatic enforcement of the requirement for the retailer to use the manual transaction device. If the retailer neglects this part of the procedure, the recipient will enter an overdraft situation simply by using the benefits remaining in the card balance.

One alternative to the manual transaction recorder would require the recipient to visit an issuance machine to reconcile the manual transaction. The EBT Center, after authorizing a manual transaction, mails the recipient a

letter saying he or she must take the benefit card to an issuance machine to have the manual transaction recorded. (A less forceful way to convey the requirement would be to have the manual transaction receipt instruct the recipient to go to an issuance machine the next day for the adjustment.) Manual transaction adjustments in this design would be transmitted to the issuance machines daily, along with issuance information. The recipient can still enter an overdraft situation, however, by spending the remaining balance before receiving or responding to the notification.

With any of these approaches, any overdraft created by the manual transaction might be subtracted from the next issuance, if any. This suggests another option: rather than requiring a specific action to incorporate the manual transaction into the card policy, the system might automatically apply the value of all manual purchases to subsequent allotments. Current regulations prescribe procedures for recovering the value of overissuances from subsequent allotments, and this might be considered equivalent. The recovery process is quite cumbersome, however, requiring advance notification, a fair hearing process, and special reporting procedures. Moreover, the limits posed in the existing policy might be too low to allow full recovery of the overdraft, depending on how frequently manual transactions occur, how high a limit is placed on authorizations, and which regulations are considered applicable.¹ All approaches that involve reconciling manual transactions at issuance entail a risk of benefit losses when recipients make manually authorized purchases in their last month of participation.

For cost estimation purposes, the procedure involving the manual transaction device is incorporated in the basic system design. This reflects an assumption that the extra cost of the device will be more acceptable than the extra risk of benefit loss inherent in the other approaches. Chapter 5

¹Regulations identify three situations in which benefits may be recovered from households through reducing future allotments: inadvertent household error, administrative error, and intentional program violation. The highest limit on the recovery amount applies for intentional program violations, and amounts to the greater of \$10 per month or 20 percent of the allotment. For inadvertent household error, the limit is \$10 or 10 percent, and recovery in the case of administrative error must be negotiated with and acceptable to the household. Households also have the option of paying off claims in a lump sum, either in cash or in benefits.

also explores the implications of selecting a policy of no manual transactions.

Balance information. Normal purchase receipts indicate the recipient's balance remaining after the purchase. The Reading experience indicates that this will be recipients' most important source of information.

In an off-line system, issuance machines and terminals at checkout stations also have balance inquiry functions. Recipients can take their cards to the food stamp office, which has equipment to read them and show the balance. In addition, balance-only terminals can be located in stores with large volumes of food stamp transactions, as in Reading.

Unlike the Reading system, an off-line system cannot incorporate a telephone inquiry for the current balance. Because the actual amount available at a given moment is recorded only on the card, the balance can be determined only by an interaction that reads the card. Recipient balance information may be centrally maintained, but it will always reflect the balance at the end of the previous business day. Thus a telephone inquiry would resemble an inquiry about a checking account balance, in which the bank has no information about checks that have been written but not yet cleared.

Particular technological choices could make additional information available to recipients. Chip cards currently in the prototype stages of development offer an internal power supply, a keyboard, and a display. These cards could display the current balance without interacting with a terminal. Terminals for disposable cards theoretically could be constructed to print the balance on the card after each transaction. Neither possibility is assumed in the basic system design, however.

Recipient and retailer account problems. Recipients who have some problem with their EBT account (e.g., they believe their balance is incorrect) go to the food stamp office. The nature of the resolution process depends on the system's design for data capture and storage, which is covered in some detail below in the discussion of reconciliation procedures.

The Reading system includes a "hotline" service for retailers. They call this number to obtain manual transaction authorizations, to report equipment problems, or to obtain deposit information or report deposit problems. Other systems might use a different organizational approach, such as having

the retailer call different points for each function, but any system must provide a means for retailers to obtain the needed service. Cost estimates assume that the hotline service is configured as in Reading.

3.3 CREDITING RETAILERS FOR BENEFITS ACCEPTED

Two quite disparate approaches exist for crediting retailers. One resembles the Reading approach and the settlement process in most commercial POS systems, accumulating transaction information at a central point and initiating electronic funds transfers from that point. The other looks more like the coupon system, with retailers filing claims with their local banks. The two approaches are described below.

Centralized settlement. In the centralized settlement approach, each retailer terminal is equipped with a modem and is served by a dial-up telephone line (assuming the retailer has telephone service). At a specified time each day, probably in the low-volume evening hours, the central EBT computer polls all terminals in the network. (Alternatively, retailers can be responsible for initiating the telephone calls at a convenient point in their operating cycle, such as the close of business or a shift change.) Each terminal transmits the file of transaction records it has accumulated during the day, and erases the file to begin again. If a terminal reaches a specified portion of its file capacity before the polling or retailer-initiated transmission occurs, the terminal itself initiates a connection and uploads the accumulated records.

Some retailers have no telephone service, either because none is available in the area or, more commonly, because it is not necessary or practical for the business. In Reading, the initial examination of 105 establishments requesting EBT equipment showed that 17 had no on-premises telephone service and another 3 had only pay telephones. Most of these were small stores or produce stands in a farmers' market, where telephone service could be installed even though the business had not previously needed it. One was a milk delivery company with a fleet of eight trucks for which normal telephone service was infeasible.

For retailers who have no telephone service, an off-line EBT system might have terminals capable of writing transaction records onto a portable storage medium, such as a cartridge tape. The retailer sends or takes the

transaction file to a local transmission point, probably a bank or the local food stamp office, or perhaps the EBT center. Retailers may deliver files at any time, as often as they choose. The transmission point has a workstation equivalent to a retailer terminal, which reads the retailer's file, establishes a connection with the central EBT computer, and uploads the data.

Once transaction data are accumulated, the central computer totals each retailer's transactions. Theoretically, the retailer terminal could total the transactions and transmit only the total to the central computer. This would yield savings in communication and central data processing costs, but would substantially reduce the controls on retailer abuse. Because these controls would be less stringent than the current coupon system, where the retailer must present coupons as evidence of transactions completed, it is assumed that transmitting only summary data would be unacceptable.

The EBT Center formats transaction summaries to meet the requirements for electronic funds transfers through the Automated Clearing House (ACH) network. The resulting file is delivered or transmitted to a financial institution that acts as ACH interface. The transfers move funds from the interface bank's account to the retailers' accounts at their local banks, and the interface bank requests a corresponding transfer from USDA to cover the deposits.

As an alternative to the ACH, a local bank could perform a clearing function. All banks with participating retailers would establish accounts at the clearing bank, which would transfer funds directly into those accounts. The clearing bank would then proceed with the wire funds transfer request, or USDA could establish an account at the clearing bank, which would then transfer funds directly from the USDA account to the destination accounts.

Decentralized settlement. With decentralized settlement, all retailers have terminals equipped with portable storage devices, like the no-telephone retailers in the centralized settlement design. However, the settlement process resembles the flow in the coupon redemption system.

Retailers take their transaction files to their local bank. The bank reads all retailer files and copies them to a magnetic tape for overnight transmission to the Federal Reserve Bank (FRB). The FRB totals the transactions in each retailer file for each bank, and creates an ACH deposit

item to that account. The FRB transmits the ACH items to the bank, and the bank accordingly posts credits to the retailers' accounts. Retailers are normally credited two banking days after delivering the transaction files to the bank. The FRB obtains funds from the USDA Treasury account equal to the total of the ACH items for all retailers in all banks.

A slight variation on this approach would have the banks credit retailers immediately upon reading the transaction files, and then request reimbursement from the FRB. This mirrors the most common practice in the coupon system, and differs from the first approach only in that the banks, rather than the retailers, bear the cost of the "float," or foregone interest on the funds in the period between the sale and the deposit.

Decentralized settlement offers some opportunity for cost savings to the Food Stamp Program, in that communications and processing costs at the EBT Center are reduced. Some communication between the store terminals and the EBT Center are still needed to control the terminals' programming (e.g., to change the encryption keys each month).

The cost savings with decentralized settlement are achieved mainly by transferring settlement functions to retailers and banks, and thus may not represent a reduction in the overall cost to society of operating the system. Moreover, decentralized settlement makes it more cumbersome for the EBT Center to obtain data on purchase transactions, which limits the types of reconciliation that can be performed, as discussed below. For these reasons, centralized settlement is assumed in the basic cost estimates developed in Chapter 5, although the implications of a decentralized approach are explored.

Security features. Data encryption or message authentication are important components of both settlement approaches. In the centralized model, the communication that uploads transaction data must be protected. Where portable storage devices are used, special procedures are needed to ensure that the transaction files are not copied or altered. For example, the retailer terminal may use a secret algorithm to create an offset to the transaction amount as part of each transaction record; each transaction can then be validated as being generated by a legitimate terminal. Reconciliation is also a central element of security in both settlement approaches, as discussed in the next section.

3.4 RECONCILIATION AND MONITORING

The coupon system and the Reading EBT system occupy opposite ends of a spectrum of data availability and reconciliation capacity. The coupon system records coupons issued to recipients and coupons redeemed by retailers, but it has no information on the intervening process and no capacity to reconcile issuances against redemptions. The Reading system produces a record of every step in the flow of benefits, from agency to recipient to retailer to bank, and can fully reconcile issuances against redemptions.

An off-line system could be designed with capabilities similar to the coupon system, similar to the Reading system, or somewhere in between. This section illustrates the options by describing three scenarios: a "full reconciliation" design comparable to Reding; an intermediate "last balance" design; and a "no balance" design analogous to the coupon system.

All three off-line designs produce four types of data:

- Allotment records. The State creates allotment records as the first step in the issuance process. These are the origin of the files sent to the issuance machines.
- Issuance records. When an issuance machine credits a recipient's account, it creates a record of the transaction and subsequently transmits it to the EBT Center. It would be logically possible to design a system without this feature, because the interaction of the card and the issuance machine protects against duplicate issuance. Omitting this feature, however, means that the program would not know the value of food stamps it issues or which recipients claim their benefits and which do not. In fact, it would not know the total number of households actually participating in the program. Because this level of information is present even in the coupon system, and because audit trail regulations appear to require the program to maintain records for all transactions in which it is directly involved, issuance records are assumed to be mandatory.

each issuance to a household on the card itself. Because the card does not automatically return to the food stamp

information about how many allotments had been credited to the household's card since the card was issued.

- Purchase records. The retailer terminals capture information on electronic purchases and refunds. This is more than the minimum logical requirement for settlement, as terminals could be programmed to retain only a running total of the value of transactions since the last settlement transmission. This would be analogous to the total on a Redemption Certificate in the coupon system, but in that system the retailer presents the coupons as evidence that the total is correct. Not capturing individual purchase data means that, apart from the design of the terminal itself, the system has no protection against inflated redemptions due to terminal error, tampering with the terminal, or fraudulent transaction entries. Accordingly, we assume that data on individual purchases must be captured.

Manual transactions, coupon conversions, and other special transactions also produce individual records. These are required for audit trail purposes, because the State (i.e., the local office or the EBT Center) is responsible for these transactions.

- Deposit records. Each funds transfer to a retailer account (in centralized settlement) or each local bank credit for a retailer's food stamp deposit (in decentralized settlement) generates an individual record. These records are analogous to the record of Federal Reserve Bank transfers to local banks in the coupon system.

Given that any off-line system contains all four types of data, the main differences lie in where the data go and how they are used.

Full reconciliation. The EBT Center could use issuance and transaction records to maintain a "synthetic balance" for each recipient's account. That is, when each day's transaction data arrive from the issuance machines and POS terminals, the computer can construct a recipient's balance by taking the previous day's balance, adding the value of issuances and other credits received, and subtracting the value of purchases and other debits. This would require a file structure and data processing system somewhat analogous to that of the Reading system, in that an account would have to be maintained for each household and each transaction would have to be posted to the appropriate account.

A recipient's synthetic balance after a particular transaction might differ from the balance on the card, for a variety of reasons. For example, a

grocer might neglect to enter a manual transaction through the manual transaction recorder. The card balance might be incorrect due to card failure or tampering. The synthetic balance might be incorrect because of a processing error, such as duplicating or deleting a transaction. An incorrect synthetic balance does not necessarily indicate a true problem, but an incorrect card balance implies a risk of loss. If the card balance is incorrectly high, the Food Stamp Program stands to lose that amount of benefits. An incorrectly low balance represents a potential loss to the recipient. Comparing the card balance to the synthetic balance will identify all "out-of-balance" accounts, including any fictitious account numbers that may have been established on counterfeit or altered cards. If examining the transaction history for an out-of-balance account does not yield reconciliation, the EBT Center transmits information to the issuance machines. When the card is next inserted in an issuance machine, the recipient is instructed to go to the food stamp office.

Complete reconciliation requires knowing the balance on the card. To achieve this, each issuance and purchase transaction must not only write the post-transaction balance onto the card, but also record it in the transaction record that will be transmitted to the EBT Center. This allows comparison of the synthetic balance to the card balance at any point in the recipient's account history (with a one-day lag).

Although recipient accounts could be reconciled daily, less frequent reconciliation would reduce costs with little expected loss in value. With less frequent reconciliation, the only daily balance update would be in a "current card balance" file. This file would contain the card balance as of the last known transaction (i.e., the last issuance, purchase, or other transaction that has been transmitted to the EBT Center). The current card balance file would be used to authorize manual transactions and to replace benefits for damaged or destroyed cards.

Periodically, probably in the week before issuance each month, transaction data would be used to compute each recipient's synthetic balance as of a selected date, taking account of all transactions since the synthetic balance was last computed. The new synthetic balance would be compared to the card balance for the same date.

Detailed transaction data would be accessible on-line for one month, and could be used during that period to resolve client or retailer problems

with their accounts. After one month, transaction data would be archived on tapes or microfiche.

Full reconciliation is facilitated by a centralized settlement approach, but can be accomplished with decentralized settlement. Full reconciliation requires all transaction data captured in the retailer terminals to be forwarded to the EBT Center. This occurs automatically with centralized settlement. In decentralized settlement, the bank would send a copy of the retailer files to the EBT Center in parallel with its transmission to the Federal Reserve Bank. This leads to some delay in performing reconciliation. It also creates an additional source of discrepancies if some retailers delay in taking their transaction files to the bank, because the synthetic balance created as of a particular date may not include all transactions. This problem could be common, as a number of smaller retailers in Reading deposit their food stamp coupons only once a week.

The full reconciliation approach includes performance of the following primary reconciliations, all of which are roughly comparable to reconciliation performed in the Reading on-line system:

- Issuance reconciliation. Each month, allotment records (i.e., allotments authorized) are compared to issuance records (i.e., amounts credited to recipient cards) for each household. System totals for allotments transmitted from the State to the EBT Center are compared to total allotments transmitted to issuance machines on a daily basis.
- Deposit reconciliation. Each retailer's purchase records and deposit records are reconciled monthly. System totals for purchases and deposits are compared daily. In addition, total deposits are compared to total transfers from USDA daily.
- Account balancing. Each recipient's account is reconciled monthly by comparing the synthetic balance and the card balance, as described earlier. Based on this reconciliation, it is possible to describe total system activity in terms of benefits issued, benefits redeemed, and benefits outstanding in account balances.

Last balance. The last balance design is very similar to the full reconciliation design, but no transaction data are maintained on-line and synthetic balances are not created.

Data from retailer terminals flow to the EBT Center as in the full reconciliation system. The EBT Center reads the data to summarize retailer transactions and to update a current card balance file. The transaction data are immediately archived on tape or microfiche. Like the full reconciliation approach, a last balance design can be used with decentralized settlement, but is easier with centralized settlement because the requisite data already flows to the EBT Center for other purposes.

Issuance reconciliation and deposit reconciliation are essentially the same in the last balance approach as in the full reconciliation approach. No recipient account balancing is performed, however, which also means that total issuances cannot be reconciled against total redemptions. The system does not identify out-of-balance cards unless a recipient reports a problem with the card.

As in the full reconciliation design, the current card balance file is used to authorize manual transactions and replace benefits on damaged or destroyed cards.

Recipient account balance problems in this design may be resolved by either of two procedures. Archived data may be retrieved, although probably with a lag of one or two working days. If the system uses chip or laser cards, individual transactions can be recorded on the card, and problem resolution can be accomplished without recourse to other data except when the cards are damaged.

Most retailer problems will be resolved on the basis of the totals generated by the EBT Center and the retailer records (receipts for individual transactions, totals for shifts or other intervals). Occasional reference to archived records may be needed.

No balance. In the no balance design, purchase data does not flow to the EBT Center. Accordingly, a no balance approach is likely to be chosen only in combination with decentralized settlement. Banks would send retailer files to the Federal Reserve Bank, which would credit the banks and then transmit the files to the FNS Minneapolis Computer Service Center (MCSC). MCSC would perform some reconciliations and archive the data after performing its monitoring analyses.

The no balance design includes the same two reconciliations as the last balance design (issuance and deposit reconciliation). The only differ-

ence is that retailer-level deposit reconciliations are performed by the Federal Reserve Bank and MCSC rather than the EBT Center. The FRB and MCSC would have the data necessary to perform these reconciliations in the full reconciliation and no balance designs as well. If the EBT Center has the data, however, it would probably perform the transaction-level reconciliations because it has the easiest access to recipients, retailers, and operating information that may be needed to resolve discrepancies. As in the last balance design, the no balance design does not reconcile total issuances with total redemptions, nor does it identify out-of-balance accounts.

In addition, the no balance design does not provide an account-specific basis for authorizing manual transactions or replacing benefits in damaged or destroyed cards. Policy options for performing these functions without account balances were described in Section 3.1.

Recipient and retailer account problems would not be resolved by reference to archived transaction data, except in extraordinary circumstances (e.g., litigation). With chip or laser cards, the transaction history on the card would be used for problem resolution. Retailer problem resolution would be based on retailer records and deposit reconciliation data.

The basic cost projections in subsequent chapters assume a full reconciliation approach, because this approach offers maximum protection to the program and maximum convenience to recipients and retailers. The costs of the no balance approach are also explored; the last balance system would be expected to have costs in between the other two approaches.

3.5 MANAGING RETAILER PARTICIPATION

The off-line system involves essentially the same activities as the on-line system for managing retailer participation. FNS, through its Regional and Field Offices, authorizes and de-authorizes retailers. In an EBT system, FNS notifies the State of each such action so that newly authorized stores can be equipped and trained, and equipment can be removed and accounts closed for stores no longer authorized. Retailers participating in an EBT system also need equipment maintenance and supplies, a means to report problems or request manual authorizations, reconciliation data, and a procedure for resolving deposit problems. All of these functions have been discussed in previous sections.

3.6 THE POS/ACD APPROACH

The discussion thus far has described a "pure" POS EBT system -- that is, a system in which all food stamp benefits are redeemed through electronic transactions at the point of sale. An alternative approach would allow some benefits to be redeemed as traditional paper coupons, while others are redeemed through electronic POS transactions.

The POS/ACD approach could be of interest for several reasons. First, retailer terminals could be placed only in the higher-volume stores, potentially resulting in cost savings. Second, the POS/ACD system would offer recipients the choice of redeeming their benefits through either coupons or electronic purchases, depending on which medium was more convenient and comfortable to them. Finally, a POS/ACD approach could be considered a transitional measure. It could be used at the borders of an EBT area to allow recipients to shop in stores outside the area, or it could support a staged implementation strategy in which stores are only gradually equipped for electronic transactions.

The key feature of the POS/ACD system is a machine that dispenses coupons, much like the widely used automated teller machines that bank debit card holders use to obtain cash. The coupon dispensing machine would logically be combined with the issuance machine, so recipients would visit the machine either to have their new allotment credited to their card or to draw out part of their existing card balance in coupons.

The main differences between the pure POS and the POS/ACD approaches to performing the five basic functions are summarized below.

Authorizing recipient access to benefits. The recipient's benefit card in the POS/ACD system is identical to that in the pure POS system. Procedures and options for issuing the card, crediting allotments to the card, and handling lost or stolen cards are the same as those described above.

Recipients may choose at any time to obtain coupons with any or all of the benefit amount shown in their card balance. Recipients insert their card into the ACD/issuance machine, enter their PIN, and enter the amount of coupons they wish to obtain. The machine dispenses coupon books with the appropriate values, and prints out a receipt showing the amount of coupons issued and the amount of benefits remaining in the card balance.

Because the smallest denomination of coupons is \$1, recipients may obtain coupons with even dollar values only.¹ If a recipient has \$9.75 remaining on the card, only \$9 in coupons may be obtained from the issuance machine. A recipient moving from the area served by the POS/ACD system may go to the local food stamp office to convert all remaining benefits to coupons, as in the pure POS system.

The coupon dispensing element of the POS/ACD system implies some additional requirements for FNS and the State food stamp agency. FNS must contract for printing and distribution of coupons, as in the current coupon system. The State agency must keep the ACD/issuance machines stocked with coupons, which involves ordering the coupons, warehousing them, and resupplying the machines as necessary. This will require a data system providing daily information on machine inventory levels and expected demands based on past usage patterns.

Allowing recipients to use benefits. Recipients use their benefits either through coupon purchases, as in the coupon system, or through electronic transactions as in the pure POS system. A POS/ACD system might provide equipment for electronic transactions to only a subset of the retailers authorized to participate in the Food Stamp Program. For example, retailers with small volumes of food stamp transactions or retailers without telephones might not be equipped. In this situation, recipients could make electronic purchases only at the equipped locations, but could redeem coupons at any participating establishment.

A POS/ACD system might not use a manual authorization procedure when electronic POS transactions could not be completed. Rather, recipients might be required to visit an issuance machine to obtain coupons to pay for their purchase.

Crediting retailers for benefits accepted. The POS/ACD system must credit retailers both for coupon benefits and for electronic benefits they accept. Although the requirement for dual crediting systems is novel, the crediting procedures themselves are identical to those in the current coupon

¹A POS/ACD system could be designed to dispense coupons in larger increments, such as \$10. This might allow some economies in issuance machine design. It would be more inconvenient for recipients, however, especially those who would otherwise shop exclusively at stores that happen not to be equipped for electronic transactions.

system and the pure POS EBT system. Settlement for POS transactions may be either centralized or decentralized, as in the pure POS system.

Reconciliation and monitoring. The POS/ACD system performs the same reconciliation and monitoring functions as the pure POS system, but also appends some procedures for reconciling coupon redemption.

The POS/ACD system generates records of three kinds of individual recipient transactions: allotments credited, coupon disbursements, and POS purchases (and refunds). These records are sufficient to maintain synthetic balances for recipient accounts, if the full reconciliation approach is preferred. The synthetic balance represents only the benefits remaining on the recipient's card; however, it does not count any coupons the recipient has obtained but not yet spent. This means that issuances cannot be fully reconciled against redemptions, either for an individual recipient or for the system as a whole. The full reconciliation approach therefore has slightly less value than it has in a pure POS system. Both the last balance and the no balance approaches to account maintenance are viable options in the POS/ACD system, with no difference from their characteristics in a pure POS system.

The POS/ACD system must also adopt some current coupon system procedures for reconciling and monitoring redemptions. These procedures are based on the Redemption Certificate that the retailer completes and the Food Coupon Deposit Document filed by the bank. As in the coupon system, these procedures provide no record of individual recipient purchases.

Managing retailer participation. Managing retailer participation in the POS/ACD system is almost the same as in the pure POS system. The only difference is that retailers must be trained in accepting coupons as well as electronic benefits.

3.7 THE MULTI-PROGRAM POS APPROACH

In discussing both the pure POS EBT system and the POS/ACD system, we have assumed that the system serves only the Food Stamp Program. Alternatively, the system could be designed to serve other public programs as well. These might logically include other public assistance in which food stamp recipients frequently participate, such as Aid to Families with Dependent Children (AFDC), General Assistance (GA), Medicaid, the Supplemental Food Program for Women, Infants and Children (WIC), and others. A multi-program

approach could present an opportunity for the Food Stamp Program to share some EBT system costs with other programs, and might offer recipients some additional convenience because of the need to learn fewer procedures or keep track of fewer documents.

The mix of programs served in a multi-program POS system could obviously vary from State to State, depending on what programs are offered, the administrative structure of the programs, their level of automation, and the policy objectives of the State. Which programs the system serves will determine a number of aspects of system design, such as how many terminals of what type are needed in what location. For discussion purposes, however, we assume the system includes the AFDC, GA, and Medicaid programs. These programs overlap substantially with the Food Stamp Program in terms of households served and local administrative structure.

It is natural to consider including WIC in the group of EBT-linked programs because most WIC recipients also receive food stamps and, like food stamps, WIC benefits are redeemed in grocery stores. WIC benefits, however, resemble "prescriptions" for certain amounts of certain types of food. A WIC purchase therefore requires matching particular items in the purchase with the particular food types and quantities on the prescription. Vendors are reimbursed by submitting to the State documentation of the items sold and prices charged. Fully automating this process would require electronic scanners and complicated coding systems to relate many items in a store's inventory to the WIC food categories. Because of the high cost of scanning equipment, which many WIC-authorized stores do not have, this application is not considered feasible. A partially automated system is also conceivable, in which cashiers would enter a product identification code, quantity, and price for each WIC item into the EBT terminal. This approach places a substantial burden on the cashier, which would probably make it unacceptable to many retailers. Based on these considerations, WIC is not included in the multi-program systems explored in Chapter 5.

The general concept of the multi-program POS system is that a household would receive a single card to authorize access to benefits in all of the participating programs. Households could use food stamp benefits or benefits from cash assistance programs (AFDC and GA) to buy food at terminals in participating food stores. They could obtain cash from cash machines using

their AFDC or GA benefits, and they could be authorized for medical services by health care provider terminals.

The remainder of this section briefly describes how the multi-program POS system approaches the five basic issuance system functions. It describes the system from the perspective of the Food Stamp Program, focusing on the ways the multi-program system would differ from the pure POS approach. It does not attempt to specify in detail the configuration of those parts of the system that serve only the other assistance programs.

Authorizing recipient access to benefits. The access card in the multi-program system contains the same Primary Account Number and PIN offset as in the pure POS system. Food stamp information on the card is also identical. In addition, the card contains data fields for AFDC and GA equivalent to the food stamp fields for issuance and balance information. For Medicaid, the card contains at least an indication of the household's current eligibility status, and it may identify eligible case members.

Card issuance procedures will depend on the extent to which certification operations are integrated at the local office level. For example, where a "generic" worker handles all programs, a recipient may fill out a single application form, receive the card already activated for all programs, and be trained in using it for all programs in a single training session. Where the programs are separately administered, however, the recipient may have to apply separately for food stamps. If the recipient has not already been approved for other forms of assistance, the food stamp worker issues the EBT card as in the food-stamp-only system. If the recipient already has an EBT card issued by another program, the food stamp worker simply posts the initial food stamp allotment onto the card and the recipient is immediately able to use it.

The recipient visits the issuance machine to obtain each food stamp allotment, as in the pure POS system. The only difference is that the same visit serves also to post AFDC or GA benefit amounts and current Medicaid eligibility status to the card. Procedures for lost, stolen, and damaged cards are the same as with pure POS, although benefit replacement policies could differ in the other programs (e.g., AFDC benefits might be replaced even if food stamp benefits are not).

Allowing recipients to use benefits. Recipients use their food stamp benefits in the multi-program POS system just as they do with pure POS. All electronic and manual transaction procedures are the same.

Recipients with AFDC or GA benefits may use them in food retailer terminals as if they were food stamp benefits, but without restrictions on what items may be purchased. These programs' benefits will presumably be usable at other types of terminals as well, such as cash dispensers (probably ATMs) and perhaps POS terminals at other retail locations.

For the Medicaid program, the system assumed here performs only an authorization function. The recipient's card is inserted in the health care provider's or pharmacy's terminal and the recipient enters the PIN. If the PIN is correct, the terminal computes an authorization number (probably using an algorithm that combines the PIN offset with some other information, such as the terminal identification number or the date). The provider uses the authorization number on the normal Medicaid claim forms.

More extensive Medicaid applications can readily be conceived, in which the EBT system is used for filing claims or for maintaining medical history information. Such applications could have implications for the choice of a benefit card technology, because they would probably require more data storage capacity than normal magnetic stripe cards offer. They would also have implications for the design of the Medicaid terminals and the flow of information, but these factors would not affect the parts of the system visible to the Food Stamp Program.

Crediting retailers for benefits accepted. Food retailers are credited in the multi-program POS system through the same procedures used for centralized settlement in the pure POS system. Decentralized settlement is an unlikely option for the multi-program system because of the need to sort the various types of transactions that may occur at the grocer terminal (food stamps, AFDC, or GA) and get the data to the appropriate program. Thus, transaction data are transmitted each day to the EBT Center from all terminals (except Medicaid-only terminals). The EBT Center totals the various types of transactions, initiates the appropriate funds transfers, and passes transaction data on to the various programs' data centers.

Reconciliation and monitoring. Food stamp reconciliation and monitoring procedures in the multi-program system are identical to the pure PCS system. The full range of account balancing options -- full reconciliation, last balance, or no balance -- is available in the multi-program environment.

The focus of reconciliation responsibilities may vary according to the division of functions between the EBT Center and the data centers supporting the participating programs. In its smallest role, the EBT Center would be little more than a routing agent. The food stamp data center, and those for the other programs, would send a daily list of allotments to the EBT Center, which would transmit the appropriate files to the issuance machines. Similarly, the EBT Center would obtain transaction data from the issuance machines and POS terminals (except Medicaid terminals), sort the data by program, and send each program's data to the appropriate data center, which would perform the necessary reconciliation and file maintenance activities. At the other extreme, the EBT Center could perform for all programs all of the functions described previously in the food-stamp-only context, although Medicaid reconciliations would include only issuance reconciliation. This is most likely where State-level operations for the various participating programs are already relatively highly integrated, especially in the area of data processing. In less integrated situations, differing procedures are more likely to cause individual programs to want separate control over file management and reconciliation operations.

Managing retailer participation. The multi-program EBT system includes a variety of establishments other than food retailers, and an individual establishment could potentially be authorized to accept benefits from any one or combination of the participating programs. Thus, although each program continues to authorize and de-authorize particular establishments, a single entity is responsible for equipping, training, and servicing them. For the Food Stamp Program, this might imply a difference in organizational responsibility but no difference in the actual procedures for managing retailer participation.

3.8 SUMMARY

Examining the ways an off-line EBT system might perform food stamp issuance functions indicates that an off-line approach is conceptually

feasible, as expected. The examination also suggests, however, that building an off-line system will involve some major design choices and pose some important challenges.

Among the design choices, which are summarized in Exhibit 3-1, four stand out as particularly important in determining the off-line system's structure. These involve the issuance machine, the settlement approach, the maintenance of purchase transaction data, and manual transaction procedures.

Issuance machines or disposable cards. Some mechanism is needed to get new allotment amounts posted frequently, because allotments change for a significant portion of food stamp households each month. The most viable approaches appear to involve an issuance machine, a system component not needed in an on-line EBT system. A mail-out, disposable benefit card might be an alternative.

Centralized or decentralized settlement. The procedures for crediting retailers could parallel on-line procedures, with purchase data transmitted to the EBT Center. Alternatively, they could follow the coupon model, with the retailers taking transaction files to their local bank. The choice has potential implications for the design of retailer terminals and the central computer facility, and for the effort retailers and banks must devote to effecting settlement.

Account maintenance and reconciliation. The off-line system can approximate either the coupon system's absence of information on what recipients do with their benefits, or the on-line system's complete record of each household's transactions and current balance. With the latter approach, the off-line system can reconcile total issuances against total redemptions. Choosing an account maintenance approach affects the policy options for handling manual transactions, lost and stolen cards, damaged cards, and recipient account problems.

Manual transactions. In providing for situations when an electronic purchase cannot be completed, the first decision is whether or not to allow manually authorized transactions. If manual transactions are allowed, the key questions are whether and what kind of balance information will be checked, and how the card balance will be adjusted to reflect the purchase. These

choices have implications for the nature of equipment in the stores as well as

the EBT Center's functional and data requirements.

In these four choices and in other aspects of system design, security is a pervasive challenge. Any EBT system must have a means to prevent legitimate accounts from being overdrawn and to prevent the use of non-existent accounts. An on-line system affords this protection by maintaining a constantly updated central balance for each account and checking the balance before authorizing any transaction. An off-line system relies mainly on the interaction of the card and the terminal to ensure the legitimacy of the transaction. The off-line system therefore needs more physical and electronic protection for cards and terminals, while the on-line system needs more communication and central data processing.

A somewhat surprising finding is the absence of a need for extensive transaction information on the recipient's benefit card. Maintaining such information provides little or no advantage for the primary functions of issuing benefits, authorizing transactions, and crediting retailers. It would be useful for resolving certain client account problems, but alternative approaches to this function exist within an off-line context. This opens the possibility that an off-line EBT system could use benefit cards with limited storage capacity, a possibility explored further in the next chapter.

The conceptual analysis suggests that, in most respects, off-line and on-line EBT systems offer parallel paths to a similar end. An off-line approach may have advantages in two areas however. First, an off-line system may accommodate retailers without telephones more readily because it does not require immediate communication to authorize purchases. Second, the issuance machine in an off-line system may have the potential for additional future applications in the Food Stamp Program, such as capturing information about changes in recipient circumstances. Although these advantages are not likely to be decisive in choosing between an off-line and on-line approach, they could be significant secondary considerations in some program environments.

EXHIBIT 3-1: SUMMARY OF OFF-LINE SYSTEM DESIGN OPTIONS

<u>System Function or Feature</u>	<u>Dimension of Variation</u>	<u>Options (* = basic design)</u>	<u>Reading System</u>
Issuing benefit cards	How long card lasts	<ul style="list-style-type: none"> - *Indefinite, multiple allotments - One allotment, disposable card 	Indefinite, multiple allotments
Crediting allotments	Cycle of allotment posting	<ul style="list-style-type: none"> - *Each allotment posted separately - Advance posting for full certification period 	Each allotment posted separately
	How recipient gets allotment	<ul style="list-style-type: none"> - *Visits issuance machine - Issuance machine if no change, office visit if change - New card comes in mail 	Automatic posting to account
Lost and stolen cards	Benefit replacement	<ul style="list-style-type: none"> - *None - Prior day's balance, after one-day wait - Prior day's balance, immediate - Standard amount set by policy 	Remaining balance when reported
	Procedure for closing account	<ul style="list-style-type: none"> - *No further allotments credited, but card may still be used - Hot list - Selective on-line authorizations 	Immediate stop at central computer
Damaged or destroyed cards (not readable)	How balance determined	<ul style="list-style-type: none"> - *Prior day's card balance, after one day's wait - Prior day's balance, immediate - Standard amount set by policy 	Balance in central file at time of report
Cash change	Amount of electronic purchase or refund	<ul style="list-style-type: none"> - *Exact dollar and cents amount, no cash change - \$1 increments, cash change up to \$.99 	Exact dollar and cents amount, no cash change

EXHIBIT 3-1 (continued)

<u>System Function or Feature</u>	<u>Dimension of Variation</u>	<u>Options (* = basic design)</u>	<u>Reading System</u>
Electronic purchase impossible	Alternative transaction procedure	<ul style="list-style-type: none"> - *Manual authorization - No manual authorization, use cash or different store 	Manual authorization
	Balance adjustment procedure	<ul style="list-style-type: none"> - *Manual transaction recorder, adjustment by next terminal - Recipient visits issuance machine - Deducted from next issuance 	Immediate adjustment at central computer
Recipient balance information	Telephone balance information	<ul style="list-style-type: none"> - *Not provided - Previous day's card balance 	Current balance provided
Normal settlement	Transaction data flow	<ul style="list-style-type: none"> - *Batch electronic transmission from terminal to EBT Center - Retailer takes cartridge tape or chip card to bank 	On-line electronic transmission to EBT Center
	Transfers to retailer initiated by:	<ul style="list-style-type: none"> - *EBT Center (centralized settlement) - Local bank/Federal Reserve Bank (decentralized settlement) 	EBT Center
Retailers without telephones	Transaction to EBT Center through:	<ul style="list-style-type: none"> - *Cartridge tapes or chip cards - Manual transaction receipts 	Manual transaction receipts
File maintenance	Recipient account balance maintained at EBT Center	<ul style="list-style-type: none"> - *Previous day's card balance, synthetic balance possible - Previous day's card balance only - No balance 	Operative balance in central computer
Reconciliation	Reconciliations include:	<ul style="list-style-type: none"> - *Issuance, deposit, and recipient account balancing - Issuance and deposit only 	Issuance, deposit, and recipient account balancing

Chapter Four

TECHNOLOGY ASSESSMENT

The discussion in Chapter Three indicates that it is theoretically possible to design an off-line electronic benefit transfer (EBT) system that will meet the functional requirements of the Food Stamp Program. This chapter addresses the question of whether it is technically feasible.

To assess technical feasibility, the chapter examines in turn each of the major components of an off-line EBT system, including:

- access cards;
- point-of-sale (POS) terminals;
- issuance machines;
- central computer facility;
- software; and
- communications.

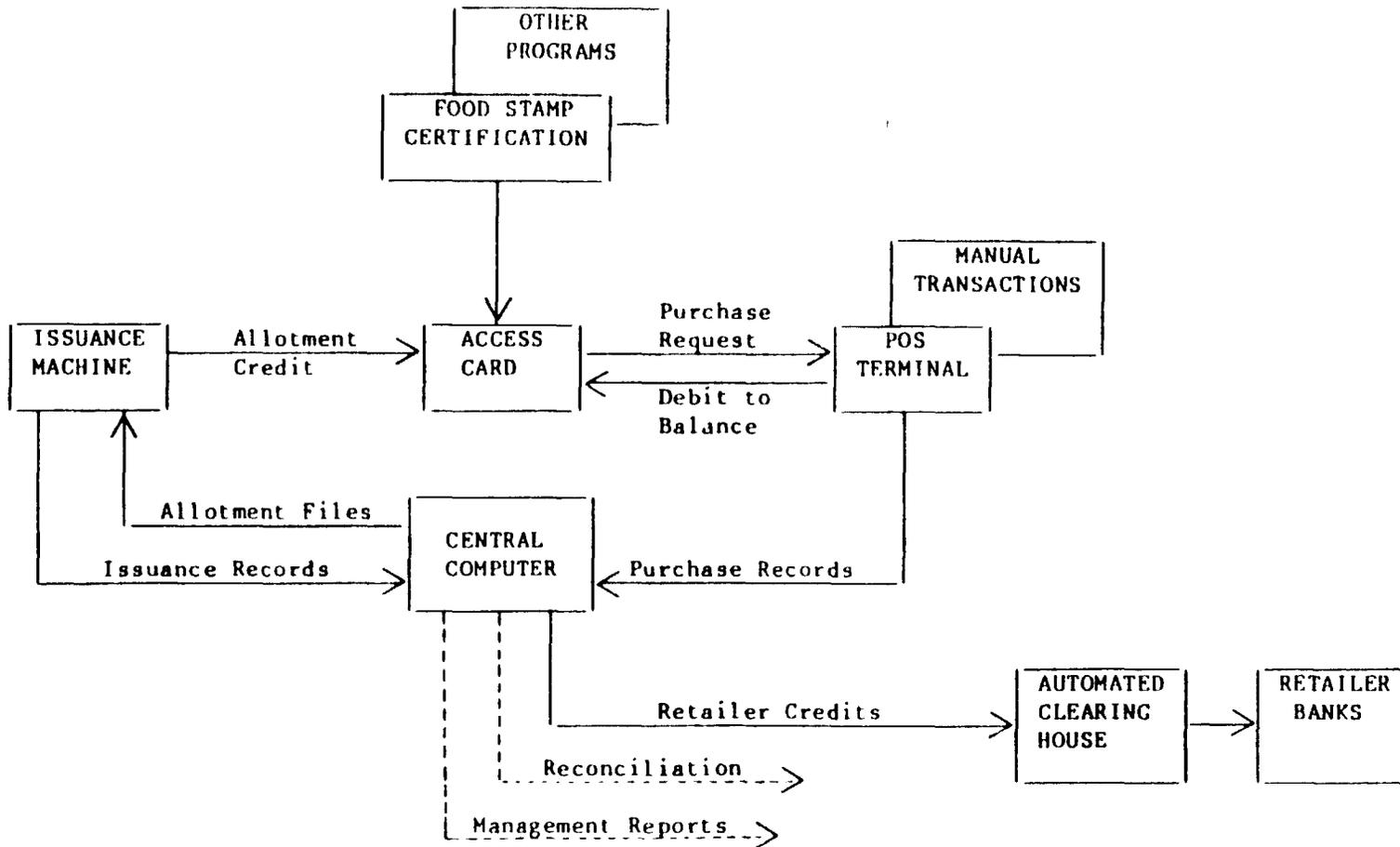
The overall functioning of these components in an off-line EBT system is summarized in Exhibit 4-1.

The central issue in assessing technical feasibility is availability -- that is, are products available that will perform the functions required by an EBT system with a sufficient level of reliability and security? In many instances, the answer depends on exactly what is meant by "available." For purposes of this study, availability is defined in terms of four categories:

- Available. This category means that a product can be purchased immediately, "off the shelf" in quantity, with a set delivery schedule.
- Restricted Availability. This category means that a small number of the products exist, typically in a prototype form. It is highly likely that the product will be available off the shelf within three years, by 1990.
- Available with Modifications. A product in this category could be available following a series of modifications to current products. The extent of the modifications could vary from the relatively simple to the more complex. A good example is the automatic coupon

Exhibit 4-1

The Off-Line Electronic Benefit Transfer Process



dispensers (ACDs) discussed later. At least three major vendors report that they have equipment which could meet the needs described, but that it would require modifications to features such as memory capacity, communications handling ability, dispenser throats, and the safe of the devices that would hold negotiable stamps.

- Unavailable. This category contains those devices which, while vendors believe they could be produced, do not currently exist and are not planned. An example of this type of product would be a point-of-sale terminal which reads laser cards; these are not available on the market, and no vendor interviewed in the study has plans for making them available in the near term.

It is important to note that the industry segments covered in this study are developing and changing rapidly. New products are constantly being introduced and existing products modified. It is possible that some products now considered available with restrictions, or even unavailable, could become readily available in a matter of months. A major EBT application could itself have this effect by providing the capital or the clear market opportunity that would motivate investment in product development. For purposes of this report, however, availability categorizations are based on the environment existing at the time of the interviews.

Each of the major components of the EBT system is discussed below, with information regarding the ability of existing technology to fit FNS functional and performance requirements, the extent and result of applications in experiments, pilot tests, or operating environments, the availability of products and support services, and developments expected within the next three years.

4.1 ACCESS CARD

The access card or benefit card provides the recipient entry into the EBT system. The card allows entry by giving access to machines which dispense benefits or authorize purchases. The card must hold information about the user and the account balance, have sufficient reliability to perform program functions without a high replacement rate, and possess enough integrity and security that it cannot be easily counterfeited by a person without extensive "insider" information.

The card would contain, in machine-readable form, at least the following:

- a Primary Account Number (PAN) (16 characters);
- a Personal Identification Number (PIN) offset (4 characters);
- the amount and date of the last allotment credited to the card (12 characters);
- the currently available balance (6 characters);
- the amount of a manual transaction (4 characters); and
- any further security data such as check digits (2 characters) and offsets to the allotment and balance information (4 characters each).

The minimum requirements for card capacity, based on this structure, would be about 20 characters of identification information and 32 characters of rewritable financial information and associated security fields. If the card technology does not involve rewriting fields, more space is required to record the balance after each transaction.

A multi-program POS system would have more extensive requirements. Each cash assistance program, such as Aid to Families with Dependent Children (AFDC) or General Assistance (GA), would require an additional 32 characters in financial and security fields. Little or no additional capacity would be required for identification because a single account number would be the key to the various program accounts.

Medicaid authorization documents typically contain some identifying information on each eligible member of the case, such as name, birth date or social security number, and sometimes further identifying or programmatic information. An EBT card could store this data in machine readable form or have it printed or embossed on the outside of the card. It is also possible to envision the case member information on a separate document, with the EBT card serving only to verify the identity of the head of the case. Thus the access card might require only a few characters of additional space for Medicaid, or it might require up to several hundred characters for case member information. A Medicaid application using the EBT system for claims processing or medical data recording would require much more extensive storage

capacity. Similarly, most applications for programs offering benefits other than cash, such as the Supplemental Food Program for Women, Infants and Children (WIC), would require more extensive storage. Their benefits tend to be sufficiently complicated that they cannot be described in a few characters of numeric data.

This chapter discusses five general categories of off-line access devices: standard magnetic stripe cards; integrated circuit (chip) cards; optical memory (laser) cards; decrementing value (token) cards; and non-standard magnetic stripe cards. All of these technologies are capable, at least in theory, of fulfilling the basic functional requirements of identification, access to benefits, and benefit redemption. All five are available at some level. They can be purchased in quantity, but with marked differences in the levels of implementation in a financial transaction environment within the United States.

STANDARD MAGNETIC STRIPE CARDS

Standard magnetic stripe cards are those cards which conform to American National Standards Institute (ANSI) standards, especially X4.13 and X4.16 (see Appendix D). Often described as the financial transaction card or bankcard, the standard magnetic stripe card contains magnetically encoded information in a series of information tracks on a magnetic stripe on the back of the card. At card issuance, the stripe is encoded with information regarding the cardholder's accounts and the card issuing organization in standardized positions and formats.

Hundreds of millions of standard magnetic cards are in use in the United States and the card is well beyond any experimental or pilot stage.¹ An entire industry exists to support the production, embossing and encoding, and use of standard magnetic stripe cards. These cards are used as credit and debit cards by financial institutions, MasterCard, VISA, American Express, Diners Club, and other major financial transaction systems. In the last few

¹The Nilson Report, HSN Consultants, Inc., February 1987, reports there are over 700 million magnetic stripe cards in the U.S., with banks, travel and entertainment, and oil companies accounting for 350.3 million cards. All bank, travel and entertainment, and most oil company cards are standard magnetic stripe cards.

years, the cards issued by major retailers, airlines and petroleum companies have begun to conform with the standard magnetic card requirements. In cases where retailer cards are not standardized with regard to size, they are typically embossed or encoded in accordance with standards; if they contain a magnetic stripe, that is usually encoded according to the standard.

Standard magnetic stripe cards are manufactured in the U.S. by a handful of large volume vendors as well as smaller suppliers. The suppliers manufacture millions of cards each year for foreign and domestic uses. The cards tend to be highly reliable with an average lifetime of between two and three years, depending on the usage and abuses to which they are submitted. An EBT system is sufficiently comparable to the common debit and credit card applications that comparable performance levels could be expected.

Functional issues. Because standard magnetic stripe cards have not generally been considered for an off-line EBT system, the first important question is whether this card can actually meet EBT functional requirements. In terms of data storage capacity, the answer appears to be affirmative.

The magnetic stripe on a standard card contains three areas, or "tracks," in which information can be stored. The use of these tracks is governed by the following conventions:

- Track I usually contains cardholder identification information. It is sometimes called the airline or oil company track because it was used by those industries. New bankcard specifications require placing cardholder data, such as name and address, in track I. Standards require the stripe to contain space for 79 alphanumeric characters with 76 being available for discretionary use. The other three characters are used to mark the end of the data on the stripe and to allow the terminal to determine that it has read the data correctly.
- Track II is called the "on-line" track and contains information identifying the issuer and cardholder, specifically the PAN and perhaps a PIN offset. Industry standards specify that this track contains 40 numeric characters with 37 being available for use. It is typically not rewritten by terminal devices.
- Track III, called the "Docutel stripe" or "off-line stripe" is usually used for read/write functions of off-line automated teller machines (ATMs). Industry standards call for 107 numeric characters of data on this track with 104 being usable.

Existing terminals read only two of the three tracks on the magnetic stripe: track II, and either track I or track III. For an EBT application, the PAN and PIN offset would be located on track II, following the standard. In a multi-program application, the PAN would be constructed in a uniform way across programs so that a single number could provide the link to all data bases. Track III would store the rewritable allotment and balance information and related security fields. The 104 characters of available space on track III could hold such data for three programs at 32 characters each.

The standard magnetic stripe card would probably not be able to hold Medicaid identification or other information on individual case members, although it could contain a household eligibility indicator such as an eligibility expiration date. It would be possible to devote track I to Medicaid use, with Medicaid terminals reading tracks I and II while other terminals read tracks II and III. Even if case member data could be limited to ten characters per individual, however, track I could hold only seven persons, which will be insufficient for some households. Thus, in a multi-program application including Medicaid, a standard magnetic stripe card would have to be supplemented by other documentation identifying eligible recipients.

The standard magnetic stripe card's storage capacity would also be inadequate for off-line applications requiring more detailed information storage, such as Medicaid claims processing, medical history storage, or WIC benefit issuance.

Security. Security is the main concern in using a standard magnetic stripe card in an off-line EBT system. Information on the magnetic stripe can be duplicated or altered by equipment that is not elaborate or costly. This opens the possibility that counterfeit or altered cards could be used in fraudulent redemptions. This possibility must be taken very seriously in an off-line system, especially if it does not incorporate a "hot list" feature, as discussed in Chapter 3.

It is difficult to assess the potential dollar value of losses that might result from the magnetic stripe's vulnerability. The limited industry experience in using the rewritable characteristics of a magnetic stripe card for off-line financial transactions provides a basis for concern. In the

first generations of automated teller machines (ATMs), a number of banks took the rewriting approach. Track III is still often referred to as the "Docutel stripe" for the manufacturer of ATMs who first specified the use of the track for their equipment in an off-line mode.

As ATM use increased, banks found that the off-line feature was susceptible to abuse. Unscrupulous cardholders rewrote track III and took substantial quantities of money from an ATM or, depending on the rewriting done by the ATM, went to multiple machines and deducted the daily limit from each. While no figures were ever published on the amount of loss incurred, it is noteworthy that this off-line approach was quickly abandoned.

Although this experience is sobering, it differs from the EBT context in some important respects. For example, the ATM fraud provided the perpetrator with completely negotiable cash in relatively large values (in the hundreds of dollars per incident). In contrast, a perpetrator of an equivalent EBT fraud could only get comparatively small dollar amounts of food, which has limited resale value. A retailer or someone colluding with a retailer could obtain cash by executing fictitious purchase transactions, for which the retailer receives cash credits. If the EBT system retains purchase transaction data, however, it would be easy to identify and prosecute a retailer who is a consistent or unique source of illicit transactions.

It is also important to note that the security measures used in the off-line ATM experience were not as stringent as those available today. For example, using a watermark procedure allows a terminal to verify that a magnetic stripe is legitimate, making it difficult to duplicate a card's data onto a counterfeit card or one whose value has already been used. Similarly, information can be encrypted so that no one can rewrite the data on a legitimate card unless they know the encryption key. An EBT system has a further protection in that the benefit card must look legitimate to a cashier, which allows the use of holograms and related anti-counterfeiting techniques on the card. Such security measures are discussed in more detail later in this chapter.

Given the relatively low value of card-related EBT fraud, and the security measures potentially available, it is reasonable to consider that an off-line EBT system could use a standard magnetic stripe card and meet at least the minimum security requirements of the program. Security is a relatively weak aspect of this technology, however.

Future developments. The survey respondents foresee few changes for the standard magnetic stripe card. The physical characteristics, magnetic stripe placement and encoding of the cards have been standardized on an international basis. The respondents do expect some enhancement to the ability of the magnetic stripes to carry additional information by increasing the density of data storage. For commercial uses, this information could potentially include data which would be keyed to identification techniques or to determining limits at which the cardholder would have access to services. In an EBT environment, the additional space might be sufficient to store Medicaid-related identifying information on eligible household members.

General Recommendations. The standard magnetic stripe card can be considered a viable possibility for an off-line EBT system. The card has sufficient machine-readable storage capacity to meet food stamp requirements. The card is well beyond any experimental stage, and no special development work would be required to specify how cards should be constructed. An infrastructure exists for manufacturing the cards, embossing and encoding them, and reading them in financial transaction situations. This allows the food stamp agency to select from an array of equipment and service vendors in developing and operating a system. Moreover, the standard magnetic stripe card has an advantage over other card technologies in its compatibility with equipment currently used in commercial POS networks, an issue that will be discussed further in Section 4.7.

Balancing these advantages, the standard magnetic stripe card has two important limitations. First, although it has sufficient storage capacity for some multi-program applications, it can not handle some uses that might reasonably be desired. The second problem is the magnetic stripe's vulnerability to duplication or alteration. Neither of these limitations is sufficient to rule out use of the standard magnetic stripe card, but both must be carefully considered in using this approach to an off-line EBT system.

CHIP CARDS

The chip card is also known as the integrated circuit (IC) card or as the "smart card." The names are basically a description of the ability of the card to perform certain computational and memory functions. These computational and memory functions are enabled by the presence of an integrated circuit, a chip, embedded in the material of the card.

The carrier for the chips is often a standard magnetic stripe card, and several vendors have constructed cards that contain both a magnetic stripe and a chip. It is likely that the same standards that govern the shape and other physical characteristics of the standard magnetic stripe card will apply to chip cards. This compatibility would allow a migration from one to the other with only minimal changes in the ability of the terminals which read the cards. These would include changes to the ability of the terminal reader to read a chip card and to the internal programming of the terminal to handle increased information and communication to and from the chip.

International standards are now being set for the placement of chips on cards, and it appears that any placement questions will be resolved within the next year. Prior to the International Standards Organization's (ISO) decision on the placement of chips, varying and incompatible chip locations have been used by various vendors and countries. Existing standards already specify physical requirements for the chip card, including some features related to durability such as resistance to ultraviolet and x-radiation.

Under current consideration is a set of standards for message protocols, which concern the way data is placed in and taken from the chip. The survey respondents anticipate that these message standards will be in place within three years. It is unlikely that the standardizing of protocol-type messages to and from the chips would affect an EBT system in any significant way.

Functional issues. The chip card offers considerably more memory and ability than the standard magnetic stripe card. The smallest of the chips placed in the early cards held 4,600 bits of machine readable memory, or about

920 characters. Even this is more than four times the currently available storage space on a standard magnetic stripe card, and the storage capacity of the chips placed in cards has been increasing rapidly. Among cards supplied by the vendors interviewed for this study, the smallest storage capacity is about 1,000 characters and the largest is about 13,000 characters.

With this storage capacity, the chip card clearly exceeds the Food Stamp Program's minimum requirements. The 1 KB card can carry all of the information needed for food stamp, AFDC, and GA benefit delivery, as well as adequate information to identify all members of the household eligible for Medicaid. It would have sufficient storage capacity left over to consider additional applications, such as having different PINs for different household members, some of which could be associated with purchase limits (for example, a child could have a simple PIN but a \$5 maximum purchase allowed).

The chip cards with greater memory capacity offer still further functions. For example, a card could record the date, amount, and retailer identification number for every purchase transaction. At the Reading average of eight purchases per month, a full year's transactions could be stored in about 2,000 characters. This information could be used to resolve recipient problems concerning their benefit balance. As indicated in Chapter 3, however, this function can be performed by other means providing that the EBT system retains centralized access to purchase transaction data.

Chip cards also offer the ability to have some logical operations performed inside the card. For example, the POS terminal might simply be used as a power source, data entry device, and printer. The cashier would enter the purchase amount on the terminal, which would transmit it to the card. The card itself would then calculate the new balance and send the appropriate data to the terminal for printing. This could reduce the program memory requirements for the POS terminal. In practice, however, such memory is a very inexpensive component of the POS terminal, and there is little practical advantage in the EBT context to having operations performed by the card rather than the terminal.

The most ambitious of the chip cards, although still in the prototype stage, contains a keyboard, a video display, and an internal power

supply, as well as a large memory capacity. With such features, recipients could learn their EBT balance without going to a terminal, or could enter their PIN without a PIN pad. These features are potentially useful, but they add significantly to the card's cost.

Current applications. The chip card has been widely used in Europe and in the Far East as a financial transaction card and as a way of keeping track of value units for such services as telephones. The card is just beginning to make its entry into the U.S. market after having been on the scene for a number of years with few applications. One of the better known thinkers on chip cards and EFT technology has characterized the chip card as being much like the Concorde airplane, a solution looking for a problem.

Survey respondents estimate that fewer than 200,000 chip cards are currently in use in all U.S. applications. The largest applications have been a MasterCard test of 38,000 cards and an effort by the U.S. government which includes over 60,000 cards. The MasterCard test has been completed.

The largest applications of chip card technology have been in France and several other northern European countries. These programs, generally with the support of the government or the banking community, have used the chip card as a vehicle to complete financial transactions. The cardholder uses a chip card for identification and as a vehicle for transferring value from his/her bank account to a retailer. The card is taken to a participating retailer and, following a purchase, stored value units are deducted from the purchaser's card and credited to the retailer's card. The items are then settled with value being exchanged between the cardholder's accounts and the merchant's account. The European efforts, which have involved millions of cards, have largely been successful.

American tests and pilot programs for the chip cards have involved security access to systems or property, keeping track of allotments in a closed environment, or triggering forms completion. Major users have been the MasterCard organization and the U.S. Department of Agriculture.

In the MasterCard test, chip cards were issued to cardholders along the East Coast of the United States and could be used in specially equipped

terminals at selected merchant locations. According to MasterCard officials, the test was to determine whether the card could be used as a transaction authorization vehicle and whether the technology was sufficiently reliable to retain the transaction histories. The chip card was not used to store value, however. The actual sales drafts were completed and settled as usual. MasterCard officials interviewed in the survey report that the test was a success and that the cards performed reliably. The test has since been completed and the cards' chip component is no longer in use.

The largest U.S. chip card user to date is the Agricultural

allotments for peanut farmers. This "peanut card " keeps track of the allotments across various redemption areas and serves to trigger a forms printing process at the local redemption points as well as updating a central computer file with data on which allotments have been used. Officials from the Agricultural Stabilization and Conservation Service report that they have been extremely pleased with the program and have expanded it to about 74,000 cards as of September 1987.

The Bank of America has begun to use a security system in which chip cards provide access at a number of levels of stringency. At one level, simple presentation of the card allows an employee into the parking lot. Increasingly restrictive security is used to limit access to the computer center and finally to the machine room within the center. The large memory and computational capacity of the chip card supports different security techniques at each level, with biometric verification for entry into the computer room.

The Royal Bank of Canada has used smart cards as an access control mechanism for entrance into a cash management system. The bank reports excellent results with the cards, and there is every anticipation that this sort of use will continue.

In several other applications, the card is used to collect information across many points, as when a salesman is taking orders, and to keep track of customer accounts at a brokerage firm. As in the peanut card program, the cards trigger the completion of invoices, with their storage capacity used to provide transaction summaries.

Security. As might be judged from its applications as a secure access device, chip card security is generally considered strong. Two factors underly this assessment. First, card production is technically sophisticated, making the cards difficult and expensive to counterfeit. Second, the card's large memory and ability to perform logical operations support relatively complicated verification, encryption or other security procedures. For example, most biometric verification procedures require storing a substantial amount of digitized data. The card's internal processing capacity could be used to perform a PIN check without storing the security key in POS terminals, or to check the validity of a terminal's "signature" before accepting a transaction. The chip can also be programmed to erase itself or to lock out further access if user identification fails in a pre-determined number of attempts.

It should be noted that actual experience with the cards in the United States, particularly in situations where the card holds value, has still been limited. Hence there has been little motive or opportunity for card tampering or counterfeiting. As the potential for gain increases, it can be expected that attempts to breach the card's security will also increase. Nonetheless, the industry consensus is that the chip card's characteristics give it an inherently greater capacity for security than most other card technologies, especially those based on the magnetic stripe.

Availability. At this point, only a few U.S. manufacturers make chip cards. Most chip cards come from either Japanese or European sources and are sold in this country through organizations who have license arrangements

with or are subsidiaries of the foreign firms. Because American subsidiaries are being established, however, it is unlikely that any foreign purchase problem would develop.

For purposes of an EBT system, it is reasonable to consider chip cards available. Cards at the lower end of the spectrum of memory and functions performed will meet program requirements, and such cards can be obtained in quantity. Cards with very large memory and special features would fall in the "restricted availability" category, but these are not needed for an EBT application.

Future developments. Although considerable disagreement still exists, many observers now believe that the chip card will establish a major position as a financial transaction card in the future. The MasterCard organization has thrown its support behind chip card development. This support has taken the form of a highly visible public test as well as pronouncements by key officials that the organization expects the chip card to supplant the standard magnetic stripe card within a few years.

The VISA organization has been only lukewarm about the chip card. VISA's Chief Executive Officer announced in late July of 1987, however, that the company would proceed with its version of the chip card. The card contains an internal power source, a liquid-crystal display, and a calculator-like keyboard as well as a large memory. The announcement indicated that 15,000 cards would be "on hand" by year-end. It is expected that the cards will be marketed to affluent customers willing to pay for features such as the ability to hold account balances, foreign exchange rates, and frequent traveler information. For the most part, however, the move toward the chip card in a financial environment has been seen as an attempt to reduce fraud and counterfeiting without the communications costs of on-line authorization.

Respondents to the survey feel that the key to the development of any chip card applications in the financial transaction industry is the support of VISA and MasterCard. At the same time, they point out that VISA and MasterCard now support large authorization services to enable the use of standard magnetic stripe cards. Thus the respondents see only slow acceptance of the chip card as an off-line authorization device. They foresee a blending

of reliance on the current standard magnetic stripe card with development of the chip card over a five- to ten-year period. In this scenario, the major card networks would make chip cards available to a select subset of their customers, who would be willing to pay extra for the memory and computational characteristics of the chip cards.

General recommendations. The chip card has more than sufficient capacity to perform the functions of a benefit card in an off-line EBT system. Even the most limited chip cards can readily handle a more complicated multi-program application than the standard magnetic stripe card, and they offer substantially greater security.

An EBT system can reasonably use a chip card from the low end of the range of memory and functionality, which means a card with about one kilobyte of rewritable memory. Such a card would not allow the storage of detailed transaction information, however. To record data on every purchase transaction, a card would need about three kilobytes of memory. Such cards are available, but at substantially higher prices. It seems likely that the limited food stamp functions that could be performed with this additional memory would not justify its cost.¹

Although the chip card is far from widely accepted in the United States, it can now be considered available. Moreover, it has established a good reputation for reliability in foreign applications and in the U.S. tests. The chip card has some limitations concerning the availability of equipment and compatibility with existing POS systems, but the limitations are not severe.

LASER CARD

The laser card, the more common name for the optical memory card, is a wallet size, plastic card that can store two megabytes of digital information or about 800 pages of normal text. The card, roughly the size of a

¹Based on prices quoted by vendors surveyed, this capacity would add around \$1 per case month to the EBT system's operating costs.

standard magnetic stripe card, is composed of silver layers of different characteristics bonded between polyester and acrylic-coded layers. Data are recorded by using a laser beam to make holes in the silver layers. The card appears much like a standard magnetic stripe card with a series of 35 millimeter strips of film coated or laminated with silver.

There is a single licensor of laser card technology in the United States. However, this firm has licensed its technologies to numerous other firms, including major Japanese as well as U.S. firms. The cards themselves come in a variety of sizes and capabilities. For an EBT system, the cards would probably be the size of standard magnetic stripe cards and would accept external printing of the recipient's name and account number.

In applying optical memory technology, the laser card is based on the concept of portability and durability combined with high storage capacity. According to a survey respondent, the greatest expected use for the cards is storing of large amounts of information in a small space. Some see the laser card as the "book" of the future, with long shelves of text replaced by a box of silver compound cards.

Functional issues. Because the laser card technology does not permit information to be rewritten, the minimum data storage requirements described earlier do not apply. Rather than rewriting the balance field, each food stamp transaction would be written in a new field or set of fields. For example, each purchase might record the date and amount of the purchase, a security offset to the purchase amount, and the retailer's identification number. This information would require about 24 characters of storage. Recording all food stamp transactions for a household for a year -- including allotments, refunds, and other non-purchase transactions -- would require about 3,000 characters of storage space for an average household, and about double that amount for a very active household.

It is clear that the laser card offers vastly more space than the Food Stamp Program would be likely to use (based on the figures above, the average household could use the card for over 600 years before running out of storage capacity!). The laser card could readily perform any of the multi-

program applications discussed earlier, including more complicated applications like storing medical records or issuing WIC benefits.

It is worth noting that the laser card in an EBT system will necessarily contain a transaction history, at no additional cost. This differs from the chip card, which can hold a transaction history only if the card has more than the minimum memory level. As noted earlier, the transaction history is useful mainly for resolving questions concerning the recipient's account balance.

Current applications. Current applications of laser cards in the United States are extremely limited. A number of test applications are underway or have been announced, but few have been completed. Most of the tests are small enough to be considered, in the words of one survey respondent, "pre-tests" or "beta tests," and their results are "carefully guarded."

One survey participant reports using an optical memory card which is parallel to, but slightly technologically different from, the laser card system. The manufacturers of the card report that their cards would store substantially more information than the laser cards. The application, for Blue Cross/Blue Shield of Maryland, involves storing data on insurance coverage and medical records, as well as claims processing data.

The program had originally selected laser card-type technology, but after about two years still could not obtain a card and read/write terminal that would work together. The current testing phase has been functional for approximately three months. The test is using Panasonic reader equipment and has about 600 cards issued with 50 terminals.

The survey respondent also reports that an application with the laser-like card is operational with approximately 10,000 cards issued and 27 terminals made by Canon being used. The application involves medical insurance coverage and patient records. The respondent reports that its terminal devices require an interface to a personal computer to operate.

Several more laser card tests have been announced in recent months. In one, Baylor University will use the cards to keep track of medical

patients and to hold standardized medical data. An Ohio firm will use the cards to retain warranty information on cars and auto parts. In a test begun in July, the Army will use laser cards to retain student training records. Finally, a consortium of companies will apply the cards in a test that is believed to involve maintaining parts inventories, maintenance records, and system documentation. None of the existing or announced tests in the United States has used the laser card to store financial value, as would be the case in an EBT application.

The only known use of the laser card as a financial transaction card began in mid-1986 by the Sumitomo Bank of Japan. The pilot test consisted of 100 cardholders in the Tokyo main office who were used to test the performance of the laser card as a payment system at the bank's special dining room and gift shop. The trial was designed to ascertain the accuracy and reliability of the card's ability to deduct purchases and to provide cardholders with the means of checking the details of previous purchases. In every way, this could be considered a test of off-line POS. The limited experiment appears to have been successful.

The Sumitomo Bank described its test as outlining potential uses for the laser card. The bank felt the test would demonstrate that the card could be used as: a general purpose prepayment card (off-line POS card); a credit card with a checking and passbook account, giving the cardholder the ability to keep track of deposits and withdrawal transactions and other related data on a single card for many years; a remittance-only card, which could be used to facilitate regular payments to the same payee; and an asset management card, allowing the cardholder to store confidential financial or other information by using data encryption.

Several other test applications have been reported outside the United States. As in the U.S., applications for the health care industry are most prominently featured but other applications involving extensive data storage are being tested or planned.

Availability and performance issues. Optical memory cards are best classified as falling in the "restricted availability" category. There has been extremely limited use of the cards, either in the United States or in the

Far East. The one test in an off-line POS context was completed in a restricted situation in that values on the card were small, the two redemption points were both located on the twelfth floor of the Sumitomo Bank, and the entire card population was limited to 100 cards.

In the U.S. applications, tests are either extremely small or have just begun. As a result, in the words of a survey participant, answers to the questions about the use of the card, its reliability, and lifetime are "sketchy" at best. This is because the card technologies being used -- in particular, the technologies for reading and writing the cards -- are just now becoming available. Tests to date have not raised any major concerns about card performance, however.

Security. The laser card, like the chip card, appears to offer considerably more security than the magnetic stripe card, and for much the same reasons. For example, the card's great storage capacity leaves ample space for complicated verification procedures, such as biometric measures. Producing the cards is technically complicated, which would discourage counterfeiting.

Information on the card cannot be altered in the sense of being erased and replaced with new information. New information can be added to the card, however, by an individual with access to the appropriate equipment. For example, a fictitious allotment could be posted to legitimate cards whose benefits had all been used. Although few people would be able to access appropriate equipment today, a more widespread use of laser cards -- especially in relatively low-security applications such as inventory control -- will increase the risk. As with other card technologies, then, it is important to protect balance information through encryption.

Future developments. There is every anticipation that the optical memory card will find a place in industries such as health/medical applications, publishing systems, and record-keeping systems. Initial efforts to make entry into the health care market for patient record-keeping are just getting underway. Additionally, proponents of the laser card have attempted to use the card for such other record-keeping functions as system documentation and other paper-based systems for logistics and technical information.

Programs such as the Digital Storage and Retrieval of Engineering Data System (DSREDS) for the Army, the Engineering Data Computer Assistance Retrieval System (EDCARS), and Automated Technical Order System (ATOS) for the Air Force are now focusing on the efficient storage and retrieval of technical information from very large digital data bases. However, for this information to be usable in the field, it must be available in logical unit sizes and distributed in a convenient, reliable medium; the optical memory card could well become that medium.

It is doubtful, however, that the laser card will also become widely used as a financial transaction card in the United States in the near future. None of the U.S. tests to date have put the card in that role, and no such applications are being publicly discussed. No study respondents in banking or related fields expect laser cards to be incorporated into POS systems in the foreseeable future.

General recommendations. Laser cards can readily meet the functional requirements of an access device in an off-line EBT system. The cards have not been widely enough used, however, to determine whether they are feasible for an EBT application. The cards have restricted availability and little real experience exists to assess their performance characteristics. Moreover, as discussed in later sections, terminals and other supporting equipment are not available in a form compatible with an EBT environment.

TOKEN CARDS

A token card is a form of decrementing value card, from which a certain amount or unit of value is subtracted at each usage. Generally, a card is issued with a certain number of value units, which is reduced upon each use until the card no longer contains any value. When all value is removed from the card, a new card is issued.

The best examples of token cards are those seen in transportation systems and similar situations where access is controlled by deducting a certain amount from the card for each use or each service received. Foreign vendors have introduced telephone cards allowing the purchase of message units which are decremented as used by the purchaser. Token cards are being used in

the United States both in transportation systems, such as that in Washington, DC, and San Francisco, and by several U.S. telephone companies.

The typical token card is printed on a stiff paper stock rather than plastic as with the other types of cards. The token card uses a magnetic stripe. Rather than a rewritable balance field, however, the magnetic stripe has a series of fields, each representing one unit of value. The value units may represent a financial unit, such as a dollar or penny, or a functional unit such as a phone message unit or a subway trip. All value unit fields have equal potential value; the technology does not allow the token card to contain, for example, some fields valued at \$10 and some at \$1. The token card may arrive from the vendor with its value fields set or the issuer may set the value fields. This is decremented by erasing successive fields until the value is zero. Often an indicator of the value remaining in the token card appears as a scale along the edge of the card, or the value remaining is written on the margin of the card by the terminal following use.

Currently available token cards contain from 100 to 240 value unit fields. Vendors indicate that cards containing as many as 400 fields are planned for availability in the near future.

Functional issues. The technological approach used in the token card means that an EBT system would have to use it quite differently from the cards discussed previously.

The key factor is the card's limitation to 100-400 units of value. Because food stamp allotments typically fall in the range of \$50 to \$150, it would be impractical to set the value units equal to \$.01 because most recipients would have to get a large number of token cards each month. For discussion purposes, we assume that token cards are denominated in units of \$1, although other units between \$.01 and \$1 are conceivable. With a token card containing as few as 180 value units, 85 percent of the recipients would need only a single card for each allotment (based on the Reading patterns).

Recipients would get their token cards from issuance machines. At certification, they would be issued standard magnetic stripe cards with track II encoded with the PAN and PIN offset, as in the standard magnetic stripe

system. This card, however, would be used only to gain access to the issuance machine. The issuance machine, instead of crediting the allotment to the card, would dispense token cards containing the appropriate value.

Token cards could in principle be issued by mail. With each new allotment, a card would be mailed to the recipient's home, eliminating the need for issuance machines and for recipients to make a visit to have their allotment credited. As discussed later, however, the token card does not support PIN or other user verification procedures. It would be very easy for a casual thief to steal cards from the mail and use them. Accordingly, the mail-out option is not considered a feasible application of the token card.

The recipient would use the token card at the food retail store in a manner similar to other types of cards, but with three differences. First, the recipient would not enter a PIN, because the only data the token card holds is the value units. Second, assuming that the card's value units equal \$1, the recipient would receive cash change up to \$.99,¹ because only even dollar values can be deducted from the card. Third, any refunds or credits to the recipient would take the form of cash or paper food stamp coupons, because the token card can only be decremented, not incremented. In these respects, the token card resembles the paper coupon system.

Once the token card's full value has been used, the recipient disposes of it.² The recipient's next allotment comes on a new token card.

Current applications. In the U.S., the widest use of token cards has been for mass transit purposes. The cards replace the issuance of tickets or transfers and allow unattended access to the system by placing the cards into a turnstile and having value removed from the cards equal to the value of the service being provided. In cases where insufficient value remains in the

¹If the token card is denominated in smaller units, such as \$.10, the maximum amount of change from a single purchase would be smaller.

²Some token card terminals retain cards whose value has been fully used. It is unclear whether a terminal with this feature could be designed to meet the space requirements of a grocery checkout counter.

card for the service requested, the user is directed to nearby machines where additional token cards can be purchased.

As foreign telephone companies have entered the U.S. market with their products, they have brought with them the idea of decrementing value approaches to telephone calls. Having already been successful in Europe and the Far East with this approach, the telephone company expects the user to place a token card into the telephone and complete a call. At the end of the call, the telephone subtracts the value equal to the number of message units expended and returns the token card to the user. Token cards are just beginning to be considered for this purpose in the United States, however, and no performance information is yet available.

Security. The token card is considered the least secure of all of the card types examined here. Not only is the token card based on comparatively vulnerable magnetic stripe technology, but it does not support PIN or other user-identification procedures that require storing data in machine-readable form. In principle, the token card technology could support a PIN function. Certain of the value fields would be reserved for the PIN offset before card manufacture. Card preparation for mail-out would include writing the offset into the reserved positions as well as decrementing from the value fields the number of units necessary to set the value equal to the allotment. POS terminals would have to be designed to accept PIN entry, to read the offset, and to conduct the PIN match. Although these steps are technically possible, they are not part of current processes and equipment and would apparently require significant development effort.

In an EBT application, the presence of the cashier at the point of sale provides an opportunity for some protection against counterfeit cards. The card can be printed on safety paper, or complicated patterns can be printed on the card. Moreover, the color of the stock and certain printed information can be changed each month. Such measures would probably make the token somewhat less vulnerable to counterfeiting than the paper food stamp coupons, even without a PIN function.

Future developments. The survey respondents expect that use of token cards will continue. Growth is expected for transportation systems and for vending machines such as soft drinks and candy. Observers believe that a potential purchaser of the tokens will be willing to pay in advance to have a machine dispense five or ten cans of soda, for example, without requiring a pocket full of change.

Use of token cards for telephone calls is also expected to increase, but slowly. The cards compete against U.S. telephones which allow the use of major credit cards or credit cards issued by individual phone companies. The marketplace response has been unenthusiastic; consumers apparently find little reason to purchase phone calls in advance when they can be paid for as they are made, or later, conserving the consumer's funds.

Token cards have had no major application in a retail POS setting, either in the United States or abroad. No such applications are anticipated by token card vendors or other respondents to the survey.

General recommendations. Although token cards could support the minimum requirements of a food stamp EBT system, the technology comes with too many limitations to consider it a desirable option. The major concerns are that the card:

- does not support user verification and is weak in other security aspects,
- requires cash change and cash or coupon refunds,
- does not support a multi-program application, and
- is not being used or planned for use in retail POS settings.

Any of these limitations could be argued to be acceptable if the overall approach offered enough advantages in other areas. Taken together, however, these factors argue against the token card as an acceptable approach.

NON-STANDARD MAGNETIC STRIPE CARD

Many types of cards could fall under the general title of non-standard magnetic stripe cards. For purposes of this study, however, the non-

standard magnetic stripe card is envisioned as being constructed of thin plastic stock in the shape of a standard bank card, with a magnetic stripe whose placement conforms to bank card standards.

Most major vendors of standard magnetic stripe cards also manufacture non-standard cards for a variety of uses, such as library cards, frequent flyer cards, and telephone credit cards. The cards' reliability and durability are based largely on purchasers' specifications concerning the card's intended use and lifetimes.

Functional issues. The stripe construction and format of the non-standard magnetic stripe card is presumed to be identical to the standard card. The nature and placement of identification, financial and security data would also be the same. Thus, the ability and limitations of the non-standard card in terms of meeting program requirements are also identical.

The key difference between the non-standard and standard cards is that the non-standard card is disposable, like the token card. The procedure for obtaining new allotments parallels the token card approach. The recipient has a standard magnetic stripe card for access to the issuance machine. After the recipient inserts the card and enters the PIN, the issuance machine dispenses the non-standard card, encoded with the recipient's PIN offset and with the current benefit allotment as the card balance.

Mail-out issuance is a viable alternative approach with the non-standard magnetic stripe card. In this approach, the cards are centrally prepared by printing recipient identifying information on the outside of the card and encoding the account number, the PIN offset, and the card balance (the allotment amount) on the magnetic stripe. Cards are mailed to the recipient's home address by regular mail. Because the card is PIN-protected against unauthorized use, mail theft problems would not be expected. If some recipients have problems, these can be handled by exception procedures like those used in the coupon system, such as having those recipients pick up their cards at the food stamp office or another designated distribution point.

At the checkout station, recipients use the non-standard card just as they would use the standard magnetic stripe card. PIN or equivalent

verification is required, purchases are for the exact amount, and the card's balance field is rewritten with the new balance. When recipients have used their full allotment, they dispose of the card.

The mail-out approach with the non-standard magnetic stripe card eliminates the need for the issuance machine and for the recipient's visit to the machine. It entails some risk of mail loss, but the PIN function means that the casual thief will not be able to use the card.

Performance and security issues. For the most part, performance and

those for the standard card, because the only important difference is in the card stock.

The non-standard stock is much more susceptible to physical damage than the heavier and stiffer standard stock. Because it is normally expected to last only a month, however, with an average of fewer than 10 uses, the card's limited durability is not a problem.

The non-standard card stock is easier to counterfeit than the standard card, and placing holograms or analogous protective devices on the card is impractical because it will be important to limit the disposable card's cost. The presence of a large number of "used" cards also poses some vulnerability. The disposable nature of the card, however, offers the opportunity to change periodically the color or design of the stock or the information or authorization code printed on it. Given such protection, together with the encryption and other security measures described for the standard magnetic stripe card, the non-standard card should not be substantially less secure than the standard card.

POS systems than the standard magnetic stripe card, but only if the magnetic stripe is not placed in the standard position. None of these limitations is important enough to consider the approach infeasible, however.

ACCESS CARD SECURITY

The recipient's access card in an EBT system must be protected against three general kinds of threats:

- Unauthorized use, in which someone other than the recipient obtains the card and is able to use it without alteration to redeem benefits;
- Rewriting, in which someone alters or adds information in the cards' machine readable memory. For example, someone might add information indicating that a fictitious allotment had been received, increasing the available benefit balance; and
- Counterfeiting, in which someone fabricates a replica of an EBT card or puts a fabricated data storage device into a stolen blank or used card.

A variety of security measures have been developed to guard against these three threats. This section reviews them briefly, indicating the card technologies to which they might apply.

Unauthorized use. Protections against unauthorized card use work by verifying the identity of the would-be user. The PIN is the procedure most commonly used in electronic financial transactions. Additional procedures include:

- A photograph of the cardholder is digitized into 20-plus shades of gray and the digital information is stored in the card's machine-readable medium. At the time of use, the terminal reads the digits and represents a picture of the user to be identified on a screen which is made part of the terminal. A special terminal with a viewing screen must be utilized.
- Card user biometrics are digitized and stored in the card. When the cardholder appears, the biometrics are compared with those of the user and the identity of the cardholder is verified. Biometrics used most often are fingerprints, retina prints, voice prints, and hand spans. These biometric techniques are typically used

in security situations where an absolute identification is required. This technique requires a special device to conduct the measurement and digitize the results at each issuance machine and POS terminal.

- The dynamics of signature are digitized and placed within the access device. The digitized signature is then compared with a specimen provided by the cardholder at the time of transaction. This technique requires special equipment (a signature pad) at every point of redemption and issuance.

All of these enhanced procedures for identity verification are theoretically applicable with magnetic stripe, chip, or laser card technologies. In the EBT context, however, they would be suitable only with chip or laser cards. The token card technology is not constructed to read and analyze digital information. The standard or non-standard magnetic stripe cards might be able to contain the digital information in other situations, but the suggested EBT application would not leave sufficient space on the magnetic stripe.

In all of these situations, special equipment is required to issue the card initially and then to identify it later. These features can raise terminal costs substantially, with prices ranging from about \$400 to over \$1000 per terminal. These costs could amount to \$.50 to \$1 per case month, which is much higher than the value of losses that would be expected without the security devices.

All of these procedures also raise the question of how to allow the card to be used by someone other than the primary recipient. In Reading, the recipient tells the secondary user the PIN and gives them a paper "alternate shopper" card. The alternate shopper card would be easy to counterfeit, but the user must also know the PIN. With the other techniques, unless they are combined with the PIN, it might be necessary to have identification data individually recorded for all potential card users.

None of the survey respondents expect that any of the above techniques will replace the PIN within the next three years. The general view is that these alternative techniques may be implemented in high-security situations, such as building or computer center access, but not for financial

transactions. If the cost per card or terminal unit is substantially reduced or if the dollar value of losses becomes large enough to justify new security techniques, they will be implemented.

Given these considerations, the PIN appears to be an appropriate security measure for an EBT application. The PIN offers reasonable protection except when the recipient is careless (e.g., by writing the PIN on the card). The potential loss if a card is stolen and the PIN discovered is limited to the remaining balance on the card. More advanced security procedures are therefore unlikely to be worth the cost.

It is important to bear in mind that the PIN is only as secure as the user makes it. Recipient training procedures must emphasize the need to keep the PIN confidential and not provide it to unauthorized individuals.

Rewriting. Any of the techniques for putting information into an EBT card could be used by an outsider to alter or add information. Equipment and knowledge are readily available to rewrite magnetic stripes. Equivalent equipment and knowledge are less readily accessible for chip and laser cards, but they will become more accessible as the technologies become more broadly used.

Encryption is the primary protection against this threat. Information is stored in the card in such a way that the terminal can determine whether it is legitimate. Only someone with knowledge of the encryption formula can write or read the information. Encryption procedures are viable with all technologies except the token card.

The laser card has an extra potential protection in that information cannot be rewritten. Thus any information that must appear in a particular position on the card -- a recipient's name, account number, or PIN offset, for example -- cannot be replaced with someone else's data. This protection is of limited value in the EBT context, however, because the main targets for alteration are the financial transaction fields. These fields are written in succession, so someone who understands the writing technology and the encryption procedure can add fictitious transactions to increase the card's value.

The chip card also has the potential for special protection. A card that is capable of performing logical operations internally could perform a legitimacy check on incoming information. In effect, terminals could have an electronic "signature" that the card would check. In a large system, however, it would be impractical to maintain information about all terminals in all cards. A universal signature might be easily duplicated; the signature could be changed monthly and new recognition instructions placed in the chip card by the issuance machine, but this causes problems if the recipient does not visit the issuance machine immediately after the code changes, which is especially likely with a staggered issuance schedule. Thus the chip card technology is also mainly dependent on encryption for protection against rewriting.

Counterfeiting. Protection against counterfeiting is aimed both at the card stock and at the data storage medium.

Any device that gives the card stock a visually identifiable characteristic and increases the difficulty of producing the stock helps protect against counterfeiting. This includes special colors and designs, as well as the holograms more recently employed by the major bank card organizations.

These procedures are applicable with standard magnetic stripe cards, chip cards, or laser cards. In principle, they might also be applied to token cards and non-standard magnetic stripe cards. Because the concept of these disposable cards is to use inexpensive stock, however, costly protective techniques are not practical. Instead, the card's disposable characteristic allows periodic changes in the card's visual characteristics, such as the color, printed or graphic material, or date. Such characteristics could be changed every month, limiting the time frame within which a counterfeit card would be viable.

Procedures aimed at protecting the data storage medium are needed at this stage only for the magnetic stripe technology. The chip and laser technologies are sufficiently complicated and sufficiently new that there has been no need for counterfeiting countermeasures. A major technique applicable to the magnetic stripe is the watermark. This is a procedure for placing a permanent, non-alterable code in the material of the magnetic stripe, so that

only stripes with the watermark are accepted by the terminal as legitimate. The watermark technique is applicable for standard or non-standard magnetic stripe cards, and would be recommended in an EBT application to protect against duplicated stripes.

A final approach to controlling card use, which covers all three of the major threats, is to verify that an account number is legitimate -- that is, that the account exists and is not known to be problematic -- before authorizing the purchase. The major credit card organizations are increasingly adopting a "zero floor" policy, in which all purchases must have positive authorization. This normally means on-line authorization, which is of course unavailable in an off-line system.

The off-line equivalent is a "hot list," a file of problematic account numbers maintained in POS terminals and issuance machines, which is checked before authorizing any transaction. This procedure requires not only additional terminal storage and communications, but routine analysis to identify the problematic cases. These requirements add costs which could become substantial in a large EBT system. In addition, hot list procedures normally require the retailer to take possession of the suspect card, a requirement that many retailers find onerous. It appears, however, that the security measures discussed above offer sufficient protection that the hot list approach is not required.

4.2 POS TERMINALS

Point-of-sale terminals would be used in an off-line EBT system for the redemption of recipient benefits. The terminal would have the ability to identify the recipient, to compute a new balance amount, to store benefit transactions for later shipment to the central computer, and to supply receipts for the recipient and the retailer. The POS terminal needs sufficient internal programming and communications abilities to be contacted by (or to contact) the central computer to transmit the stored transaction data.

To function appropriately in an off-line EBT system, the terminal must be driven by sufficient software to carry out the above-listed functions

and to have about 20 kilobytes of memory available for transaction storage.¹ For certain merchants who have newer models of bar code scanners or Electronic Cash Registers (ECRs), the terminal may be built into existing equipment. Elsewhere the terminal is a stand-alone device on the checkout counter, which means that small size (a small "footprint") is desirable. The terminal will include a keyboard, display, modem, PIN pad, and printer. Terminals for retailers without telephones, and possibly for a decentralized settlement approach, also require cartridge tape or chip card capabilities.

Although manufacturers have mainly been oriented to producing on-line terminals, the basic requirements for an off-line device are essentially the same. Off-line terminals require more memory, in order to store transaction data, but this is readily available at little increase in cost.

With some system designs, an off-line terminal might not need communications capabilities, i.e., it would not need the modem, handset, and the software controlling communications. Such a terminal is sufficient only if:

- Settlement is decentralized, with transaction data written to a cartridge tape or chip card rather than transmitted directly to the EBT Center;
- Software changes (e.g., to change encryption keys) are made in person rather than downloaded by telephone; and
- Compatibility with commercial POS systems is not needed.

If these conditions are met, the POS terminal does not need communications capability but does need a cartridge tape drive. Cartridge tape drives were available on some of the earlier terminals, but found little market and are not part of any product now manufactured. Some of the older terminals are still available at prices comparable to those of standard terminals. A major off-line EBT application, however, would be likely to solicit bids for new production.

¹A transaction record is estimated to contain about 75 characters. This includes recipient, retailer and terminal identification numbers, date and time of the transaction, the transaction type and amount, the card balance after the transaction, and security information. With 20K of memory, a terminal could store about 250 transactions.

Terminal availability by card type. Most of the POS terminals currently in place or on the market are designed to handle standard magnetic stripe cards. A number of major manufacturers supply terminals for this purpose, and many of them participated in the survey. Taken together, they offer a substantial range of devices that meet or exceed the requirements for an off-line EBT system.

Chip card POS terminals can also be considered available, but in far less quantity or variety than standard magnetic stripe card terminals. Several of the existing chip card terminals have restricted availability. Those used heavily in the European and Far Eastern markets are readily available, but not all have the features required here (for example, some have no printer or communications capability). Terminal vendors interviewed in the study indicated that a new line of terminals featuring a modular card reader will be introduced within a few months. This means that the same basic terminal can handle either chip cards or standard magnetic stripe cards by changing a single component. This terminal will also offer the option of handling both chip and magnetic stripe cards with the same reader/writer unit.

POS terminals suitable for benefit redemption in a food retail environment are not available in the United States for laser cards. These terminals could be constructed by combining a laser card reader/writer with a current POS terminal, but vendors report that no such units are currently marketed or planned. The terminals employed in current laser card applications use a personal computer to drive a reader/writer unit. This not only makes the device expensive, but gives it a prohibitively large size for many retail applications. It is probably feasible to develop a reader-writer unit that would be driven by the computers now used in many supermarkets to support electronic cash registers and scanners, but such devices are not currently available or known to be under development. Laser card POS terminals are therefore considered unavailable.

Similarly, no POS terminals currently exist to read token cards, although a reader could be combined with existing terminal technology. One vendor indicates a willingness to provide such devices, but would require a

six-month development period to produce a prototype. Token card POS terminals are classified as available with modifications.

Non-standard magnetic stripe cards can be handled by the same terminals that are used with the standard cards, providing that the placement and format of the magnetic stripe corresponds to the standards. One survey vendor offers a proprietary card that rewrites a special "cash stripe," a magnetic stripe not meeting the standards. POS terminals for these cards had restricted availability from a single vendor who had been contracted to build prototypes.

Any of the available POS terminals support a PIN verification process. Most of the enhanced security procedures, such as biometric or signature verification, require additional software and additional equipment connected to the terminal. These additions typically have price tags in the hundreds of dollars. Pursuant to the earlier discussion of security options, it is assumed that the EBT system requires no security measures involving major terminal modification.

The market for POS terminals has developed rapidly in recent years, and several significant changes have occurred since the terminals were selected for the Reading demonstration. These include a substantial reduction in price, with the equivalent models priced as much as 50 to 75 percent lower than the models that were used at Reading. A second major change is the availability of increased memory in the devices. While the original terminals had little memory, substantial capacity is now available to buyers at little extra cost. Survey respondents report that an enhancement from 16K to 32K of memory costs less than \$20 per terminal. A third development concerns the "softness" of the programming in the devices. Today's terminals can be more easily programmed without significantly increasing the hardware costs of the device.

Performance issues. While terminal packages typically consist of similar components, there are real distinctions among manufacturers with respect to the quality, functionality, availability of custom programming, and maintenance of terminals. Some suppliers are able to field their own installation and maintenance teams, while other suppliers simply provide depot

maintenance or advise users to buy an additional supply of terminals to act as spares.

Differences in quality are usually reflected in the expected lifetime of a terminal and the number of the devices which are found to be defective when they are removed from their shipping package. This quality distinction is often a function of the assembly process and the quality control used by the manufacturer. No statistical data on terminal lifetimes or problem rates in past applications are available.

The differences in functionality relate particularly to a terminal's ability to perform diagnostics, to be programmed and have programs modified, and to interface with multiple communication networks. Other variable features include presence of a telephone handset, the size of the terminal's display, the types of printer available (journal, roll, or slip), the ability to accept programming from the host computer (downline loadability), size, encryption supported, and the capacity for links with peripheral devices (number of RS232 ports).

Future developments. The main advances in POS terminals expected within the next three years are additional capabilities of the equipment without significant increases in price. Most vendors surveyed felt that the price per unit has fallen nearly to its limit, but that the next level of competition will be on features and capabilities. Among the most significant features will be the ability to take advantage of new communication opportunities offering greater flexibility and efficiency, such as the Integrated Services Digital Network (see Appendix D), and reader/writer units which will be able to handle multiple card types.

A recent advance for POS terminals has been the ability of communications suppliers to concentrate several POS terminals onto a single telephone line. In earlier POS systems, retailers were required to place a separate telephone line into each check-out lane. This is no longer necessary as a device is available which concentrates eight to sixteen terminals onto a single phone line. In short, where sixteen separate phone lines have been required, a single device is placed within the store and handles the phone requirements of all the terminals using one line.

Several manufacturers are introducing, testing, and will soon have available radio frequency (RF) POS terminals. These terminals transmit data on radio bands and can be used where no telephone service is available. The RF terminals are expected to be priced within the POS terminal cost ranges provided in Chapter 5. These terminals could be classified as having restricted availability, and it is not yet clear whether additional costs of data transmission or transaction fees to a system operator may be required to use them.

In addition to communications advances, there have been significant advances in the range of available terminals and their performance. Vendors are now often willing to make guarantees on a problem-free period of operation or the minimum expected lifetime of a terminal. The typical warranty period is from 30 to 90 days, with one-year extended warranties available at additional cost. Vendors will also produce custom terminals for specific markets or applications.

Terminals built into Electronic Cash Registers (ECRs) and bar code scanners are expected to increase their ability to handle a variety of cards for POS within the next three years. These terminals give the merchant considerable ability to accept various payment media in a way that is integrated with the systems providing inventory, purchasing, and other merchant-related services. Survey respondents anticipate that a major trend will be in the introduction of smaller ECRs and wand-type scanners for mid-range and small merchants. These ECRs and scanners will possess enhanced computational capacity and will contain a card reading feature.

The provider who holds a major market share of ECRs has begun to introduce new models which have card reading capabilities and standardized interfaces to EFT networks and other card authorizers. The devices also contain the capacity for the merchants to hold their own files for services such as proprietary check cashing. This same capability could be used for the storage of off-line EBT items.

General recommendations. The foregoing discussion suggests that the feasibility of an EBT system in terms of POS terminals varies considerably with card technology. The standard magnetic stripe card terminal technology

is clearly feasible and proven. This technology also applies to the non-standard magnetic stripe cards envisioned here. It is fair to say that the chip card approach is also feasible. Some acceptable devices are already available, and the marketplace offers an increasing menu of POS devices that can read and write to chip cards.

The token and laser cards have lower current feasibility because the terminal devices must be classified either as available with modifications or unavailable. The terminal technology for token cards is established in operational settings such as rapid transit and telephones, but not in the type of POS devices necessary for food retailers. Terminal technology is in transition for laser cards, but no suitable POS devices currently exist or are foreseen in the near future.

Balance inquiry terminals. Balance inquiry terminals can be seen as "stripped down" POS terminals. The terminal needs only to read the access device and indicate the benefits that remain in the card. To achieve this function, the terminal should have a card reader, a PIN pad, and a video display. No printer or communications capacity is required.

Although POS terminals are not commonly packaged in exactly this configuration, several products meeting this specification could be purchased from existing catalogs, and other vendors could readily produce the device. The comments on POS terminal availability and reliability by card type apply equally to balance inquiry terminals.

4.3 ISSUANCE MACHINES

In an off-line EBT system, issuance machines provide a critical link in the process of giving recipients access to their benefits. Recipients go to the issuance machine to have their allotments credited to their card balance. At the issuance machine, recipients insert the card and enter their PIN to identify themselves. Depending upon the type of access card used, the issuance machine would either write the value of the allotment into the card or dispense one or more disposable cards with the allotment value encoded.

An issuance machine is envisioned to include a card reader/writer, a keyboard, a video display, a printer, and features necessary to communicate with the central computer (i.e., software, memory, and a modem). The software, memory, and modem must be sufficient to allow the central computer to load the machine with issuance instructions and levels of benefits for those recipients within the area of machine operation. In a disposable card system, the issuance machine must also contain a safe for storing the card stock, a dispenser mechanism and throat.

About four megabytes of data storage capacity is necessary to hold allotment data received from the central computer and transaction records of allotments credited to recipients' card balances. This assumes a maximum density environment, with about 2,400 households served by each issuance machine. Less data storage capacity could be acceptable in a less concentrated area. Additional capacity could be needed in a multi-program system.

In a POS/ACD system, which involves automated coupon dispensing, the issuance machine must dispense food stamp coupons as well as performing the other issuance functions. The ACD/issuance machine requires a safe and a dispensing mechanism for the coupons and additional data storage capacity to record coupon issuance transactions, as well as the features described above.

Availability by card type -- issuance machines with no coupon dispensing. No devices are currently available that meet the requirements of the issuance machine as described above, regardless of card technology. Much of the basic technology can be seen in related equipment, however.

For the standard magnetic stripe card, the issuance machine performs functions that are very similar to those performed by the POS terminal. The issuance machine requires much more data storage capacity, however. Another important difference is that the issuance machine must operate as a stand-alone, unattended device. This implies a need for physical security against accidental misuse, vandalism, and theft. The issuance machine is therefore envisioned as a simplified automated teller machine (ATM), mounted in a wall in a location affording public access, with only the keyboard, the display, and the card insertion and receipt slots accessible.

Although no such device currently exists, several vendors report they could produce it. In each case, the vendor would modify existing devices that work with standard magnetic stripe cards.

The vendors also indicate that they could produce devices that would handle chip or laser cards. The only difference would be in the reader/writer units, and the vendors report that appropriate reader/writers can be obtained for either technology, although at higher cost than the standard magnetic stripe card unit. An issuance machine for laser cards involves some development challenges. Reader/writer units for laser cards are not yet considered fully proven, both because usage has been limited and because some tests have encountered significant problems with the units. The issuance machine might require additional processing capacity to drive the reader/writer units, which are now typically driven by personal computers.

Several European vendors have available telephony-based devices that could be used as an issuance machine with chip cards. These devices amount to specially equipped telephones that have a keyboard, a video screen, and a printer. Although widely used in Europe, applications of these devices in the United States are just beginning. Some can be found in airports offering access to services such as stock quotations and airline ticket purchases or reservations. Although it would appear feasible to construct an equivalent device for standard magnetic stripe cards, only the chip card device was available at the time of the survey.

The telephony-based issuance machine would act in an on-line manner to credit allotments to recipients' cards. Recipients would go to the machine, insert their card, and enter their PIN. The machine would establish contact with the central computer, which would transmit the amount of any allotments available to the recipient. The machine would credit the allotment to the card and print out a receipt. Like other issuance machines, the telephony-based device could be used for balance inquiries. In addition, it could serve as a public telephone, potentially generating revenue for the deployer.

Issuance machines that dispense disposable cards involve additional functions and components, but can also be considered available with modifica-

tions. Token card dispensers exist, for example, but they typically handle cash and perform somewhat different functions from those required in the issuance machines. Again, vendors assert that appropriate machines could readily be constructed with modified versions of existing product concepts.

ACD/issuance machine availability. Like the issuance machines described above, no currently existing device meets the specifications for an ACD/issuance machine, but analogous products exist. In fact, the ACD/issuance machine would closely resemble an ATM. ATMs normally read (but do not generally write to) standard magnetic stripe cards, store data, communicate with a central computer, and dispense cash.

The most important distinction between an ATM and an ACD issuance machine is that the ATM dispenses cash rather than coupons. Variations on the dispenser function have been implemented in a number of applications, however, such as the dispensing of travelers' checks, airline tickets, and merchandise coupons. Vendors believe that they can produce ACDs that would dispense food stamp coupons with relatively small modifications to existing products, at least if the coupons can be provided individually. In the current coupon system, coupons are packaged and distributed in books, and recipients are required to keep the coupons in the book until the time of purchase.¹ If the ACD machine is required to dispense coupons in books, vendors indicate that somewhat more complicated versions of the machines will have to be developed.

Because ATMs are generally designed to read standard magnetic stripe cards, an ACD/issuance machine could be produced most readily for this technology. As in the case of the plain issuance machine, however, the only difference required to handle a chip or laser card is the reader/writer unit. ACD/issuance machines for all three technologies may therefore be considered available with modifications.

ACD/issuance machines for use with disposable benefit cards would

cally possible, this combination of functions lies well beyond products currently marketed or envisioned by the vendors. This technology is therefore classified as unavailable.

General recommendations. Of all the devices considered as potential issuance machines, the only one classified as currently available is the on-line, telephony-based device designed for use with chip cards. Nonetheless, most of the other issuance machines are considered available with modification. The widespread use of ATMs and other analogous equipment makes it reasonable to consider these as technically feasible components of an EBT system. The exceptions are the laser card machines and the ACD/issuance machine when used in conjunction with disposable cards; these appear to be too far removed from existing products to be considered feasible.

4.4 CENTRAL COMPUTER FACILITY

The central computer facility (EBT Center) carries out several functions in an off-line system. It receives allotment data from the State food stamp data center¹ and transmits it to the appropriate issuance machines, then retrieves from the issuance machines data on allotments credited (and data on coupons issued in an ACD system). Data on credited allotments and coupons issued are reconciled and archived. The Center also maintains records of special transactions carried out by Food Stamp Program personnel, such as manual transaction authorizations and conversions of EBT benefits to coupons. Periodic management reports are produced to describe system activity and diagnose problems.

The Center's responsibilities regarding purchase transaction data may vary, depending on design decisions described in Chapter 3. With centralized settlement, the EBT Center retrieves transaction data from the store terminals, summarizes and formats the data to initiate the funds transfer process, sorts the data into recipient files and maintains a current balance file, and reconciles and then archives the data. With decentralized settle-

¹The EBT facility could be located within the food stamp data center, eliminating this data transfer step.

ment and a "no balance" approach, the EBT Center may not perform any of these functions.

The range of functions means that the hardware configuration of an EBT Center may differ from one EBT system to the next. The variations are mainly in the equipment's size or capacity, however, because the central facility must always perform the same fundamental activities, transmitting, retrieving, and processing transaction data from a dispersed network of devices. Section 5.6 presents illustrative equipment lists for a central computer system in an off-line system serving three different sizes of caseload. A more general specification of the central system would include:

- a central processing unit to process in the range of 1.14 MIPS (million instructions per second) for a small city's caseload and up to 4.8 MIPS for the caseload in a large State. The MIPS requirement is calculated on the basis of number, length, and expected arrival pattern of transactions, as well as system overhead (e.g., to support peripherals, disks, and application software) and other processing requirements;
- a disk sub-system which will store operating system files, system overlays, application software and recipient and retailer data;
- a tape sub-system consisting of a tape controller and two tape units. The function of the tape system is to provide storage of data that is not vital to the immediate processing requirements of the overall system. Additionally, the tapes store periodic backups to ensure the rapid restoration of the network should unforeseen complications occur;
- a system printer to be initially rated between 600-1200 LPM (lines per minute). All paper output, which includes status reports, settlement-related reports, transaction activity, program listings, etc., will be generated by the printer; and
- a communications controller which will handle all activity initiated throughout the terminal and issuance machine network and create the interface with the central processing unit.

The configuration for an off-line system differs somewhat from those typically used in on-line environments. On-line systems generally employ con-

tinuous processing computers to accept incoming authorization requests, route them to their appropriate destination, and transmit the response back to the originating terminal. An off-line system involves a lower volume of communications, and these can occur on a more predictable basis because the EBT Center determines exactly when to contact each device in the network. The off-line system therefore does not need the continuous processing computers.

The differing card technologies discussed in previous sections have no impact on the requirements for the central computer system. The data sent to and received from the issuance machines and POS terminals is the same, regardless of the nature of the card carrying the recipient's benefit balance.

A substantial number of mainframe computer manufacturers offer equipment meeting the general requirements outlined above. The equipment is quite common, being used for a variety of purposes. With the possible exception of the communications controller, the configuration described could be found in thousands of data centers across the country. This means that many States would be able to implement an off-line EBT Center within their existing data processing facilities with relatively minor equipment modification. Such integration potentially allows greater efficiency in the use of equipment and labor; the effects on operating costs are explored in Chapter 5.

Much of the packaged software that is available to perform functions like those of the EBT central computer has been developed for IBM-compatible or equivalent hardware. All such equipment is available with warranties when purchased from the manufacturer, and limited warranties are often available on used equipment purchased in the third party market. All vendors make support service an important part of their product offer, and will typically provide consultation and "tuning" assistance to make minor adjustments to hardware or operating system software to help the customer get maximum utilization and efficiency from the equipment.

Future developments. During the next few years, no significant change in technology that would dramatically affect an off-line EBT system is anticipated. For example, IBM has announced and will begin to deliver a model 9370 by year-end, a machine that might well be used as the central processing unit in an off-line EBT system. The 9370's architecture features additional

compactness, but offers little advantage in terms of speed and capacity over previous models. The 9370's price will be only slightly less than previous models.

Several continuous processing CPUs have been either down-sized or up-sized to meet new market segments. With the entry of new competitors into the continuous processing market, prices have fallen. Survey respondents expect some further price reductions in the next two to three years in both the mainframe and continuous processing market. Continuous processing computers would not be used in most off-line EBT designs, however.

General recommendations. The requirements of the central computer system provide no obstacle to an off-line EBT system's feasibility. The technology involved is quite mature, with acceptable products offered by a number of manufacturers. This equipment can be used in conjunction with any of the technologies previously discussed for cards and terminals.

4.5 SOFTWARE

Software refers to the programming and operating system which allows the central computer system to function. In the case of an off-line EBT system, software must be available to drive the communications and data transfer between the central processor and issuance machines and POS terminals, to post transactions to account files and generate settlement if these functions are performed at the EBT Center, to perform necessary reconciliations and provide reports and, generally, to control the functioning of the computer system's various components.

Packaged software developed for commercial electronic funds transfer and POS systems is applicable to an off-line EBT system. The software normally contains the following key functional modules:

- terminal driving modules, which control the flow of data back and forth to a network of dispersed devices such as POS terminals and ATMs (in an off-line EBT system, this would include issuance machines);

- settlement module, which summarizes transaction data and prepares a transmission conforming to the requirements of the Automated Clearing House or other clearing system; and
- network interface modules, which control communications and data transmissions with card-issuing organizations (in an EBT system, these communications would be with the State food stamp data center and any other participating programs or networks).

Additional modules maintain client and merchant account files and generate reconciliation and management reports.

The software packages have been developed in modular form to allow customers to select exactly the functions that need to be performed with a minimum of custom programming. In the commercial environment, this typically means selecting modules to match particular manufacturers' terminals and the protocols of the particular card-issuing organizations participating in the network. The network interface aspect will be less complicated in an off-line EBT system, but considerable attention may focus on selecting among the file management, reconciliation, and reporting functions. Special programming may also be required to handle any off-line EBT functions that are performed differently from the normal commercial pattern, such as manual transactions and balance adjustments.

Software requirements are not directly affected by the choice of card technology. An indirect effect may exist, in that selecting a particular card technology may limit the available choice of terminal and issuance machine manufacturers. Although available terminal driver modules cover a wide range of manufacturers, it is possible that none would be compatible with the chosen EBT terminals or issuance machines. In this case, modifications would be necessary to obtain an appropriate module. Acquiring modified software is more costly than purchasing existing packages, but less costly than developing it afresh, and it is certainly technically feasible.

Packaged software was available to drive EFT and POS applications as early as 1977, and the number of providers and sophistication of the products has grown substantially in the intervening decade. Most of the major commer-

cial POS networks use software supplied by one of four major vendors, and several other organizations also offer full or partial packages.

All of the current software vendors are able to provide ongoing maintenance and customization as needed. The differentiation among products is typically in terms of which manufacturer's terminal devices can be driven, which commercial networks the system can interface with, and how many transactions per second the system can handle. This final measurement is important even in an off-line system because the abilities of the system must match the expected volume of data flow. For example, the system must be able to poll all the POS terminals and process the transaction data to create funds transfer items in the required format in the schedule "window" between the close of the system's banking day and the deadline for submitting funds transfers.

Most available EFT software packages have been installed in several locations. Locations and applications vary from a single financial institution running a few ATMs to state-wide, multi-state, and even national networks. Other applications drive up to several thousand POS terminals while providing authorizations for credit and debit cards and the collection of data, such as cash concentration totals. In almost every case, comparable sites for different vendors' software can be found, visited, and evaluated, a useful procedure for any agency establishing an EBT system.

In addition to terminal handling and application software relating directly to the processing of transactions, the CPU requires a basic operating system (DOS, MVS, GUARDIAN, MCP, etc.). These operating systems are generally provided by the equipment manufacturer along with the other operating system-related components such as disk space managers, line handlers, text editors, and miscellaneous utility programs.

Future developments. Software developments within the next two to three years can be expected in areas of terminal driving and routing of messages to alternative data bases. Additional routing capability will become available for other types of networks, such as those offering stock quotations and other services. The capability to drive touch-screen video terminals or other input mechanisms will be developed. Other likely developments will be

in the area of sizing systems, i.e., the custom creation of software and applications based on the size of the user and the size of the application expected to be processed.

A final area for EFT software development will be applications in new markets. The most likely candidates for these applications are welfare delivery, the insurance industry, and the health care field. The major suppliers of EFT/POS software all report that they are seeking such new markets for existing software, with the understanding that certain modules may have to be customized for the new applications.

General recommendations. Existing packaged software that has been developed for commercial EFT applications will probably meet the requirements of an off-line EBT system. Some modification could be needed, particularly if the card technology leads to a choice of terminal or issuance machine vendors whose products are not compatible with existing terminal driving software modules. The general technology is proven in a large number and wide variety of applications, however, and poses no obstacles to the feasibility of an off-line EBT system.

4.6 COMMUNICATIONS

An off-line EBT system needs four main data communications links. First, the central computer must communicate with the State food stamp data center to receive allotment information and to transmit reconciliation data, management data, and any account or transaction data desired for the data center's own files. Second, the central computer must communicate with issuance machines to send out authorized allotment data and retrieve data on allotments credited to recipient cards and, if applicable, coupons dispensed. Third, the central computer must communicate with the local food stamp office to receive information about new accounts opened, coupon conversions, balance adjustments, and other transactions occurring at the local office. Finally, in a centralized settlement system, the central computer must communicate with POS terminals to retrieve data on purchase and refund transactions.

Although these communication links are quite similar to those required in an on-line EBT system, especially when the off-line system has centralized settlement, some differences exist. The main differences stem from the off-line system's communication with issuance machines. The off-line system communicates a larger volume of data: the volume from the POS terminals is the same, but data must be also moved to and from the issuance machines for each allotment. On the other hand, the off-line system involves fewer instances of communication connects, because it communicates with each machine only once each day. Each connect transmits a greater volume of data than a connect in an on-line system, but the communication cost is reduced because the first minute of a telephone call has a higher price than subsequent minutes. Further, the off-line system's communications can be initiated by the central computer and handled on a predictable schedule, avoiding some of the peak load problems that can occur in an on-line system when many customers attempt transactions at the same time.

Data communications use one of two technological approaches: dial-up lines or dedicated lines.

Dial-up lines. These are the standard lines that are connected to all telephone sets. They have the ability to connect to any other dial line in the telephone network. These lines are suitable for low to medium speeds of data communications, up to 480 characters per second. Cost for these lines are based on a low monthly fixed rate plus any applicable toll charges. There are two classes of toll charges, local dial calls and long distance calls. Long distance calls are comprised of any calls that leave the local dial area. These calls are billed by time and distance.

Individual local dial calls are either free (flat-rate billing), or chargeable (measured service). The local dial area is a small, well-defined physical area, typically a city, group of cities, or county. Some areas of the country offer flat-rate service only, some offer measured service only, and others offer both. Typically, the midwest, northeast, and California are measured services areas, while the rest of the country has been slower to adopt measured service.

It is to the telephone company's advantage to use measured service rather than flat rate service because the customer is billed for actual services used. The deregulation of AT&T has signaled the breakdown of the cross-subsidization of telephone costs from one group of users to another, thus pressuring the telephone companies to switch to measured service. The main reason measured service has not taken over nationwide is that State Public Service Commissions (PSCs) fear that telephone rates for private users will rise sharply. These PSCs have blocked the attempts of many telephone companies to switch to measured service. In time though, as the concept of "pay for usage" is accepted, measured service will replace flat-rate billing.

There are two ways to calculate measured service. The first is message units, where the user pays for the duration of a call. The second method is zone unit measured, where the user pays by distance.

Dedicated lines. These telephone lines are physically connected, end-to-end, without passing through any telephone switching gear. They are suitable for medium to high speeds of data communications, 480 to 500,000 characters per second. These lines are priced at a fixed monthly rate determined by mileage and line speeds. The higher the mileage and/or line speeds, the higher the cost.

Several variations on these basic service options exist. These include:

- WATS lines -- These are out-going only, dial-up lines with a special billing arrangement to reduce long distance fees. The special billing arrangement is the deletion of the call detail records on the monthly statements, which are replaced by total hours used. These lines are sensitive to both duration and distance of call.
- 800 lines -- These are in-coming only, dial-up lines with a special billing arrangement identical to WATS lines.
- Packet switching networks -- These are hybrid networks made up of dial-up lines, dedicated lines, WATS lines and 800 lines. The objective of the vendors of these networks is to utilize the dedicated lines as much as possible, thereby reducing the toll charges on the

other lines. The user is charged for connect time and amount of data sent. Usage is not sensitive to distance, so it would cost the same amount to send a file from Boston to New York as it would to send it from Boston to San Francisco.

If line speed requirements do not mandate dedicated lines, the choice between dial-up and dedicated lines usually depends on cost. In an on-line POS system, this generally becomes a matter of transaction volume. When the transaction volume reaches a level that makes the cost of dial-up service exceed the cost of dedicated service, dedicated service is used. Although the break point depends on specific telephone service prices, it tends to be about 2,000 transactions per month. Most POS terminals in commercial systems have dial-up connections unless they happen to be connected to some equipment that is already served by a dedicated line.

The choice of a service configuration for an off-line EBT system will depend to some degree on the design of the specific system. In a simple choice between dial-up and dedicated lines, one might expect the links with local food stamp offices and with store terminals to use dial-up lines. The local offices will have a few very brief communications per day. The POS terminal will have one somewhat longer communication per day, but only rarely would more than a few thousand characters of data be transmitted. Issuance machine communications also occur only once daily, but transmissions could range from a few thousand to several hundred thousand characters of data. Whether dial-up or dedicated lines are more appropriate for issuance machines would depend on the number and location of machines in the network as well as the data flow expected from each machine. Similarly, the choice for communicating with the State data center will depend on the size of the system and the proximity of the two data centers.

Future developments. Currently, the regional telephone companies supply the dial-up lines. This is unlikely to change, and will remain a regulated environment. The dedicated lines, WATS lines, 800 lines and the toll services for the dial-up lines are supplied by a handful of long distance carriers (i.e., MCI, Sprint, AT&T, etc.). The packet switching networks, also called value added networks (VANs), are run by third party companies such as

TELENET or CompuServe. The companies buy their lines and services from one or more long distance carriers. Although these privately held VANs are the only ones currently operating nationwide, the long distance carriers as well as the local telephone companies are attempting to enter this market. In anticipation of these large entries, other communication companies have attempted to carve out market segments for themselves and have already entered the transaction processing and terminal-driving markets.

In an EBT system, this increased competition by non-regulated VANs allows for the negotiation of fixed-cost, long term contracts, charged by the transaction. Some VANs view EFT applications as particularly desirable business because volumes will be constant or growing and calls are short and spread over more hours of the day and weekend than normal business calls. These traffic patterns allow the VANs to use network capacity that would normally be idle.

In the near future, there will be many new communication services. Examples are the Integrated Services Digital Network (ISDN), radio frequency (RF) terminals (i.e., terminals that operate on radio frequencies), and some new hardware devices. These new technologies will improve network reliability by offering automatic alternate routing and user-configurable networks to adapt to changing traffic patterns and to reduced costs.

General recommendations. An off-line EBT system's communication requirements are well within the range of readily available technology. The technology and services for telephonic data transmission are well established. The only important issues concern choices among service options, choices that will be made on the grounds of cost-efficiency for particular system configurations rather than technical feasibility.

4.7 COMPATIBILITY WITH EXISTING SYSTEMS

The original EBT feasibility study¹ indicated that linkage with an already existing EFT network would increase the potential for cost savings. This section explores that possibility in the context of an off-line EBT system.

Background. EFT/POS systems can be characterized as a series of card-authorizing data bases linked to each other through a central computer facility called a "switch." The card-authorizing data bases, referred to as processors, intercept processors or DPCs (Data Processing Centers), supply card authorization services for a single entity or a group of entities on a profit basis. Alternatively, these services are sometimes provided by card base affiliations, such as a regional bankcard association, on a non-profit basis.

The switch, which is pivotal to the operation of an EFT network, contains the central routing computer and software which allows the multiple DPCs to exchange transaction data. The switch contains a file identifying all legitimate terminals and card-issuing organizations, and a record of which DPC is expected to authorize transactions for each card base. Typically, the switch operates 24 hours a day, 7 days a week and is always available except for short, scheduled maintenance.

The operations of the early bank network switches were usually placed in the hands of one of the participant banks. As networks developed, this was believed to provide an undue competitive advantage to the network participant running the switch, and a migration began to independent switch-operating entities or third parties. Even though the operation of the switch is now one step removed from the participants, network operating rules and bylaws strictly govern the behavior of the switch operator and specify which organizations can effect a direct switch link for authorizations and interchange of transactions among the network participants.

¹Report on the Feasibility of an Electronic Benefit Transfer System for the Food Stamp Program, Silver Spring, Maryland: Birch & Davis Associates, Inc. and the Orkand Corporation, 1982. The report indicated that there was a potential for piggybacking on in-place EFT networks.

The DPC normally provides a menu of services to its card issuers, or correspondents. For example, the DPC may maintain files containing a series of account numbers with a current balance attached (strip files), a list of accounts for which no activity is to be allowed (negative files), or a list allowing for each account parameter-based activity to a pre-specified level. These parameter files are also sometimes referred to as velocity files in that the parameters may include the number of transactions in a relatively short time period (e.g., an hour) as well as the total amount of activity over a complete period (e.g., a day). All three of the services may be offered by the same DPC with certain overlaps such as strip files with a velocity feature.

The number of DPCs that share ATM/POS networks varies from as few as 3 to as many as 50. Requirements for DPC technical abilities and response time for transaction authorizations are set by the network. A DPC that chooses to link to the network must agree to meet the standards and to abide by all the requirements stated in the network's operations guidelines. DPCs typically also drive terminals for their correspondents or customers. In most large networks composed of multiple DPCs, the switch does not own or drive terminals, but acts only as a router for transactions between terminals and the authorizing DPC. These networks are referred to as interchange networks.

A second type of EFT network exists. In these networks, a single entity provides the switching service for all network participants, and all card authorization files are held at a single point. The card-issuing entities "share" the terminals, but do not authorize transactions individually; this is handled by the single DPC, which is also the switch. These networks are usually referred to as shared networks. When an entity operates a network entirely for itself, performing switching, card authorization, card-issuing, and terminal driving functions, it is referred to as a proprietary network.

Operating rules. EFT/POS networks function in accordance with a set of regulations referred to as operating rules. Although the handling of most

financial transactions in the United States is governed by the Uniform Commercial Code (UCC), the original shared networks found that the UCC did not provide for the handling of EFT items. In lieu of the UCC conventions, the

networks developed operating rules which were an equivalent to the UCC. The operating rules set all liabilities and handling requirements for electronic transactions.

The original operating rules were created in 1975/1976 for the first state-wide EFT network, which became operational in December of 1976. Because that network chose to sell its basic switch software and operating procedures, portions of those first operating rules appear in many subsequent networks. Operating rules have a high degree of similarity across networks.

The operating rules of the network also define the characteristics of those entities which will be allowed to participate within them. These participation strictures will appear either in the operating rules or in the bylaws of the entity which is formed to coordinate the network. EFT networks founded by financial institutions, for example, commonly exclude third party DPCs or non-financial institutions from a voting and ownership role within the network.

In cases where a third party is allowed to participate in the network, its role is typically constrained so that it can only operate through the offices of a financial institution. This financial institution receives a fee or a specific service from the third party. An example of this would be the participation of BUYPASS The System, Inc. (a third party POS provider) within the AVAIL or HONOR networks. BUYPASS was required to be sponsored by an already-participating financial institution and either paid fees or provided services to that financial institution.

It is interesting to note that many of the early restrictions in EFT networks excluded certain classes of financial institutions (Savings and Loans/Credit Unions) or financial institutions whose main offices were not within the State. Other restrictions appeared with the development of national networks, such as CIRRUS or PLUS. In these networks, typically only one financial institution within a market area was allowed to participate and the restrictions were marketplace specific.

Restrictions against classes of financial institutions and out-of-state participants have generally been lifted in the past four years. This lifting of restrictions is largely the result of the purchase of network participants by out-of-state financial institutions, industry consolidation, and the growing understanding that restrictions on EFT networks tended to produce low transaction volumes which resulted in high per-transaction costs. In the cases of CIRRUS and PLUS, the networks were purchased by the major card associations, MasterCard and VISA.

The role of third parties in EFT networks has accordingly increased over the last two years. Major terminal-driving firms, such as ADP, GTE, or subsidiaries of financial institutions, routinely are allowed operation within the networks. While third parties are allowed to offer their services within the network, it is still uncommon to see a third party have full participation or play an ownership role.

An entity desiring to participate in a network usually must complete an agreement with the switch operator or with an individual DPC or participant within the network. If a State food stamp agency or FNS wished to participate, this rule would apply. Some entry or switch connection fee would be required. This switch connection fee varies from network to network; it ranges as high as a \$25,000 one-time fee or a several thousand dollar monthly fee, and as low as a \$200 one-time fee plus the costs of interface. The one-time entry fee would allow the State to establish a connection with the central switch and to operate terminals within the network. Additionally, the fee would cover the initial loading of terminals into the switch's files.

The operating rules and bylaws of some networks preclude participation by a non-financial institution, which would exclude a State or FNS. On the other hand, several networks interviewed expressed an interest in having EBT as part of their services, and even offered to waive their initial connection fee for the opportunity. The networks expect that the additional volume of food stamp transactions would result in scale economies which could be passed on to the rest of the network participants. In such situations, existing third-party restrictions may not pose binding constraints.

Requirements for network participants. The behavior and liabilities of participants in an EFT network are governed by the bylaws and operating rules, and will affect a food stamp agency. These responsibilities and liabilities include provisions that would not be intuitively obvious. For example, a terminal placer typically bears all responsibility and civil liability for events taking place at its terminal. Thus, if a recipient were to be robbed while at a food stamp terminal, there is some likelihood that the food stamp agency could be drawn in a lawsuit. As unlikely as this seems, crimes at ATMs have already involved the terminal owner, the card issuing bank, the network provider, and all of the network owners in lawsuits.

All EFT networks operate with specific technical guidelines for terminal availability, security, encryption, and DPC and switch performance. Included in these guidelines are requirements for the coding and physical characteristics of cards. To participate in a network such as this, the food stamp agency would have to subscribe to all of the technical requirements and agree to pay penalties for failing to meet performance requirements. Some guidelines explicitly require the use of standard magnetic stripe cards (track II) and on-line authorization. An off-line EBT system or a system using some other card technology would not be allowed to participate in such a network.

Settlement of funds within EFT networks is handled through Federal Reserve Bank accounts or through a single bank within the network which serves as the settlement bank. The food stamp agency would be required to have available funds on deposit if a settlement bank is used, or would be required to pay the cost of a Federal Reserve entry each day to settle terminal usage fees and incidental charges which the network would make.

Communications in a switch network. Communications usually use dedicated telephone lines to multi-dropped ATMs (i.e., where several terminals share the same telephone line), and use either dedicated or dial-up lines to POS terminals. Dedicated lines connect the switch to the DPCs. The communications protocol normally includes network-mandated encryption techniques or encryption equipment for communications security.

In most cases, the costs of communications are borne by the individual network participants who use the facilities. The owner or installer of

an ATM pays for a share of the dedicated circuit on which the multi-dropped ATM resides, while the DPCs pay the cost of the lines between themselves and the switch. Where a third party is driving terminals for a network participant, communication costs are either directly charged back to the participant or are included in the fees paid by the participant for the third party's service.

Operating charges. Charges in an EFT network appear on three levels. On the first level, a price is set for each transaction which passes through the switch. This fee averages around 8 cents, with fees being seen as low as 3.5 cents and as high as 25 cents. The price depends on who owns or controls the network, what services are provided, and the volume of transactions experienced by the network.

Switch fees may be set by the owning and controlling members of the network, or may reflect the contract which the network has with the third party which provides its switch operations. For example, if the third party is charging ten cents per switch transaction, the network must pay the ten cents and must markup each transaction to assure its continued functioning. In very high volume situations, a markup as low as two to three cents will allow the network-operating entity to continue on a break-even basis.

Historically, the card issuer paid the entire switch fee. In several networks, however, including the evolving ENTREE POS system, the POS switch fee is divided between the card issuer and the terminal placer or owner.

During the past year, several networks have reduced switch fees either to remain competitive in their marketplace, as a result of renegotiations of contracts with their third party switch provider, or as a result of substantial volume increases.

The second level of fees are set by participants for the services they provide. DPCs charge their correspondents (i.e., card bases which they process) for authorizations on that card base, for additions and deletions to the card base, for researching records, for report production, for funds settlement activities, for card production, and even marketing or consultation

services. An example of this would be a DPC which charged 50 cents per card issued, 10 cents per month for having the cardholder on its computer files, 10 cents per authorization, \$200 per month for driving an ATM, and a 50 percent mark-up on all marketing materials provided to the correspondent. It is not atypical for each correspondent also to have a funds account with the DPC for the settlement of network fees. The DPC makes additional profits from holding this account.

The financial institutions participating in an EFT network can charge their cardholders for use of the network. These fees are set by the individual institution and are in no way regulated by the network. A recent trend is for network participants to charge cardholders for the use of terminals that belong to another network participant. This charge, called a "foreign transaction fee," has become increasingly prevalent and often is as high as 75 cents per transaction.

The third level of fees in a shared network are those fees paid by a card-issuing institution to a terminal-placing institution when cardholders of the issuer use a terminal owned by the placer. These fees are called interchange fees and are set by the Board of Directors of the network. The fees are subject to revision as the network grows or significant economies of scale are produced. Many of the newer networks use the services of a third party, such as a consulting firm, to assist them in setting interchange fees. By having a third party evaluate the costs in the network and setting a fee which reflects costs, network participants protect themselves from price fixing concerns.

Interchange fees, the payment by one financial institution for having its customer use the terminal of another is the basis for the "foreign transaction fee" mentioned above. Since Bank X must pay Bank Y a certain amount for each terminal usage by a cardholder, it passes on this fee directly to its cardholders.

Exhibit 4-2 summarizes the fees typically found within an EFT network. These fees will vary from network to network.

Exhibit 4-2

Typical ATM Network Fees
(cents per transaction)

TYPE OF FEE	COST
DPC charge to correspondent	Various, depends on service level
Switch fee charged to card issuer and/or terminal placer	3.5c - 25c
Terminal use fee charged to card issuer	
ATM	45c-75c
POS	10c-45c
Transaction fee charged to card holder	0 - 75c

A food stamp agency operating an EBT system, if it participates in an EFT network, may find it must take the role of placing terminals, especially in smaller food stores, convenience stores, or "Mom and Pop" food retailers. If the agency allows the terminals to accept other network debit cards, under the operating rules or bylaws, the agency would either be paid a fee when a network cardholder used the terminals or would be required to collect from a merchant a certain portion of the switch fee when transactions are completed. This could place the food stamp agency in a somewhat uncomfortable role, as merchants contacted in this study expressed displeasure at the prospect of paying fees for food stamp redemptions or to accept debit POS items. Nonetheless, the network operating rules would require the agency either to collect the fees, or to pay the fees itself if it chose to sponsor terminals in the network and not charge participating retailers.

POS services. The typical EFT network is composed mainly of ATMs, but many have begun to offer POS service. Such service most often involves dial-up terminals placed in convenience stores and gas stations, and occasionally with retail merchants. It is unusual for any EFT network to drive ECRs and bar code scanners in major supermarkets. In a few situations, however, networks have placed dial-up or dedicated devices in a few supermarket lanes. More commonly, dial-up terminals in supermarkets are driven by third-party providers for participants of the network.

Examples of in-place POS services can be found in many States, with concentrations in California, Georgia, Ohio, Wisconsin, Iowa, Texas, Florida, New York, and Washington. POS services placed by participants in EFT networks are expected to rise during the next three years. Exhibit 4-3 provides a series of estimates from Carmody & Company based on their research into the number of debit terminals available in mid-1986 and by 1990. Although the Carmody study has been widely quoted in EFT industry trade magazines, it may, like many previous projections of future POS growth, be overly optimistic.

Some of the larger food store chains, including several survey respondents, indicate that they are placing debit POS terminals in selected stores. While this is a strong positive indication of growth, the surveyed merchants also cited factors that could keep the growth slow. They expressed

Exhibit 4-3

Expected Industry Distribution of
178,000 Debit POS Terminal Placements by 1990¹

INDUSTRY	PERCENTAGE	TERMINALS
Supermarket	42	74,760
Retail gas	17	30,260
Convenience store	7	12,460
Fast food restaurant	10	17,800
Major retailer	4	7,120
Others	20	35,600

¹Source: Carmody & Co., Inc., Woodcliff Lake, New Jersey.

concern for the ability of EFT networks to provide services which were both highly reliable and low in cost. Some survey respondents also indicated an unwillingness to have a financial institution or network control their payment technology, particularly because they feel their own technology may be more advanced and productive than that offered by the network. For example, they feel their ECRs and bar code scanners are much more advanced than the dial-up terminals being offered.

In addition to the terminal technology issue, network authorization reliability is a concern. Current networks record rejection rates ranging as high as 17 percent and as low as 3 percent of all POS transactions. The reasons for these rejection rates vary, but leave retailers questioning the reliability that the network can deliver, reliability which is key to the merchant's good relationship with the customer.

While early testing of debit-only terminals is taking place, POS in EFT networks has generally found only a lukewarm response. The volume of transactions is not yet large enough to prove that it is a viable concept when including only debit cards as the card base. Observers expect that as more networks offer both credit and debit services, per-transaction costs can be reduced and more merchants recruited. Unfortunately, only a select subset of retail food merchants anticipate the use of credit cards, so this blending of card bases is unlikely to be a strong motivating factor for food merchants to participate in debit POS.

There is every expectation that EFT networks will continue to develop their POS activity. However, the last five years have seen relatively little growth in the distribution and operation of POS terminals in the food retail industry.¹ In the words of one shared network president, "I'd love to do food stamps, but I'm not in enough food stores. Call me back when I have at least a 20 percent penetration."

¹POS News of June, 1987, reports the placement of 1,782 debit card POS terminals in convenience stores, and 6,805 in supermarkets. There are approximately 230,000 stores redeeming food stamps.

Trends. There are several strong trends among EFT networks. One trend is that States which support multiple networks are seeing a consolidation into a single network. This is also true in the case of smaller networks in adjoining states which can be consolidated into a single, more efficient network. Consolidations are unlikely in States such as Wisconsin, Iowa, Florida, and Georgia, which already support a single network.

Following several years of discussion, movement is beginning for networks having common service areas to allow direct interchange of transactions. An example of this interchange is the PULSE network based in Texas and the Star network based in California. It remains to be seen whether organizations such as the Shared Network Executives Association (SNEA) can accomplish the network interfaces they have proposed.

On a national basis, the MasterCard and VISA bankcard associations have purchased the PLUS and CIRRUS ATM networks. There have been two immediate results of the purchase: the networks have been opened to membership by any depository financial institution, and transaction prices have been reduced. At this point, both PLUS and CIRRUS support only ATM traffic, but they have talked considerably about POS.

MasterCard and VISA, as well as several other regional networks, have joined to develop an on-line POS service known as ENTREE. ENTREE will provide a debit logo which will be recognizable across the country. ENTREE has only been introduced within the last few months and industry observers expect at least two years to pass before the service is fully implemented. Survey respondents, reflecting on ENTREE and on standardizing efforts by groups such as the American Bankers Association (ABA), state that the strongest role to be played by the new service may be in the setting of national POS standards. Any EBT system which uses these POS networks would be required to comply with the standards.

Another trend is that significant new entries into EFT are being seen. These include communication companies such as GTE, AT&T and several Regional Bell Operating Companies (RBOCs). In addition to the communication companies, other large corporations who have historically supplied authorization services, such as First Data Resources (FDR) and National Data

Corporation (NDC) are expected to offer EFT services. New entries are also contemplated by airlines and foreign corporations.

There are three major results of these trends. The first result is that the cost of EFT services has fallen significantly and is expected to continue falling in the next few years. The second result is that standards are being either developed or reaffirmed for use within POS networks. Finally, a choice of service providers is now being allowed where network participants were previously limited to those services offered by other network participants.

Issues for off-line EBT systems. Assessing the compatibility of off-line EBT systems with existing EFT networks is not straightforward. It involves issues of technical compatibility, of organizational objectives and constraints, and of market developments. .

The technical compatibility issue can be viewed from two perspectives. One question is whether the equipment and technical design of an off-line EBT system could accommodate usage by a commercial POS network. The second is whether an off-line EBT card could be used to redeem benefits within an existing commercial network.

An off-line EBT system which uses tracks II and III of a standard magnetic stripe card and which involves centralized settlement, would have no difficulty accommodating commercial POS usage. As previously indicated, terminals are readily available which read and write to standard magnetic stripe cards and contain the communication capability needed for on-line transactions. They need only additional software programming to identify which cards require on-line authorization and some additional memory to store and forward off-line items. Even with decentralized settlement, the EBT terminals could handle commercial transactions as long as the terminals are purchased with communications capability.

Existing EFT networks might not so readily accommodate off-line EBT transactions, however. Some existing terminals do not have the capability to accept the additional software needed for off-line authorization, and many more do not have the memory capacity to accumulate transactions for later

delivery to the central computer. This problem could be overcome by replacing or upgrading the existing network terminals with off-line EBT-compatible terminals, however.

The same level of compatibility is possible with an off-line EBT system based on chip card technology. POS terminals available in the immediate future will accept both standard magnetic stripe cards and chip cards. An EBT system with these terminals could handle off-line food stamp chip cards, and at the same time allow commercial network transactions using on-line authorization and standard magnetic stripe cards.

An off-line system based on any other card technology would have to be considered incompatible with EFT networks. No terminal devices exist or are planned that would handle standard magnetic stripe cards in conjunction with laser or token cards, or with cards whose magnetic stripe does not conform to placement and format standards.

Beyond the technical issues lie organizational concerns. The vast majority of existing EFT networks report that they are exclusively on-line operations. A food stamp agency would be likely to face stiff resistance to the use of off-line techniques and technologies. Off-line activity is commonly barred by the operating rules, and in some cases rewriting track III on a standard magnetic stripe card may not be allowed. Only one network, Cactus Switch in Arizona, is known to encourage off-line techniques.

This on-line stricture is somewhat mitigated by the ability of terminal-driving DPCs to allow transaction sets at their terminals which exceed the network's minimum transaction set. In other words, the EBT system could allow its own cards to operate off-line at its own terminals while allowing other network transactions to be completed in an on-line mode. This would not account for the use of off-line cards at terminals which are not driven by the EBT system, however.

The final issue concerns the penetration of POS services into the food retail market. Despite optimistic forecasts, the actual placement of terminal devices in food stores has not proceeded with great speed. For example, figures from POS News indicate that the number of terminals in

supermarkets has grown from 760 in June 1985 to 2,319 in June 1986, to 6,805 in June 1987. Terminals in convenience stores have grown from 650 to 2,702 in the same period. Although this represents rapid percentage growth, it still implies penetration of only a small proportion of the market. Moreover, the bulk of the establishments accepting food stamps are smaller grocery and specialty food stores, where commercial POS networks have virtually no penetration. Given this situation, there is no compelling reason for an EBT system to join a POS network in most locations.

4.8 SUMMARY

Reviewing the currently available technology indicates that an off-line EBT system is technically feasible. In fact, the system can be feasible with several different technologies. The availability of individual system components varies, however, as summarized in Exhibit 4-4.

Technical feasibility can be seen most clearly for an off-line system using the rewritable characteristics of track III of a standard magnetic stripe card. Cards and POS terminals are well established and readily available. Issuance machines, either with or without a coupon-dispensing feature, can be constructed with relatively minor modification to package currently-available components differently. For the chip card system, telephony-based issuance machines are already available. Central computer equipment, software, and communications are all fully available to support an EBT system based on this or any other card technology.

At the same time, the standard magnetic stripe card system has limitations that must be considered. The memory capacity of the card allows only a limited combination of food stamps with other assistance programs in an EBT system, although it could readily combine food stamps with AFDC and GA. The magnetic stripe technology is vulnerable to tampering and counterfeiting. While no estimates are available on the extent of this vulnerability, it is of particular concern in a highly visible application that would have no automatic way to close an account (i.e., to stop further use of a problem card).

Exhibit 4-4

AVAILABILITY OF OFF-LINE EBT SYSTEM COMPONENTS

Component	Access Card Technology				
	Standard Magnetic Stripe Card	Chip Card	Laser Card	Token Card	Non-Standard Magnetic Stripe Card
Access cards	available	available	restricted availability	available	available
POS terminals	available	available	unavailable	available with modi- fication	available
Issuance machines					
regular	available with modi- fication	available with modi- fication	unavailable	available with modi- fication	available with modi- fication
telephony- based	unavailable	available	unavailable	unavailable	unavailable
with coupon dispensing	available with modi- fication	available with modi- fication	unavailable	unavailable	unavailable
Central computer	available	available	available	available	available
Software	available	available	available	available	available
Communications	available	available	available	available	available

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The chip card appears less frequently in the U.S., but has been used sufficiently in Europe and the Far East to consider a chip card system technically feasible. The cards have been used for functions which are directly analogous to those of an EBT system, that is, to identify users, to retain value units, and to authorize financial transactions.

POS terminals are available and new terminals incorporating a modular reader/writer that will handle both chip and standard magnetic stripe cards are either available or expected within the immediate future. An on-line, telephony-based issuance machine for chip cards is currently available, and an equivalent to the issuance machine for the standard magnetic stripe card is considered available with modifications. Finally, the chip card offers substantial security against counterfeiting and tampering and the flexibility to handle most imaginable multi-program applications.

An off-line system could also be constructed with either of two disposable-card technologies: the token card or the non-standard magnetic stripe card. Only the non-standard magnetic stripe approach appears desirable for an EBT system, however.

The non-standard magnetic stripe card is available and considered proven. Provided that the stripe placement and format conforms to bank card standards, it can use the same POS terminal as the standard magnetic stripe card. The issuance machine differs in requiring a card dispenser, but is considered available with modifications. In general, then, the advantages and limitations noted for the standard magnetic stripe card also apply to the non-standard card.

Token cards are available and proven in some situations. The token card has important limitations for EBT use, however: it is less secure than other technologies, it requires the use of cash change and cash refunds, and it is not suitable for any multi-program application. Token card terminals are not currently available in a form suitable for the food retail environment and issuance machines do not exist as such, but both devices are considered available with modifications. Although the technology appears feasible, the card's limitations make it less desirable than other approaches.

An off-line EBT system based on optical memory or laser card technology is theoretically possible and would have many of the same advantages as the chip card. The technology is not sufficiently proven to be considered feasible at this time, however. The problem is less with the card itself than with the supporting equipment. Relatively few applications of the laser card have occurred thus far, and these have not involved development of equipment closely resembling POS terminals or issuance machines.

None of the technologies lead to an off-line EBT system that would be fully compatible with existing commercial POS networks. Systems using standard or non-standard magnetic stripe cards or chip cards, however, could be partially compatible. The EBT system could be used for commercial POS transactions, but EBT transactions could take place on the commercial POS terminals only by replacing terminals. The penetration of POS services into the food retail industry has been sufficiently slow, however, that compatibility may not be an important issue in most locations for the near future.

Chapter Five

OFF-LINE EBT SYSTEM COSTS

The evaluation of the Reading demonstration suggests that the critical question about any electronic benefit transfer (EBT) approach is its cost. Although the the EBT system was preferable to the coupon system in most respects, operating costs for the demonstration system were \$27 per case month, fully nine times the \$3 cost of the ATP/coupon system. Much of the cost difference stemmed from special characteristics of the demonstration, such as the small caseload served, the need to lease equipment rather than purchase it, and the stand-alone nature of the demonstration. Nonetheless, projections indicated that an on-line EBT system might have costs in the range of \$5 to \$7 per case month even in large-scale systems.

This chapter addresses the question of an off-line EBT system's cost. It begins by reviewing estimated prices for each major component of the EBT system (Sections 5.1 through 5.8). These component costs are then assem-

bled into overall system operating costs for the pure point-of-sale (POS) EBT system, a system combining POS with automated coupon dispensing (POS/ACD), and the multi-program system (Sections 5.9 through 5.11). The analysis examines costs for several configurations of each system, and compares off-line EBT costs to those of on-line and coupon systems. Finally, the chapter briefly discusses the design, development, and implementation costs of an off-line EBT system (Section 5.12).

Much of the analysis presented in this chapter is based on information obtained through the vendor interviews. Each vendor of major system components, such as access cards or terminals, was asked about the prices of existing products for varying order sizes. In the case of system components not currently available as "off the shelf" products, vendors were asked to provide rough estimates of the price of a suitably modified product. The vendors' responses are presented in the component-by-component discussion in Sections 5.1 through 5.8.

The vendors' price quotes also form the basis for most of the costs included in the overall system estimates in subsequent sections. That information is supplemented by data from the Reading evaluation on system parameters, such as the number of purchases per household, and certain cost

elements that appear applicable to an off-line system, such as the cost of computer time when the central computer facility is integrated within a State data center.

Three caveats to the vendor price data should be noted. First, prices in several of the industry sectors surveyed are quite volatile. Prices used here were in effect as of April/May 1987. Second, quoted prices often represent a vendor's starting position, which may be modified in competitive bidding or negotiation.¹ Finally, the reliability of price estimates is closely related to product availability. Vendor responses for products considered "available with modification" and "not available" can only be considered rough approximations.

Throughout the chapter, system costs are explored for three scenarios. The three scenarios correspond to a small city, a major city, and a large state, with caseloads of 5,300, 130,000 and 400,000 respectively. For purposes of estimating the number of retailers, issuance offices, and other factors related to system scale, statistics for the three scenarios were taken from data for Berks County, for Philadelphia, and for Pennsylvania as a whole. These factors were used in determining, for example, the number of terminals that must be ordered and hence the vendors' price per unit. The same three caseload scenarios were used in projections developed during the Reading evaluation.

5.1 ACCESS CARD COSTS

Price data were obtained for the five types of cards discussed in Chapter 4: standard magnetic stripe cards, chip cards, laser cards, token cards, and non-standard magnetic stripe cards. Costs per card range widely, depending on the card technology and the size of the order (see Exhibit 5-1).

Standard magnetic stripe cards are generally the least expensive type of card at all volume levels. This occurs partly because the magnetic stripe technology is relatively simple, and partly because the market for the standard magnetic stripe cards is so well developed that average production costs are very low. An order for these cards entails no special start-up,

¹Appendix B discusses these factors and provides suggestions for purchasing EBT-related equipment.

Exhibit 5-1

Access Card Prices Per Card

Item ^a	Purchase Volume		
	5,300	130,000	400,000
Standard Magnetic Stripe Card ^b	\$.40 R = .32/.44	\$.30 R = .26/.34	\$.12 R = .06/.30
Chip Card ^c	\$12.00 R = 12.00/100.00	\$7.75 R = 7.75/52.10	\$6.25 R = 6.25/52.10
Laser Card ^d	\$10.00	\$2.50	\$1.50
Token Card	\$.45	\$.35	\$.20
Non-Standard Magnetic Stripe Card	\$1.34	\$.15	\$.13

R = range.

^aRaw stock without encoding, embossing, mailing, etc. All cards have two-color graphics.

^bThe primary figure is an average of all vendor responses. Special security features such as a watermark can add several cents per card to the prices shown.

^cWide price variations are based on set-up costs, sizes of memory and functionality of chips, and manufacturers' varying production costs. The primary figure is the price for a card with the limited size and functionality required for an off-line EBT system.

^dThe vendor reports a significant price break at 100,000 cards.

fabrication or retooling costs. The average cost per card ranges from 40 cents in a small EBT system to 12 cents in a large system.

Token cards and non-standard magnetic stripe cards have the potential to be less costly than any of the other card types because they use a less expensive card stock. At this point, large markets for token cards in financial transaction systems have not been established, leading to price quotes that exceed the price of the standard magnetic stripe card at most volume levels. Although it can be expected that prices will fall rapidly as utilization grows, current prices are shown here.

Chip cards are the most expensive alternative, and display a very wide range of costs. A major factor in the cost variation is the range of memory and functions in the card. At the low end of the price range are cards with one kilobyte of memory, little or no internal processing capability, and no internal power source. The highest prices apply to cards still in the prototype stage that feature more memory, an internal power source, and a keyboard and video display.

Cards from the low end of this range can perform all functions needed for an off-line EBT system, even in a multi-program application. Accordingly, the primary cost figures shown in the table and used in later projections represent the quoted prices for such "low end" chip cards.

Production costs for chip cards are higher than for the other technologies. Thus, although prices are likely to decline as the cards become more widely used, they will probably remain higher than costs for the other types of cards.

Laser cards were quoted at a figure of \$10 each with a rapidly diminishing cost to \$1.50 each for the large case scenario. The laser card vendor reports that production entails high initial set-up costs and that the major price drop is at approximately 100,000 cards.

5.2 ISSUANCE MACHINES

Although the issuance machine as described in this report does not correspond to any existing product, three vendors report that they have equipment that they feel can be customized to fit the role. The vendors could provide only approximate prices on the basis of the general description of the

device. More precise estimates would require specification of factors such as how much security must be provided for the machine (i.e., whether a safe is required and whether the machine will be installed in a stand-alone position where it might be more vulnerable to tampering), the amount of memory required, the communications requirements of the device, and specific capabilities of printers and card readers.

The cost per unit declines with increases in purchase volume. The purchase volume in Exhibit 5-2 assumes that one issuance machine is placed at each issuance point currently established for the coupon system. This results in a varying ratio of households to issuance machines: each issuance machine in the small city scenario serves an average of about 200 households, while the large city has over 2,000 households per machine.¹

Prices per machine are estimated to be in the \$7,000 to \$9,000 range for an off-line issuance machine with no dispensing feature. The machines for standard magnetic stripe cards, chip cards and laser cards are the same except for the reader/writer unit. Because the standard magnetic stripe card technology is the most fully developed, manufacturers indicate that incorporating a reader/writer unit using chip or laser technologies would add about \$1,000 to the cost per issuance machine.

As mentioned in Section 4.3, an on-line telephony-based issuance machine is available for chip cards. In this option, a specially equipped telephone acts as an on-line issuance machine for a chip card. The vendor of the devices quotes prices ranging between \$2,500 for a single unit and \$1,250 per unit in quantities greater than 1,000. The device comes equipped with a keyboard, video screen, and printer which could produce receipts.

Issuance machines for systems using a single-allotment disposable card must be capable of storing and dispensing cards, and accordingly have higher costs. No products are currently marketed that perform exactly the functions required here, so a vendor could provide only rough estimates. No estimate was available for the non-standard magnetic stripe card. Based on a general comparison with analogous devices on the market, vendors estimate that these issuance machines would be priced at about \$40,000 at the volume

¹Alternatives to this strategy for issuance machine placement are explored in section 5.9.

Exhibit 5-2

Issuance Machine/Automated Coupon Dispenser
Cost Per Machine

Item	Number of Units Purchased		
	27	63	1,587
Issuance Machine ^a for:			
Standard Magnetic Stripe Card	\$8,000	\$7,600	\$6,700
Laser/Chip Card	9,000	8,600	7,700
Telephony Chip Card ^b	2,300	2,300	1,250
Token	45,000	35,000	30,000
Non-Standard Magnetic Stripe	40,000	35,000	25,000
Automated Coupon Dispenser (ACD) ^c			
Standard Magnetic Stripe	27,000	22,500	18,000
Chip/Laser	28,000	23,500	19,000

^aCosts are based on vendor estimates to construct devices. Device would contain read/write capability for card types indicated, four megabytes of memory, communications capability, security features, and printer.

^bContains chip card reader/writer, basic communications capabilities, printer, video screen, and keyboard.

^cCosts are based on vendor estimates to modify current device. Device would contain read/write capabilities for card types indicated, coupon dispenser, printer, and security features.

required for the small city, ranging down to \$25,000 in the high-volume scenario.

Automated coupon dispensers (ACDs) are available with modifications from at least three vendors. The vendors report that the existing devices may require modifications from their present use. These modifications would include changes in the dispensing throats, the size of memory, and other physical characteristics such as safes, etc., depending on the expected installations. The vendors envisioned the ACDs would cost between \$18,000 and \$30,000 based on sales volume. Again, exact specifications will be needed to fix the final prices. No quotations were available for machines dispensing both coupons and disposable cards (token or non-standard magnetic stripe) because these represent greater departures from existing products.

5.3 POS TERMINALS

The POS terminals allow recipients to redeem their benefits at authorized food retailer locations. These terminals are stand-alone devices with personal identification number (PIN) pads, printers, memory, and communications ability.

POS terminals currently exist in substantial numbers only for the standard magnetic stripe card. These products' prices vary widely, as shown in Exhibit 5-3. The greatest sources of price variation are: the quantity purchased; the amount of memory provided; and the reader needed to read and write to the access device. In addition to these variations, some vendors have existing products for which they have incurred high fixed costs, and they must now price their devices to recover these costs. The central estimate shown in the table and used in estimating overall system costs reflects a judgemental adjustment to reduce the effects of these apparently above-market prices.

The quantity of purchases shown in Exhibit 5-3 assumes that every checkout station in all participating stores is equipped with a terminal. This assumption is made for comparability with the Reading system, but alternative strategies are examined in estimating system costs in Section 5.9.

Prices for standard magnetic stripe POS terminals are lower than those for terminals based on other card technologies. Chip card terminals

Exhibit 5-3

POS Terminal Prices Per Terminal

Item	Number of Units Purchased		
	337	4,984	18,182
POS Terminal for:			
Standard Magnetic Stripe Card	\$678 ^a R = 325/1,665	\$565 ^a R = 275/1,305	\$427 ^a R = 250/1,100
Chip Card ^b	748	635	497
Laser Card ^c	1,000	860	684
Token Card ^d	1,500	1,200	1,000
Non-Standard Magnetic Stripe Card ^e	678	565	427

^aCentral estimate is not the mean, but reflects a judgemental adjustment to reduce the effect of a few vendors with prices substantially higher than the main market range for comparable products.

^bPrices based on survey responses concerning price increases over standard magnetic stripe card required for chip card readers. Volume breaks based on survey responses.

^cProducts are unavailable and figure given is vendor estimates adjusted for price breaks by survey responses.

^dProducts are unavailable; figures given are vendor estimates adjusted for price breaks by survey responses.

^eTerminals would not differ from terminals for standard magnetic stripe cards.

approach the standard magnetic stripe terminal price level and a few POS-like chip card terminals can be found in the \$250 to \$300 price range. Few vendors offer POS terminals for chip cards that exactly meet the EBT system's requirements, however. Non-standard magnetic stripe cards can be read by standard magnetic stripe terminals, provided that stripe placement conforms to the standard. This placement is assumed for the non-standard magnetic stripe system described here.

The laser card has no currently available POS terminals which operate independently, that is, without a supporting personal computer. Similarly, no token card terminals are currently available that would be suitable for a food retail checkout station. Prices for these items are, therefore, quite speculative and are based on vendors' expectations of the price after appropriate development or modification work, rather than a current price list.

Although this section has discussed POS terminals only as stand-alone devices, some manufacturers of electronic cash registers and scanners now offer products that integrate POS terminal functions. The devices are available only for standard magnetic stripe cards, but theoretically could incorporate any other kind of reader/writer unit. Although the incremental cost for the POS terminal in this integrated equipment may be less than the prices shown here, the overall equipment package represents a major investment that only a small minority of retailers will make in any given year. Accordingly, this equipment configuration is not used in estimating system prices.

5.4 BALANCE INQUIRY TERMINALS

The balance inquiry terminal allows recipients to learn the current available balance of their account. In an off-line system, the only current balance is the one held by the card. Although recipients could use a recent receipt to estimate available benefits, a terminal in major locations could provide them with fully current information.

The balance inquiry terminal would have a reader that allows the use of one or more card types, a PIN pad, and a display. The device needs no printer, telephone handset, or modem. The number of terminals in Exhibit 5-4

Exhibit 5-4

Balance Inquiry Terminal Prices Per Terminal^a

Item	Number of Units Purchased		
	12	343	1,330
Balance Inquiry Terminal ^b			
Standard Magnetic Stripe Card	\$220	\$150	\$135
Chip Card	300	200	165
Laser Card	900	760	584
Token Card	400	380	300
Non-standard Magnetic Stripe Card	220	150	135

^aPrices are based on vendors' quotes for standard magnetic stripe cards and chip cards, both of which are considered available. Token card and laser card balance inquiry terminals are unavailable and the prices are judgmental adjustments of POS terminal estimates based on discussions with vendors. The balance inquiry terminal for the non-standard magnetic stripe card would not differ from the standard magnetic stripe card.

^bThe terminal would contain a PIN-pad, reader, and video display.

assumes a ratio of balance-only terminals to POS terminals comparable to that in Reading.

Although a full-function POS terminal could be placed and used as a balance-inquiry device, there is some expectation that smaller and cheaper devices can be used to fulfill the purpose. Balance inquiry terminals are generally estimated to cost \$100 to \$400 less than the full-function POS terminals.

5.5 MANUAL TRANSACTION RECORDER

The manual transaction recorder reads and writes to a card to indicate that a manual transaction has taken place and to record the value of that transaction. The devices are AC or battery powered and contain only a keyboard, a display and a read/write unit. It is assumed that retailers with only one POS terminal would get a manual transaction recorder. In other stores, it is assumed that the additional terminal(s) would serve as a sufficient backup.

Manual transaction recorders do not currently exist, but could be considered available with modifications. The prices reflect the best estimates from two suppliers as to what would be required to fabricate the units. As with all devices, quantity purchase would reduce the expected cost per unit. Exhibit 5-5 presents unit prices for manual transaction recorders purchased in the quantities needed for the three caseload scenarios.

The manual transaction recorder is expected to be used either with a system using a standard or non-standard magnetic stripe card or with a chip card system. Suppliers estimate the cost would be approximately \$100 per unit higher with chip cards than magnetic stripe cards.

No manual transaction recorder is envisioned for laser card or token card systems. In the case of the laser card, because the basic POS terminal does not exist and would have to be developed for an EBT system, it would probably be less costly to place a second terminal in every store than to

Exhibit 5-5

Manual Transaction Recorder Price Per Unit

Item	Purchase Units		
	143	2,976	6,529
Manual Transaction Recorder ^a	\$330	\$317	\$191

^aPrices given are based on two vendor estimates of a price after developing the device. For the standard or non-standard magnetic stripe card, the device is considered to be available with modifications. A manual transaction recorder for chip cards is expected to cost at least \$100 more per unit.

develop a second device. In the case of the token card, the existing technology cannot perform the functions required in the manual transaction process,¹ and a second terminal is the only viable solution.

5.6 A CENTRAL PROCESSING FACILITY

The central processing facility is built around the main computer for maintaining accounts, generating records, managing the terminals, providing recipient and merchant support, and providing the data to generate or encode cards for the system. The nature of the central computer facility in an EBT system depends critically on whether the EBT system is implemented as a stand-alone system, or is integrated with other activities within the context of a large State data processing facility, a commercial POS network, or other data processing operation. For comparability with Reading, we assume a stand-alone facility which contains features required for an off-line EBT system and is dedicated to that purpose. Cost implications of integrating the EBT central processing operations with other State programs are explored in the analysis of overall system costs.

The cost of a central processing facility can vary widely, depending on the configuration of the system (i.e., the types of equipment, vendors and models of equipment chosen) and the nature of the State systems with which the EBT system will interact. For example, the State's existing hardware may pose particular requirements for compatibility of EBT equipment. For illustrative purposes, the cost of a hypothetical off-line system has been developed, based on specific equipment selections. The equipment selections are used only as an example and do not represent an endorsement of particular equipment or the vendors. A comparable hypothetical system has been specified for an on-line system to show the differences in system construction and costs. The figures are presented in Exhibit 5-6.

Central computer costs are relatively insensitive to the size of an off-line system due to the fixed capacity required to process the first transaction. Once the overhead for the first transaction is in place, the amount of processing power to handle each additional transaction diminishes

¹Token card reader/writers simply count the number of fields representing positive units of value on the card and erase fields as appropriate. They are not designed for placing information in special fields or interpreting such information.

Exhibit 5-6

Central Computer Purchase Costs for
Off-Line and On-Line Systems

	<u>Off-Line</u>	<u>On-Line</u>
	<u>5,300 caseload</u>	
1 - IBM 4361 Batch Processor		1 - Tandem EXT-10 Computer
1 - 3705 Communications Controller		1 - IBM 4361 Batch Processor
1 - Tape Drive		2 - Tape Drives
1 - Disk Drive		2 - Disk Drives
1 - Printer		1 - Printer
		1 - Tape Controller
Estimated Cost	\$529,635	\$392,700
Fixed communications	<u>24,400</u>	<u>26,800</u>
Total Cost	\$554,035	\$419,500
	<u>130,000 caseload</u>	
1 - IBM 4381 Batch Processor		1 - Tandem EXT-25 Computer
1 - 3705 Communications Controller (with additional communication ports and transaction handling capabilities)		1 - IBM 4381 Batch Processor
2 - Tape Drives		2 - Tape Drives
1 - Disk Drive		2 - Disk Drives
1 - Printer		1 - Printer
		2 - Tape Controllers
Estimated Cost	\$586,770	\$737,000
Fixed Communications	<u>73,200</u>	<u>91,700</u>
Total Cost	\$659,970	\$828,700
	<u>400,000 caseload</u>	
1 - IBM 4381 Batch Processor		3 - Tandem TXP Computers
1 - 3705 Communications Controller (further enhanced)		1 - IBM 4381 Batch Processor
2 - Tape Drives		3 - Tape Drives
1 - Disk Drive		3 - Disk Drives
1 - Printer		1 - Printer
		1 - Tape Controller
		1 - Disk Controller
Estimated Cost	\$596,770	\$986,400
Fixed Communications	<u>146,600</u>	<u>128,300</u>
Total Cost	\$743,370	\$1,113,700

¹All vendors and equipment are for illustration only and do not represent an endorsement.

dramatically. The cost for the 400,000 household scenario is only about a third higher than the cost with 5,300 households, with communications equipment accounting for most of the difference. An on-line system is more sensitive to system size, with lower costs than the off-line system for the small caseload scenario and higher costs for the large caseload scenario.

An off-line system's fixed communication costs may be either higher or lower than those of an on-line system, depending on the system's geography. An off-line system must be able to receive calls from POS terminals and to initiate calls to issuance machines and POS terminals. An on-line system needs only to receive calls from terminals, although the number of calls will be greater than in the off-line system. If the EBT Center and the devices it communicates with are all located in the same city, as in the large city scenario, a single local line handles both incoming and outgoing calls. The on-line system will require more lines in this situation, because it is handling more calls. Because the number of lines and their associated equipment (e.g., modems) is a major factor in determining fixed communications costs, on-line costs will be correspondingly greater. However, if long-distance calls are needed between the EBT Center and its devices, as in the state-wide scenario, an 800 number will handle incoming calls while a WATS line handles outgoing calls. In this situation, the off-line system may need more total lines than the on-line system, and hence may have higher fixed communications costs.

The relatively high proportion of fixed costs in an off-line system means that substantial economies of scale occur for the central processing facility. The cost per household for the small-scale off-line system is \$105, compared to less than \$2 for the state-wide system, due mainly to the distribution of these largely fixed costs over differing caseloads.

Note that the costs presented here reflect only initial purchase costs for the equipment. In calculating operating costs, purchase costs are generally amortized over a five-year period. Computer operations also involve substantial monthly operating and maintenance costs, usually calculated as a monthly percentage of the purchase price. Although not reflected in the exhibit, these factors are incorporated in estimates of total system operating cost.

5.7 SOFTWARE

The largest EBT software expense is for "switch" operation. This software routes messages between the EBT center and issuance machines, POS terminals, and participating programs' data centers. It also initiates settlement, manages account files, and creates reports. Commercial switch software typically contains settlement modules, terminal handling modules, and at least one connection to another data base (e.g., MasterCard, VISA, or a major EFT network).

Most commercially available switch software is written either for IBM-compatible mainframe computers or for continuous processing computers. Exhibit 5-7 compares the expected software costs associated with the purchase of mainframe-type software, which would be used in an off-line EBT system, or for software that would be used with an on-line, continuous processing computer.

The prices in Exhibit 5-7 have been provided by two survey respondents who vend products which would serve all of the program functions. The quotations given are for switch software that would handle all three of the cardbase scenarios.

5.8 CARD PREPARATION EQUIPMENT

To prepare cards for use within an EBT system, equipment is needed which places the name and account number of the user on the card exterior and encodes information about the account number, PIN, and benefit level into the card. The cost of this equipment varies considerably across card types. For example, the embossing and encoding of a standard magnetic stripe card is handled by a machine that comes in several models whose price varies based on the cards per hour that can be processed. These machines handle hundreds of cards per hour, and their most efficient application is to have a single machine prepare cards centrally for the whole EBT system.

Chip card encoding normally requires at least a personal computer and may require an embosser/encoder as well if the card contains a magnetic stripe or if external embossing is desirable. An alternative approach, however, uses a device that a vendor reports is available for less than \$1,200 per unit. In this approach, at least one unit would be placed in each food

Exhibit 5-7

Software Price for an Off-Line and On-Line EBT System^a

Item	Cost
Software for Off-Line Mainframe	\$200,000
vs.	
Software for On-Line Continuous Processing	150,000

^aSoftware includes basic switch functions, settlement module, one terminal handler and one processing data base connection. This price is a composite vendor estimate and actual prices will vary by vendor. These software packages require minimum hardware configurations consistent with those shown in Exhibit 5-6.

stamp office. Because no high-speed preparation equipment currently exists for laser cards, this technology also requires devices in each food stamp office.

The disposable token cards and non-standard magnetic stripe cards involve no special preparation except what occurs as they are dispensed from the issuance machine. These systems involve a standard magnetic stripe card for recipients to access the issuance machine, however. Card preparation equipment for this purpose is the same as that for the standard magnetic stripe card system.

Exhibit 5-8 presents card embosser/encoders required for each of the four access devices under consideration. The prices quoted are based on vendor prices for devices that are available and estimates for the others.

5.9 TOTAL OPERATING COST FOR A PURE POS SYSTEM

Examining the costs of individual system components provides a sense of the sources of variation in the cost of an off-line EBT system. To understand the impact of the component costs, however, it is necessary to combine them into projections for a full system. Such projections must take into account the required number of units of each component as well as the component prices at varying system sizes. This section and the two following sections compare the costs per case month (i.e., cost per household per month) of various possible off-line EBT systems.

This section discusses the costs for five main systems, defined by the card technology employed. The card types are the five examined in earlier sections: standardized magnetic stripe cards, chip cards, laser cards, token cards, and non-standard magnetic stripe cards.

For each card type, costs of a "basic system" are estimated. The five basic systems share the following key features:

- allotments are credited by issuance machines, with one issuance machine for every issuance point existing in the coupon system; the non-standard magnetic stripe card system uses a mail-out approach with no issuance machines;

Exhibit 5-8

Card Preparation Equipment Cost Per Unit^a

Item	Caseload Size		
	5,300	130,000	400,000
Card Embosser/Encoder			
Standard Magnetic Stripe Card	8,845 (1)	31,955 (1)	41,530 (1)
Chip Card	1,200 (1)	1,200 (20)	1,200 (100)
Laser Card	4,500 (1)	4,500 (20)	4,500 (100)
Token Card/Non-Standard			

^aNumber of units purchased in parenthesis.

^bThese cards are dispensed by issuance machines, but a standard magnetic stripe card is used for access to issuance machine. Cost figures for standard magnetic stripe card preparation are therefore used.

- POS terminals are placed at all checkout stations for participating retailers, and all retailers authorized for food stamps are equipped for electronic transactions;
- manual transactions are supported by manual transaction recorders;
- centralized settlement is performed through the EBT Center and the ACH network;
- a full reconciliation approach is incorporated with recipient purchase transaction data maintained at the EBT Center;
- a stand-alone system is envisioned with a dedicated facility for the EBT Center and POS terminals used only for the EBT system;
- the EBT system serves only the Food Stamp Program; and
- there is no cost sharing by retailers.

The standardized magnetic stripe card, chip card, and laser card systems all use the cards for multiple allotments. The token card and non-standard magnetic stripe card systems assume that benefits are held on a disposable, single-allotment card. The non-standard magnetic stripe cards are mailed out. The token cards are dispensed by issuance machines; recipients use a standard magnetic stripe card to access the issuance machine.

Two versions of the basic chip card system are developed, one using an off-line issuance machine equivalent to those in the other systems, and one using an on-line, telephony-based issuance machine.

In addition to these basic systems, the analysis estimates system costs under a variety of strategies that might be expected to contain costs. These include limiting the number of terminals or issuance machines in the system, eliminating manual transactions, adopting decentralized settlement with a "no balance" reconciliation approach, and integrating EBT Center operations into a larger computer facility.

METHODOLOGY

The system cost projections come from a simulation model developed by the project team. The model projects costs for five major categories:

- providing recipients with access devices, including the cost of obtaining, preparing, and issuing the cards at the local food stamp office or the issuance machine and dealing with card-related problems;
- benefit authorization, including costs related to issuance machines and to handling allotment information;
- recipient use of benefits, covering the costs of POS terminals, settlement procedures, and handling recipients' and retailers' account problems;
- housekeeping operations at the computer center, which includes the equipment, labor, software support¹ and other costs of the central computer facility not assigned to any of the previous categories; and
- other Food Stamp Program costs connected with managing retailers (authorization and monitoring) and monitoring the redemption process.

Each of these major cost categories contains numerous individual cost elements, which are defined and displayed in Appendix E. Typically, an element's cost per case month is determined by combining several factors. For example, the cost per case month of card stock is calculated as the number of new cards that must be issued each month for various reasons (newly approved cases, lost and stolen cards, and damaged cards), multiplied by the unit cost of the cards, and divided by the number of food stamp households participating in the program.

Underlying assumptions are based on data from the vendor interviews, from relevant experience with the Reading on-line system, and from various reports describing the Food Stamp Program and other assistance programs. Prices for major system components are the primary figures shown in Exhibits 5-1 through 5-8. Appendix E provides a detailed explanation of the model's assumptions and data sources.

Projections are developed for each of the basic systems in three caseload size scenarios, corresponding to a small city (5,300 food stamp

¹Initial software development or acquisition cost is not treated as an operating cost, but included in the itemization of design, development, and implementation costs in Section 5.15.

households), a large city (130,000 food stamp households), and a large state-wide system (400,000 food stamp households).

The projections must of course be treated with caution. Like any estimates made outside direct experience, they rest on a variety of assumptions. The least reliable assumptions concern the prices for equipment items that do not currently exist as described here, such as the issuance machine, the manual transaction recorder, and the POS terminals for laser and token cards. In general, the estimation process steered a middle course between conservative and generous assumptions.

COSTS OF THE BASIC SYSTEMS

An off-line system's operating costs are projected at \$14 to \$24 per case month for a system serving a small city, \$3 to \$9 for a state-wide system, and \$3 to \$5 for a large city. The principal components of these costs are shown in Exhibit 5-9, and discussed in turn below. Appendix E provides a more detailed breakdown of cost elements.

Providing recipients with access devices is estimated to cost between \$.50 and \$2.25 per case month. This range is created by variation in the price of card stock, which ranges from \$.02 to \$1.27 per case month. This in turn reflects the variation in unit prices by card type and volume discussed earlier (Exhibit 5-1). The token card and non-standard magnetic stripe card systems issue disposable cards each month, and the token card system also uses standard magnetic stripe identification cards for access to the issuance machines. Card costs in these systems are therefore higher than would be expected solely on the basis of unit prices for the card stock.

Apart from card stock, this category includes the costs for caseworkers and clerks to prepare cards and train recipients in using them. This accounts for about \$.45 of the total, and is assumed to be constant in all six systems.

Benefit authorization costs in all but the mail-out system are dominated by the cost of issuance machines. The issuance machines fall in three basic cost groups: the on-line telephony-based machine (for chip cards only), the off-line machines that simply write allotment amounts to the cards, and the machines that dispense disposable token cards. The wide range, seen

Exhibit 5-9

Operating Costs Per Case Month
by Major Cost Categories

	Standard Magnetic Stripe	Chip Card	Chip with Telephony	Laser Card	Token Card	Mail-Out Non-Std. Magnetic Stripe
System size = 5,300						
Providing Access Devices	\$0.58	\$1.48	\$1.48	\$1.33	\$1.18	\$2.25
Benefit Authorization	4.40	4.55	1.06	4.55	10.08	0.26
Recipient Use of Benefits	3.56	3.80	3.80	4.24	5.47	3.37
Housekeeping at Computer Center	6.96	6.96	7.91	6.96	6.96	7.78
Other Food Stamp Program	0.47	0.47	0.47	0.47	0.47	0.47
Total	15.97	17.25	14.70	17.55	24.15	14.12
System size = 130,000						
Providing Access Devices	\$0.54	\$1.13	\$1.13	\$0.73	\$1.00	\$0.86
Benefit Authorization	0.47	0.49	0.29	0.49	0.87	0.11
Recipient Use of Benefits	1.49	1.65	1.65	1.83	2.29	1.33
Housekeeping at Computer Center	0.39	0.39	0.46	0.39	0.39	0.45
Other Food Stamp Program	0.47	0.47	0.47	0.47	0.47	0.47
Total	3.35	4.12	4.00	3.89	5.02	3.21
System Size = 400,000						
Providing Access Devices	\$0.52	\$1.01	\$1.01	\$0.66	\$0.78	\$0.84
Benefit Authorization	2.56	2.68	0.61	2.68	5.39	0.10
Recipient Use of Benefits	1.37	1.53	1.53	1.80	2.31	1.29
Housekeeping at Computer Center	0.17	0.17	0.20	0.17	0.17	0.19
Other Food Stamp Program	0.47	0.47	0.47	0.47	0.47	0.47
Total	5.09	5.86	3.82	5.78	9.12	2.90

Note: Category costs may not add exactly to total due to rounding.

previously in Exhibit 5-2, translates into substantial variation in overall system costs. In the state-wide scenario, for example, benefit authorization costs range from \$.60 per case month with the telephony-based equipment to over \$5 with the card-dispensing machines. The mail-out system, by eliminating issuance machines and the transmission of data to and from them, gains a substantial cost advantage over all of the other systems.

The costs also range dramatically across the three caseload size scenarios, from as much as \$10 per case month in the small city scenario to less than \$1 in the large city. Most of the variation stems from the ratio of households to machines. The basic system projections assume one issuance machine for each issuance point in the current coupon system. In the small city scenario, this means that each machine serves an average of less than 200 households. In contrast, the large city scenario has more than 2,000 households per issuance machine. Because the ratio of households to issuance machines is clearly an important determinant of an off-line system's costs, the potential for controlling this ratio is explored further below.

When the chip card is used in conjunction with an on-line, telephony-based terminal, benefit authorization costs fall dramatically. This less expensive issuance machine yields savings of about \$2 per case month relative to the other chip card system in the state-wide scenario, and causes the chip/telephony system to have the lowest overall cost in that scenario. The saving is less in the large city scenario, however, because the high ratio of households to terminals ameliorates the impact of the issuance machine's unit cost.

Apart from the issuance machine, the main items in this cost category are the daily costs of sending and retrieving allotment information between the issuance machine and the central computer, and the cost of issuance reconciliation. These are primarily labor costs for monitoring batch processing operations on the the central computer. They are sensitive to scale, and hence decline from the small city to the larger scenarios.

The cost of recipients' use of benefits ranges from less than \$1.50 to over \$5 per case month. The largest single item in this category is the POS terminal, which costs between \$1 and \$3 per case month. In addition to varying by card type and scale as seen earlier (Exhibit 5-3), terminal costs depend on the ratio of households to terminals, which in turn depends on the

number and type of retail establishments in the service area. That ratio is highest in the large city scenario, at 26 households per terminal, and lowest in the small city with only 16 households per terminal.

Settlement activities, including transmitting purchase data from the retailer terminal to the EBT Center and executing the funds transfer through the Automated Clearing House (ACH), add about \$.20 to \$.50 to the cost per case month. These costs are highest in the small city, mainly because labor costs for the daily computer run preparing the ACH file are largely fixed, so the cost per case declines in the larger caseload scenarios. Communications costs for retrieving data from the POS terminals are lowest in the large city, because it is assumed that the EBT Center would be located in the city, making all telephone connections local calls.

Another factor contributing to high benefit use costs in the small city scenario is the retailer hotline. Retailers must have a number to call to obtain manual transaction authorizations or report equipment problems. Labor costs for this service are sensitive to scale, ranging from over \$.50 in the small city to less than \$.05 in the larger systems.

Housekeeping operations at the computer center are the major cause of high costs in the small caseload levels. This category represents the equipment and labor costs of the central computer facility that are not specifically assigned to other functions. In effect, these are costs of having the central facility and its staff available to monitor general system operations, as well as to perform certain general functions such as file maintenance and report generation.

The simulation model assumes a stand-alone operation -- that is, an independent computer facility is assembled and staffed solely to serve as the EBT Center. As indicated in Section 5.6, the cost of the computer equipment is not much greater for a large system than a small one. Much the same pattern applies to labor costs, because the center must have some round-the-clock staffing even at its smallest scale. As a result, costs per case month range from around \$7 in the small city to less than \$.50 in the larger systems.

Other Food Stamp Program activities include those related to authorizing retailers, which are performed by FNS regional and field offices,

and the monitoring of redemption patterns performed by FNS' national data center in Minneapolis. These activities are assumed to be constant across all card types and caseload sizes, and amount to just under \$.50 per case month.

Total operating costs show strong variation by caseload size, and smaller but still potentially important variation by card technology. All projections for the small city scenario yield costs that are nearly triple the level in the other scenarios. The large city system has the lowest cost in all scenarios incorporating the off-line issuance machine, because of the high ratio of households to issuance points. Only in the mail-out system and the system using telephony-based issuance machines do the costs of the state-wide system fall below those of the large city.

Among the systems using off-line issuance machines, the standard magnetic stripe card system is least expensive at all operating scales. This mainly reflects the greater maturity of that technology in the marketplace, which results in relatively low unit prices for the cards and for the equipment that interacts directly with the cards (POS terminals, issuance machines, etc.). At the other extreme, the token card system is substantially more expensive than the others because the technology has not been used in retail POS settings, resulting in a high cost for issuance machines and terminals.

The projections suggest that three systems are particularly promising from a cost perspective:

- the standard magnetic stripe card system, which has the lowest costs among systems using off-line issuance machines;
- the chip card system with telephony-based issuance, which has lower costs than the standard magnetic stripe card system in the small city and state-wide scenarios; and
- the mail-out non-standard magnetic stripe card system, which has the lowest projected costs in all three scenarios.

The overall cost differences among these three systems are not very great, ranging from \$14 to \$16 per case month in the small city, \$3 to \$4 in the large city, and \$3 to \$5 in the state-wide system. All of the other systems are more costly; for the laser and token card systems, serious feasibility questions exist as well, as discussed in Chapter 4. Accordingly,

only the three promising systems identified above are examined in the remaining analyses in this chapter.

OFF-LINE COSTS VERSUS COUPON AND ON-LINE COSTS

Most of the projections above show off-line EBT system costs exceeding the \$3 per case month estimated for the coupon system in Reading. In the small city scenario, the difference is overwhelming. The gap is smaller in the other systems, however. In the large city scenario, off-line costs range from \$.20 to \$2.00 above coupon costs. The projected cost for the state-wide mail-out system actually falls below the \$3 level. These figures suggest that large off-line systems might have costs comparable to those of the coupon approach, at least in some situations.

Compared to an on-line EBT system, an off-line system seems likely to have very similar costs. The basic off-line systems simulated above closely parallel the Reading system. They have two main features that would make them more costly than an on-line approach:

- The off-line system requires issuance machines or monthly card mailings, while the on-line system does not. The off-line system therefore has additional costs ranging from about \$.30 to several dollars per case month.
- Off-line terminals are somewhat more expensive, because they must be able to store transaction data and to write to as well as read cards. For a standardized magnetic stripe card, this is a difference of around \$20 per terminal at low-volume prices, and less at high volumes. Even in the low-volume scenario, however, the difference amounts to only about \$.03 per case month.

These differences are offset to some degree by two areas in which the off-line approach is less expensive than the on-line:

- The off-line system has lower communications costs between the POS terminals and the central computer; this communication occurs only once a day for each off-line terminal compared to once per transaction in the on-line system. The difference between estimates in the Reading evaluation and those shown here amounts to

\$.91 per case month in the small city and \$.41 in the state-wide system.¹

- The off-line system involves a somewhat less costly central computer facility in the larger caseload scenarios, although it is somewhat more expensive in the small city scenario. Amortized over 5 years, this factor increases off-line system costs by \$.40 per case month in the small city, and reduces them by \$.02 in the larger scenarios.

Given these small and offsetting differences, it is impossible to argue conclusively that either the off-line or the on-line approach would be inherently more expensive.

Although estimates from the Reading evaluation are not fully comparable with the figures presented here, they are consistent with the idea that costs of the two approaches are not substantially different. Operating costs of the demonstration system were estimated at \$27 per case month, but this partly reflected some special demonstration circumstances. The evaluation projected costs for a system of the same design, but assuming that equipment was purchased rather than leased and assuming that the system was operated by State rather than contractor personnel. This projection estimated costs at \$14 per case month, roughly comparable to the projected off-line system costs in the small city scenario. The evaluation also projected costs for large city and state-wide systems. Although some of the underlying assumptions and cost factors differ from those used here, the results are again roughly comparable, falling in the \$5 to \$7 range.

COST SAVING STRATEGIES IN OFF-LINE SYSTEM DESIGN

As discussed in Chapter 3, designing an off-line EBT system involves a number of decisions that may affect the system's level of security and its level of service or convenience for recipients and retailers. Many of these decisions may involve a trade-off between security or convenience and operating costs.

¹Simulations in the Reading evaluation estimated communications costs at \$1.00 per case month in the small city, \$.67 in the large city, and \$.55 in the state-wide system. The comparable figures projected here are \$.09, \$.05, and \$.14, respectively. (Projections for the off-line system assume that the state-wide system would require a higher proportion of communication through long distance calls than the systems serving more compact areas.)

The "basic" system design generally makes the trade-off in favor of security and convenience. This is generally comparable to the design of the Reading on-line system, and yields what may be considered an upper bound estimate of system costs. It is useful, however, to see how alternative design choices would affect system costs.

The simulation model was therefore used to project system costs under the following alternative design assumptions:

- Fewer checkout stations with terminals. All stores with two or more POS terminals in the basic design are assumed to have only two terminals.
- Fewer issuance machines. An issuance machine is assumed to be capable of handling up to 240 issuance transactions per day. Each county has the minimum number of issuance machines needed to meet this criterion, but each county has at least one issuance machine.¹ In addition, it is assumed that grocery stores or other establishments would be willing to donate space for the issuance machines, reducing monthly environmental costs for each machine.
- No manual transactions. It is assumed that recipients can not complete their purchase in the event of card or terminal failure, but must go to another store or to the food stamp office to have their card replaced. This eliminates the need for the manual transaction device and for labor costs to authorize the manual transactions.
- Decentralized settlement with a "no balance" approach to reconciliation. Retailer terminals are assumed to have tape cartridges or analogous devices, which they take to banks for crediting. Banks are assumed to have existing equipment (or to be willing to purchase equipment) capable of reading the tapes and passing the data on to the Federal Reserve Bank. No purchase data flows to the EBT Center, which maintains only data concerning allotments credited. No manual transactions are authorized.

¹It is assumed that crediting an allotment to a card takes about 30 seconds, and that 240 transactions represent about one every two minutes over an eight hour period. The calculation of the number of needed machines takes into account "staggering" of the issuance schedule to post allotments for different recipients on different days. In Pennsylvania, which was used as the model for this calculation, issuance schedules vary by county. In the smallest counties, all recipients get their allotment on the same day. In the largest, issuance is spread over ten days.

- Integrated computer facility. The EBT Center is assumed to be housed within an existing computer facility and to use equipment and staff that are also serving other programs. The arrangement is assumed to be similar to that in the extended Reading demonstration, in which the central EBT processing functions were transferred to the data center that handles other Food Stamp Program activity. The impact of integrating the central facility should be roughly comparable to the impact of purchasing EBT Center services from an efficient external provider.

In testing each alternative, costs are projected for the standard magnetic stripe card system for all three caseload scenarios. Parallel projections were developed for the chip card system. Although not shown here, the results are essentially equivalent. The only difference is that strategies which reduce the number of terminals or issuance machines generate fractionally different savings in the chip card scenario because of the higher cost of the chip card readers and the lower cost of telephony-based terminals.

The impact of the cost reduction strategies, which are summarized in Exhibit 5-10, depends in part on the caseload the system serves. For example, restricting the number of issuance machines has the greatest impact on the state-wide system. The restriction results in a 59 percent reduction in the number of issuance machines in the small city and 67 percent in the state-wide system. This is enough to bring costs in a state-wide system (\$3.44 per case month) to a level that could be considered comparable with coupon system costs. Limiting issuance machines has less impact in the large city scenario, because that scenario already involved a relatively high ratio of recipients to issuance machines.

None of the other strategies has comparable impacts, although each contributes some reduction in costs. Key points are:

- Decentralized settlement saves nearly \$1 in the larger caseload systems, and about \$2 in the small city. The impact is comparatively large in the large city scenario, because the strategy does not depend on reducing issuance machine or terminal costs.
- Integrating the central computer facility greatly reduces costs in the small city. Costs in this scenario are nearly \$9 per case month, however, still well above the level with larger caseloads. With the large caseloads, integrating the computer facility generates relatively small savings because those costs were already small on a per-case-month basis.

Exhibit 5-10

Operating Costs Per Case Month
with Cost-Saving Strategies

Design Alternative	Caseload Size		
	5,300	130,000	400,000
Basic system ^a	\$15.97	\$3.35	\$5.09
Two-terminal maximum	\$15.18 (-.79) ^b	\$3.16 (-.19)	\$4.65 (-.44)
Minimum issuance machines	\$14.01 (-1.96)	\$3.31 (-.04)	\$3.44 (-1.65)
No manual transactions	\$15.78 (-.19)	\$3.20 (-.15)	\$5.01 (-.08)
Decentralized settlement ^c	\$13.51 (-2.46)	\$2.42 (-.93)	\$4.16 (-.93)
Integrated central computer	\$8.89 (-7.08)	\$2.96 (-.39)	\$4.99 (-.10)

^aAll projections are based on the standard magnetic stripe card system. Similar results were obtained in applying these assumptions in the context of a chip card system.

^bFigures in parentheses represent difference from basic system.

^cIncorporates an assumption of no manual transactions.

- Placing a maximum of two terminals in a store generates savings ranging from \$.20 to \$.80.
- Eliminating manual transactions has only a small impact, with savings of about \$.10 to \$.20.

A full cost-minimization approach would, of course, combine the various strategies outlined above. The effects of such an approach are projected in Exhibit 5-11 for three systems: one based on the standard magnetic stripe card, one using the chip card with telephony-based terminals, and the mail-out system using the non-standard magnetic strip card. Because some of the cost-saving strategies interact, their combined effect is less than the sum of the individual effects. For example, restricting the number of POS terminals generates savings partly by eliminating the cost of transmitting data from the omitted terminals to the central computer. Decentralized settlement eliminates the cost of this communication for all terminals. Simply adding the two effects would therefore double-count some of the savings in communications costs.

All three of these systems have roughly comparable costs, projected at around \$2 to \$3 per case month in the larger caseload scenarios. These levels are clearly competitive with coupon system costs. Costs for the small city scenario range between \$5 and \$6 per case month, still substantially above coupon costs. It should be noted that a food stamp agency might not find it feasible or desirable to adopt all cost reduction strategies in a single system. Nonetheless the projections strengthen the earlier indications that an off-line EBT system can, at least in some circumstances, operate at a level comparable with coupon system costs.

Several of the cost-reduction strategies examined here would be equally applicable in an on-line system, and hence, would not change the overall comparison between the systems. Some strategies would apply only in an off-line approach, however. These include the strategies for limiting issuance machine costs and the decentralized settlement approach. It is conceivable that an off-line approach incorporating such strategies could be less expensive than an on-line approach. It is also possible, however, that an on-line system may offer cost reduction opportunities not applicable in an off-line environment. For example, the on-line approach's greater compatibility with commercial POS systems implies a greater potential for

Exhibit 5-11

Selected Systems with Multiple
Cost Reduction Strategies^a

	Caseload Size		
	5,300	130,000	400,000
Standard Magnetic Stripe Card	\$5.67	\$2.36	\$2.60
Chip card with telephony- based terminal	\$5.34	\$2.70	\$2.52
Mail-out, non-standard magnetic stripe card	\$5.13	\$2.14	\$1.98

^aCost reduction strategies include restricting the number of POS terminals and (except in the mail-out system) issuance machines, decentralized settlement, no manual transactions, and integrating the EBT Center within a larger data processing facility.

integrating terminal usage and sharing those costs. It is beyond the scope of this analysis to explore such possibilities for the on-line approach, however.

5.10 POS/ACD SYSTEM COSTS

The POS/ACD system is similar in most respects to the pure POS system, but employs issuance machines that can dispense coupons. Recipients may redeem their benefits either through electronic transactions or by using coupons. The cost projections assume that 82 percent of the benefits are redeemed in POS transactions, based on the proportion of Reading recipients preferring the EBT system to coupons.

Other key assumptions for cost projections include:

- issuance machines are located at all current coupon issuance points;
- all issuance machines also dispense coupons;
- terminals are placed at all checkout stations in all stores authorized for food stamps;
- centralized settlement with full reconciliation;
- manual transactions allowed; and
- a stand-alone central computer facility.

Cost projections are developed for the standard magnetic stripe card system and for the chip card with an off-line issuance machine,¹ and are summarized in Exhibit 5-12. Costs for a POS/ACD system based on laser cards would closely parallel chip card costs. No costs are projected for the disposable card technologies because no estimates could be obtained for the cost of such ACD machines.

The POS/ACD system has higher costs than the pure POS system, as would be expected. The additional cost ranges from about \$3 per case month in the small city to \$.25 in the large city, reflecting the differing ratios of households to issuance machines. The incremental cost is identical for magnetic stripe card and chip card approaches, because neither the cost of the

¹The telephony-based issuance machine is not suitable for coupon dispensing.

Exhibit 5-12

Operating Costs per Case Month
for POS/ACD Systems

	Standard Magnetic Stripe	Chip Card
System size = 5,300		
Providing Access Devices	\$0.58	\$1.48
Benefit Authorization	7.44	7.61
Recipients Use of Benefits	3.41	3.65
Housekeeping at Computer Center	7.04	7.02
Other Food Stamp Program	0.47	0.47
Total	18.95	20.23
Diff. from pure POS	2.98	2.98
System size = 130,000		
Providing Access Devices	\$0.54	\$1.13
Benefit Authorization	0.75	0.77
Recipients Use of Benefits	1.47	1.62
Housekeeping at Computer Center	0.39	0.39
Other Food Stamp Program	0.47	0.47
Total	3.62	4.38
Diff. from pure POS	0.26	0.26
System size = 400,000		
Providing Access Devices	\$0.52	\$1.01
Benefit Authorization	4.05	4.16
Recipients Use of Benefits	1.34	1.50
Housekeeping at Computer Center	0.17	0.17
Other Food Stamp Program	0.47	0.47
Total	6.54	7.31
Diff. from pure POS	1.45	1.45

Note: Category costs may not sum exactly to total due to rounding.

coupon dispensing function in the issuance machine nor the pattern of coupon vs. electronic benefit usage is affected by the card technology.

The difference between pure POS and POS/ACD costs comes almost entirely from the fact that the coupon-dispensing machines cost considerably more than the issuance machines that only write benefit amounts to cards. In other respects, such as crediting retailers for benefits they accept, the costs for coupons differ little from the EBT costs.

As in the pure POS system, the standard magnetic stripe card approach is less costly than the chip card. The size of the difference, around \$.90 to \$1.20 per case month in the larger systems, is the same as the difference in the pure POS system, because it is based on the same price differentials for cards and card reader/writers.

Although the projections above assume POS terminals in all stores, this may not be the most likely configuration of a POS/ACD system. In fact, the coupon dispensing feature might well be added to the system as a means of limiting the number of stores that are equipped for electronic transactions. To simulate this approach, data on EBT redemptions by stores in Reading were examined. Among those stores, 36 percent processed 50 transactions per month or less, i.e., an average of no more than two transactions per day. These stores accounted for just 2 percent of all benefits redeemed. Accordingly, model parameters were adjusted to assume that 36 percent of all stores would have no terminals, and that 2 percent of all benefits would be redeemed as coupons. In effect, this assumes that stores with terminals take only EBT transactions and stores without terminals take only coupon transactions.¹

This configuration produces relatively small cost savings, as shown in Exhibit 5-13. The savings are less than \$.50 per case month in the larger scenarios. Terminal-related costs are in fact reduced, but because they amounted to less than \$1.50 per case month in the larger scenarios, the savings are necessarily constrained. A parallel analysis of the chip card system yields comparable results, although savings are a few cents greater because of the higher price of POS terminals.

If coupon dispensing is viewed as a simple substitute for POS terminals, one can determine an approximate "break even" point at which the

¹Different assumptions about the percent of benefits redeemed through coupons make very little difference in the results.

Exhibit 5-13

POS/ACD System Costs with no Terminals
in Low-Volume Stores

	Caseload Size		
	5,300	130,000	400,000
System with restricted POS terminals ^a	\$18.12	\$3.19	\$6.16
Difference from POS/ACD system with all stores equipped	-.82	-.42	-.37
Difference from pure POS system	+2.16	+.17	+1.08

^aAll systems based on standard magnetic stripe card. Applying the same assumptions with a chip card system yields equivalent results.

cost of the POS/ACD system equals the cost of the pure POS system. The incremental cost of the issuance machine's coupon dispensing feature is about \$11,000 at the volume levels for a state-wide system. This is about 26 times the price of a POS terminal, which means that break-even requires removing 26 terminals for every issuance machine. Naturally, this strategy works only if the system would otherwise have substantially more than 26 terminals per issuance machine. If the ACD option allows removal of one-third to one-half of the POS terminals from a pure POS system, break-even occurs only if the pure POS system has 50-75 terminals per issuance machine. In the scenarios examined here, however, only the large city has more than 50 terminals per issuance machine. The state-wide scenario has only 33 terminals per issuance machine even with the strategy that restricts the number of issuance machines.

In short, the POS/ACD design must generally be viewed as a higher-cost option. The POS/ACD approach might be chosen as a convenience or a transitional measure, but only in rare situations could it be effective as a cost-reduction strategy.

The cost reduction strategies described for the pure POS system are also largely applicable in a POS/ACD approach. Costs were projected for the standard magnetic card POS/ACD system with the full combination of strategies except issuance machine limitations,¹ and including the terminal restrictions discussed above. The projected costs per case month are \$9.88, \$2.25, and \$5.38 for the three scenarios. POS/ACD costs with these assumptions are competitive with coupon system costs in the large city, but they are considerably higher in the scenarios with fewer households per issuance machine.

5.11 COSTS IN A MULTI-PROGRAM POS SYSTEM

In the multi-program POS model, several agencies act in concert to operate an EBT system. For purposes of cost projection, it is assumed that the EBT system serves the Food Stamp Program, Aid to Families with Dependent Children (AFDC), General Assistance (GA), and Medicaid. For the first three programs, the EBT system functions as it does for food stamps in the pure POS

¹This includes placing no more than two terminals in a store, eliminating manual transactions, using a decentralized settlement approach, and having the central computer facility integrated with other uses. It is assumed that the number of issuance machines can not be restricted in the POS/ACD system because recipients will use them periodically to withdraw coupons as well as to obtain their allotment posting.

model, with recipients carrying a balance on their card. For Medicaid, the system is assumed to perform only an authorization function -- in effect, to be simply a security enhancement over the current system. In most current situations, the Medicaid recipient simply presents a paper identification card. The approach envisioned here includes PIN or equivalent verification of the recipient's identity.

It is assumed that all participating programs require households to make a monthly visit to the issuance machine (or receive a mail-out card) to have benefits and/or eligibility information posted to their card. Special terminals are assumed to exist for dispensing AFDC and GA benefits in cash and for Medicaid authorization. Costs of these terminals are not incorporated in the projections, however, because it is assumed that the Food Stamp Program does not share in their cost. It is assumed that AFDC and GA benefits are occasionally used to make food purchases on retailer POS terminals, but that most transactions on those terminals use food stamps.¹ National statistics on multi-program participation are used to set allocation parameters.

The total operating cost of a multi-program EBT system would exceed a food-stamp-only system's cost, because the system would have more terminals in operation and more cards issued. The savings to the Food Stamp Program would come from inter-program cost sharing based on joint utilization of various components of the EBT system. Key assumptions include:

- Card-related costs are shared according to the number of programs represented on each card. For example, the Food Stamp Program bears the whole cost for the card of a household receiving food stamps only, a third of the cost for a household with AFDC and Medicaid as well as food stamps, and none of the cost for a household with Medicaid only.
- Costs related to the POS terminals are shared according to the volume of transactions for each program. The Food Stamp Program bears nearly all of the cost for terminals in food retail stores, and none for other terminals.

¹It is assumed that 25 percent of the households with AFDC or GA benefits will make at least one electronic food purchase, and that those households will make an average of 4 purchases per month. In contrast, all food stamp households are assumed to make an average of about 8 purchases per month with their food stamp benefits. With these assumptions, about 95 percent of all electronic food purchases are those using food stamp benefits.

- Costs related to issuance machines and the central computer facility are shared according to the total number of cases each program has in the EBT system. Based on the statistics used here, the Food Stamp Program bears about 36 percent of these costs.

Cost projections for the multi-program system reflect the basic design assumptions in the pure POS system. These include terminals at all checkout stations in all participating stores, issuance machines at all current coupon issuance locations, centralized settlement, manual transactions, and a stand-alone central facility.

The Food Stamp Program's costs in the multi-program system are substantially less than those with the single-program approach. Multi-program costs are 30 to 45 percent lower than those projected for the pure POS system, as shown in Exhibit 5-14. The cost reduction is greatest in the scenarios where issuance machine costs are high (i.e., the small city and state-wide systems), because those costs are now shared across all programs.

Cost projections for the basic multi-program system with large caseloads fall to levels quite competitive with coupon system costs, all lying between \$2 and \$3 per case month. Even with a multi-program approach, however, food stamp costs for an EBT system serving a small caseload are in the range of \$8 to \$9 per case month, nearly triple the coupon system costs.

The cost reduction strategies discussed for the pure POS system can also be applied for the multi-program system. Costs were projected assuming the full range of strategies -- a two-terminal maximum, limited issuance machines, decentralized settlement, no manual transactions, and an integrated central computer facility. With the standard magnetic stripe card, projected costs per case month are \$3.06, \$1.43, and \$1.52 for the three scenarios. Comparable figures result with the other two card technologies.

These projections imply that a multi-program approach could make an off-line EBT system competitive with coupon system costs even in a small city environment, and that it might offer substantial savings over the coupon system with larger caseloads. Some caution must be exercised in interpreting the figures, because it may be unrealistic to assume that all cost reduction strategies can actually be applied in a single system environment. Nonetheless, it seems reasonably clear that, at least in a large-caseload environment, a multi-program approach with some cost reduction strategies can hold off-line EBT costs to a level comparable with coupon costs.

Exhibit 5-14

Operating Costs Per Case Month
for Multi-Program Systems

	Standard Magnetic Stripe	Chip Card with Telephony	Mail-Out Non-Standard Magnetic Stripe
System size = 5,300			
Providing Access Devices	\$0.22	\$0.74	\$1.15
Benefit Authorization	2.08	0.53	0.22
Recipients Use of Benefits	3.35	3.58	3.18
Housekeeping at Computer Center	2.50	2.85	2.80
Other Food Stamp Program	0.47	0.47	0.47
Total	8.63	8.16	7.82
Diff. from pure POS	-7.34	-6.54	-6.30
System size = 130,000			
Providing Access Devices	\$0.20	\$0.54	\$0.38
Benefit Authorization	0.22	0.16	0.07
Recipients Use of Benefits	1.39	1.54	1.25
Housekeeping at Computer Center	0.14	0.17	0.16
Other Food Stamp Program	0.47	0.47	0.47
Total	2.42	2.87	2.33
Diff. from pure POS	-0.93	-1.13	-0.88
System size = 400,000			
Providing Access Devices	\$0.19	\$0.47	\$0.38
Benefit Authorization	0.96	0.27	0.06
Recipients Use of Benefits	1.27	1.43	1.22
Housekeeping at Computer Center	0.06	0.07	0.07
Other Food Stamp Program	0.47	0.47	0.47
Total	2.95	2.71	2.19
Diff. from pure POS	-2.14	-1.11	-0.71

Note: Category costs may not add to total due to rounding.

5.12 DESIGN, DEVELOPMENT, AND IMPLEMENTATION COSTS

The system costs per case month presented in previous sections cover only the on-going operating costs of the EBT system. Before the system becomes operational, however, considerable expense must be incurred for design, development and implementation. Based on the Reading experience, it is useful to categorize these activities into the following phases:

- The pre-design phase, in which the State develops general requirements for the EBT system, specifies desired system functions and features and, if the design and development is to be contracted out, solicits proposals and awards the contract;
- The design phase, which involves planning the general system structure and its detailed technical specifications;
- The development phase, which includes developing or acquiring software, acquiring enough hardware to develop and test all system functions, and preparing training materials, user manuals, and related documentation; and
- The implementation phase, which includes installing the central computer facility, installing terminals and other dispersed equipment, in-place system testing and refinement, retraining local food stamp office staff, training retailers, and issuing benefit cards and providing training to all active recipients. Note that hardware costs (e.g., for terminals and the central computer facility) are considered operating costs and are not included in implementation expenses.

The only example to date of building an EBT system is the Reading demonstration, where the four pre-operational phases cost a total of \$2.3 million. FNS contracted out most of the design, development, and implementation effort, and that contract accounted for \$1.9 million. FNS incurred costs of about \$240,000, mainly for directing and monitoring the contractor's efforts. State and local food stamp efforts, which included participation in the design and development process as well as issuing cards and training recipients in the implementation phase, cost about \$130,000.

The Reading demonstration expenses could be a misleading indicator of the current cost of developing an off-line EBT system for several reasons. For example, the demonstration itself provides a base of information that should make future EBT system design work more efficient. Developments in the commercial POS field mean that an EBT system planner now has a greater variety of "off the shelf" products from which to choose, products which could reduce development costs. These considerations would apply to either on-line or off-line EBT systems, but some aspects of design and development work might also have different costs depending on the chosen system approach. Finally, institutional factors could make a difference, such as whether a State contracts out the effort or does the work internally, or whether a contractor is willing to underwrite some of the development cost.

To provide some perspective on the issue, the project team reviewed the pre-operational costs of the Reading demonstration. For each major cost item, a judgement was made as to whether or not a new development effort would be likely to involve a substantially different experience from that in Reading. Where strong arguments indicated that the experience would differ, the Reading figures were adjusted to estimate today's likely costs. Where no clear difference could be argued, no adjustment was made.

This procedure implicitly assumes that the State contracts out the same design, development, and implementation functions that were contracted in the Reading demonstration. It ignores any inflationary effects between 1983-84 and the present.

Pre-operational costs are projected for both off-line and on-line EBT approaches. This facilitates a distinction between cost differences resulting from developments in the field since the Reading demonstration and differences stemming from contrasts between the off- and on-line approaches. Costs are projected for the same three caseload size scenarios used in assessing operating costs (5,300, 130,000, 400,000).

Based on this methodology, pre-operational costs for an off-line EBT system in the small-caseload scenario are estimated at about \$1.5 million, as shown in Exhibit 5-15. This figure is substantially less than the actual Reading costs, but slightly higher than the estimated cost for an on-line system.

Pre-design costs are expected to be much less in future EBT systems, estimated at \$30,000 rather than the \$77,000 experienced in the demonstra-

Exhibit 5-15

Design, Development and Implementation Costs

System	Caseload Size		
	5,300	130,000	400,000
READING DEMONSTRATION^a			
Pre-Design	\$ 76,571	NA	NA
System Design	298,923		
System Development	1,170,431		
Implementation	749,636		
Total	\$2,295,561		
Cost per case ^b	\$666		
ON-LINE			
Pre-Design	\$ 30,000	\$ 30,000	\$ 30,000
System Design	195,000	195,000	195,000
System Development	507,000	1,230,000	2,793,000
Implementation	607,000	4,253,000	11,101,000
Total	\$1,339,000	\$5,708,000	\$14,119,000
Cost per case	\$252	\$44	\$35
OFF-LINE			
Pre-Design	30,000	30,000	30,000
System Design	240,000	240,000	240,000
System Development	557,000	1,280,000	2,843,000
Implementation	665,000	4,327,000	13,664,000
Total	\$1,492,000	\$5,887,000	\$14,664,000
Cost per case	\$282	\$45	\$37

^aSource: Hamilton et al., p. 29. Note that the actual scale of the Reading demonstration was about 3,500 households rather than the 5,300 assumed for the two hypothetical systems.

^bBased on a caseload of 3,500.

tion. FNS went through a lengthy pre-design process, including substantial coordination with other interested agencies and an initial solicitation of comments from potential vendors before actually beginning procurement of the demonstration contract. It is assumed that this process would be greatly streamlined in future pre-design efforts.

The design effort for an EBT system should be considerably reduced because of the information gained from the Reading experience and the general development of the POS field. The Reading experience provides a general model of how an EBT system can function, specific planning factors on points such as POS terminal usage patterns, and precedents on some difficult policy issues (e.g., whether the Privacy Act prohibits printing the recipients' remaining balance on a purchase receipt). Development of the POS industry in general provides further system models, standards or guidelines for certain system components, and a much wider range of compatible products than was available in 1983. Because there is no empirical basis for estimating the efficiencies that should come from this experience, the estimates arbitrarily assume that the contractor's design effort for an on-line EBT system would be reduced by about 40 percent from the Reading level. Because the demonstration and the industry experience offer less direct guidance for designing an off-line EBT system, this estimate assumes a reduction of only 20 percent.

The most substantial efficiencies are expected to affect development costs. Contractor costs in the Reading development phase amounted to about \$1.1 million, with about \$800,000 devoted to software development. As indicated in Section 5.7, "packaged" software for on-line POS systems is commercially available for about \$150,000, which includes some modification to fit the particular system being designed. Some additional modifications would be required for an off-line application, bringing the likely cost to about \$200,000. No adjustments are made to the other \$300,000 in Reading development costs, because basic system assembly, testing and documentation tasks cannot be assumed to be substantially different.

The development phase in the Reading demonstration included the initial distribution of benefit cards to recipients. For several months before system implementation, recipients were given benefit cards (with the magnetic stripe not yet initialized) as part of their normal certification or recertification. The cost of this activity obviously depends on the number of households in the system, and there is no reason to believe that a future implementation would differ much from the Reading process. Accordingly,

Reading costs were adjusted in proportion to the number of households in the three scenarios. Estimated costs range from about \$31,000 with 5,300 households to \$753,000 in the 400,000-household scenario.

For the most part, activities in the implementation phase are not assumed to differ from those in Reading. The main exception concerns system revisions to eliminate start-up problems, which accounted for over \$500,000 in contractor costs in Reading. Although some corrections are inevitable, it seems likely that pre-packaged software, combined with better underlying information for designing the system, will substantially reduce the need for revision and refinement. Accordingly, a saving of 40 percent is assumed in these costs for an on-line system. Because the off-line system involves somewhat more innovation, a lesser saving (30 percent) is assumed.

Most of the remaining costs of the implementation phase concern installing retailer equipment and training retailers, recipients, and other system participants. These costs are assumed to be directly proportional to the number of retailers, recipients, and local food stamp offices in the system, so the Reading costs are adjusted accordingly in the projections. An off-line system involves installing issuance machines as well as retailer terminals, and hence entails higher implementation costs in this area.

Implementation is the most expensive phase in the larger scenarios, estimated at about \$11 million in the State-wide scenario. Training is the largest cost component, with nearly \$7 million allocated to recipient training (performed by State and local food stamp personnel) and about \$1.4 million for training retailers and others (performed by the contractor). These figures seem high, and it is not unreasonable to expect that some efficiencies might be achieved relative to the Reading experience. Because of the high visibility and many uncertainties surrounding the project, more people (and more expensive) people may have been used in training Reading recipients and retailers than would be used in a non-demonstration system. In the absence of a clear basis for adjustment, however, the Reading figures are simply adjusted to reflect the number of retailers and recipients in the various scenarios.

In total, pre-operational costs for an off-line system serving a small city are estimated at about \$1.5 million. This estimate is about \$150,000 higher than the comparable estimate for an on-line system, mainly because of the greater uncertainties surrounding system design, the additional modifications required for commercially available software, and the likely need for more system refinement during the implementation period. The incre-

mental cost of the off-line system is greater in larger systems because of the cost of installing issuance machines, which do not exist in the on-line system.

Total pre-operational costs rise substantially in the large-caseload scenarios, but the costs per case are actually much lower than those in the small system. Total off-line costs are estimated at nearly \$15 million in the State-wide scenario, about ten times the level in the small city. The cost per case in the small city is \$282, however, compared to only \$37 for the State-wide system. Amortized over five years, a conventional period for such calculations, these costs amount to about \$4.70 per case month for the small city system, and \$.60 for the State-wide system.

No published figures are available concerning the pre-operational costs of commercial POS systems. One commercial system with which the researchers are familiar had development costs of about \$2.7 million. This is not fully comparable to the previous figures, however, because it includes the cost of purchasing all hardware for the central computer facility and omits installation and training costs. Excluding estimated hardware costs from the commercial figures and excluding installation/training costs from the EBT projections yields costs of about \$1.5 million and \$1.3 million, respectively. It should be noted, however, that the commercial system was also larger in several dimensions than the EBT systems considered here. It was designed to handle various types of cards (e.g., debit, credit, private label, and travel and entertainment), to drive several manufacturers' terminals, to support thousands of merchant terminals, and to handle several million transactions per month.

The figures presented here can of course be considered only rough guidelines to the cost of system design and development. Actual costs will depend on the specific nature of the system chosen, the degree to which a State's existing data systems match the EBT system's requirements, the extent to which development is conducted internally or contracted out, and the general efficiency of the development effort.

Joint development. Another factor that can affect development costs is the willingness of vendors to absorb some of the cost of developing or customizing system components. To explore this possibility, the survey of vendors asked about "joint development" projects -- i.e., projects in which a vendor and a State (or FNS) would share certain development costs. Vendors were asked specifically whether they would be willing to undertake a joint

development effort related to an EBT system, and whether they had participated in joint development efforts in the past.

In general, vendors indicate that they have not previously participated in joint development efforts, although this may be partly a public position designed to establish a negotiation base. Terminal vendors are an exception to the general pattern, however. Terminal vendors state that they have sometimes absorbed some hardware and software costs in making their devices compatible with the specific requirements of a project. These vendors typically qualify their responses, however, by noting that they expect in these situations to recover development costs in the unit purchase price for terminals for the project or in subsequent orders. If the subsequent orders come from sources other than the original purchaser, the development cost is, in effect, shared between the original purchaser and later ones.

Vendors' responses when asked about their willingness to participate in an EBT joint development project reflect these same considerations. Some vendors say they would participate in joint development, but only with a reasonable expectation that they could recover their development costs in subsequent sales. The vendors would naturally prefer an advance commitment for an order large enough to recover the entire development cost. They might consider other situations, however. For example, participating in a pilot project could give a vendor an advantage in competing for the expanded project, assuming the pilot is successful. Vendors might absorb some development costs in this situation, depending on the vendor's own assessment of the gain in competitive advantage. Anything that would enhance the vendor's competitive gain, such as a commitment to endorse the vendor's product if it performs successfully, would increase the vendor's willingness to absorb development costs.

The survey responses varied to some degree by vendor group, reflecting the differing concerns of different industry segments. For example:

- Card vendors expressed the least willingness to participate in joint development. This seems particularly true for the standard magnetic stripe card, apparently because strong price competition means that vendors cannot expect to recover costs in higher unit prices. Vendors of the other types of cards are more actively seeking to develop major new markets, and indicate greater willingness to make an investment commitment to become involved in an EBT system.

- EFT network operators express interest in joint development mainly if they can obtain a commitment for or high probability of a profitable volume of transactions flowing through their network. How much volume would be required depends on the vendor's existing volume and cost structure.
- Terminal vendors consider the number of terminals involved in the pilot project, the number in an expansion of the pilot to its potential scale, and the size of the overall market that may be created.
- Food retailers are most concerned with on-going operating costs and difficulty factors such as checkout delays and handling procedures. These factors will not justify large developmental investments, but the expectation of more efficient checkout operations could induce major retailers to absorb some operating costs, such as terminal or communications costs, especially in a pilot test.

Because EBT systems represent a new potential market for several types of vendors, a food stamp agency may have more opportunity to obtain a joint development agreement for such an effort than, for example, for a management information system. Any such agreement, however, will depend on

These three systems' costs are estimated at \$14 to \$16 per case month in the small city, and \$3 to \$5 in the larger caseload scenarios. The latter figures are potentially competitive with the \$3 cost estimated for the coupon system in Reading. The costs of an on-line EBT system would be expected to be quite similar to the off-line projections.

The other technologies examined, including a laser card and a token card system, have significantly higher estimated costs. A major factor in these costs is the issuance machine, an expensive piece of equipment which serves only a few hundred households (except in the dense urban scenario).

Several design options can reduce costs in an off-line EBT system, although their effect depends both on the system design and the caseload served. Key findings are:

- Restricting the number of issuance machines reduces costs for the systems using the relatively expensive off-line issuance machines. The cost reduction is greatest (about \$2 per case month) in the small city and state-wide systems, which have a relatively high overall ratio of coupon issuance points to recipients.
- Decentralized settlement with minimal file maintenance and reconciliation reduces costs by about \$1 in the large-caseload scenarios and \$2 in the small city. This saving to the Food Stamp Program is achieved partly by having retailers and banks incur most of the costs for settlement, as in the coupon system.
- Integrating central computer functions with a larger computer facility (such as a State data processing center) saves around \$7 in the small city. The saving is less than \$.50 with larger caseloads, because substantial economies of scale are realized even in a stand-alone facility. Purchasing EBT Center services from an outside vendor might be expected to yield similar savings.
- Restricting the number of POS terminals and not allowing manual transactions generates relatively small savings, at less than \$.50 per case month for either strategy in most situations.

A hypothetical system incorporating all of these strategies has estimated costs of \$5 to \$6 per case month in the small city and \$2 to \$3 for larger caseloads with any of the three promising card technologies. These figures must be interpreted with caution, because any one or more of the cost reduction strategies might be deemed infeasible or undesirable in a particular program environment. Nonetheless, the projections reinforce the suggestion

that an off-line EBT system's operating costs could be competitive with coupon costs.

POS/ACD systems, which allow recipients to redeem benefits either through electronic transactions or by obtaining coupons from an automated dispenser, are more costly than the comparable pure POS systems. Even when POS terminals are not placed in some stores, POS/ACD costs are higher than those of the pure POS systems because the cost of the coupon dispensing feature exceeds the savings from removing terminals in most scenarios.

The Food Stamp Program's costs for any EBT system can be reduced substantially by having the system serve multiple programs. If the EBT system serves AFDC, GA, and Medicaid as well as food stamps, and if the costs of each system component are shared according to use, the Food Stamp Program's cost per case month is reduced by 30 to 45 percent. Applying the cost reduction strategies identified earlier to a multi-program system yields estimated costs of about \$3 per case month even in the small city, and around \$1.50 with larger caseloads.

In addition to the operating costs discussed thus far, a food stamp agency contemplating an EBT strategy must consider the costs of putting the system in place. Based mainly on the Reading experience, the pre-operational cost of an off-line system is estimated at about \$1.5 million for a system serving a small city. This includes pre-design efforts, design, development, and system start-up. The cost increases with the size of the caseload served because of the start-up cost of installing equipment and training retailers and recipients. In a large State system, however, the total pre-operational cost amounts to less than \$40 per case, or around \$.60 per case month over a five-year amortization period. The coupon system also has pre-operational costs, but these were incurred in past years and no data are available to allow comparison to EBT costs.

Chapter Six

USER SATISFACTION AND PARTICIPANT IMPACTS

Several important groups of people interact with the food stamp issuance system. State and local food stamp agencies are responsible for operating the system. Recipients must follow the procedures established for obtaining and using benefits. Retailers must integrate food stamp procedures into their pattern of business operations. Banks serve as the point at which retailers receive dollar credits for the food stamp benefits they accept.

A major revision to the food stamp issuance system can have significant impacts on all of these groups. If the impacts are sufficiently negative, the system may become infeasible. Positive impacts, on the other hand, may help to offset higher administrative costs.

This chapter reviews the likely impacts of an off-line EBT system on State and local food stamp staff, recipients, retailers, and banks. The analysis is based partly on evaluation results from the Reading demonstration, and partly on interviews conducted for this project with State and local food stamp officials, organizations in the retail food industry, and organizations in the banking industry (Appendix B describes the selection of respondents and specific organizations interviewed).

6.1 STATE AND LOCAL FOOD STAMP PROGRAM STAFF

State and local food stamp staff responded quite positively to the Reading EBT system. They can generally be expected to receive an off-line system with similar warmth, although this may depend somewhat on the specific system design. This section first discusses the likely effects of a pure point-of-sale (POS) off-line EBT system. It then notes differences expected with the POS/ACD (automatic coupon dispensing) and multi-program system designs.

The pure POS system. An EBT system has two impacts at the local office level, judging from the Reading experience. Issuing recipient identification cards is more complicated in EBT systems: it takes more time and skill to prepare the card, and increases the amount of recipient training

- eliminating the need to set up and monitor issuance agencies (except when the coupon system being replaced is a mail issuance system);
- eliminating the packaging and mailing of ATPs or coupons;
- adding the requirement to operate a network of terminals (including issuance machines in an off-line system) and to process transactions and handle requests;
- adding the need to interact with retailers on a routine basis; and
- altering monitoring procedures, generally by replacing data entry and manual checks with automated analyses.

The pure POS off-line system's effects on State-level operations are expected to resemble those of the on-line approach. The main distinction is that an on-line system requires a high volume of real-time transaction authorizations on an around-the-clock basis, a demand that many States' data systems do not currently have to meet. The off-line system, in contrast, requires real-time authorizations only for manual transactions, which occur comparatively infrequently.

State and local officials interviewed for this study generally consider the potential EBT effects on program operations to be minor. Most expect program staff to welcome EBT systems, mainly because they feel the EBT approach would reduce fraud and abuse, save administrative costs, or offer a higher level of services to recipients compared to the coupon system. The major advantage they see concerning State and local operations is the elimination of the need for issuance agents, where those now exist. Any drawbacks they see tend to be transitional factors (such as staff resistance to change) or system characteristics related to cost or service quality rather than impacts on administrative operations.

The respondents' comments suggest equally favorable attitudes toward on-line and off-line approaches. This may stem partly from the relatively subtle nature of the operational differences between the approaches, such as the on-line system's greater demand for real-time processing. Although these distinctions might become more salient in an operational setting than a survey, it seems likely that administrators' opinions would still rest most strongly on their perception of comparative levels of program integrity and service to clients. With more detailed information, the lower demand for

needed. On the other hand, problems with lost and stolen EBT benefits appear to arise less frequently than lost and stolen ATPs or coupons. These problems are not only unpredictable and time-consuming, but often stressful; recipients may be upset, or workers may suspect that the recipient is attempting to defraud the program.

Lost and stolen benefit cards might be expected to occur somewhat less frequently in an off-line system than in the Reading on-line system or the coupon system. This expectation rests on two assumptions: that off-line card theft will be about as common as on-line card theft; and that recipients will take care of off-line cards as well as they take care of coupons, so that card loss occurs about as frequently as coupon loss. The first assumption is reasonable if off-line and on-line systems are equally secure, so that the cards are equally attractive targets for theft. For the second assumption, it is reasonable to believe that recipients will be about as motivated to take care of off-line EBT cards as coupons, because the program does not replace the lost value in either instance. Using these assumptions and recipient survey data from Reading, off-line EBT cards would be expected to be lost or stolen for about 0.7 percent of participating households per month. This is about half the rate of lost or stolen on-line EBT cards, and similarly about half the rate of lost or stolen ATPs and coupons.

If recipients report all such incidents to the food stamp office, workers may be expected to prefer the off-line system over the coupon system. The workers will deal with fewer incidents in the off-line system, and incidents in off-line and coupon systems should have equivalent likelihood of being stressful. On-line card loss and theft occurs about as often as ATP/coupon problems, but involves less stress because on-line card loss does not usually mean benefit loss. Hence, workers also prefer this electronic system to coupons. It is unclear how workers would weigh the reduced stress with on-line card problems against the reduced frequency of off-line incidents.

More substantial effects can be expected for State-level operations, although this depends considerably on the State's existing issuance system and on the design of the automated systems supporting the program. Any EBT approach has several consequences:

as well as administrative effort. They also see the POS/ACD as less able to produce what they perceive as the major benefits of an electronic approach, especially the reduction of fraud and abuse and improvements to the Food Stamp Program's image.

The multi-program POS system. Moving from a food-stamp-only to a multi-program POS system requires several kinds of coordination between the Food Stamp Program and other assistance programs at the State level. This requirement is particularly evident in the design and development phase, when the various participating programs will be required to:

- Establish basic responsibilities for system design and operations (for example, will one agency have responsibility for overseeing the whole system, or will the Food Stamp Program monitor the retailer terminal network while AFDC staff monitor cash dispensers).
- Make fundamental system design decisions (e.g., what card technology is most appropriate, given each program's needs?).
- Establish interface protocols between the central EBT computers and the individual programs' data processing systems. At a minimum, such protocols are needed for transmitting allotment and eligibility information to the EBT Center.
- Determine operational procedures for moving recipients through the programs and coordinating this movement with system functions (e.g., Does a new recipient get training and card initialization for food stamps, AFDC, and Medicaid in a single session, or are multiple appointments required?).
- Delineate cost-sharing principles and accounting procedures.
- Resolve conflicts or potential confusion created by divergent program policies (e.g., participation periods and expiration dates; lost and stolen benefits).

Once the system is implemented, the need for coordination shifts more to the local office level. Workers in each program will need to understand basic procedures regarding card use in all participating programs, because the "black box" nature of the card may make recipients more uncertain about where to go with problems.

real-time processing in the off-line system might tend to be more positively viewed.

The POS/ACD system. The chief characteristic of the POS/ACD system from the viewpoint of State and local operations is that it adds to the pure POS system some functions that parallel coupon system functions. In particular:

- The State must establish and maintain a network of ACD/issuance machines with somewhat greater requirements for space, security, and maintenance than normal issuance machines (without the ACD function). This entails ordering coupons, distributing them to storage points, and keeping ACD machines stocked.
- The State must operate dual reconciliation systems, one covering coupon inventory and issuance, and one tracking electronic issuance and redemption activity.
- The State agency or the local office must handle recipients' problems with ACD machines issuing coupons and inquiries concerning lost or stolen coupons. Policies must be established for dealing with claims that the ACD machine recorded an issuance on the card without actually dispensing coupons.¹

In addition, the ACD/POS system requires FNS to continue to maintain procedures for printing and distributing coupons to States as well as coupon redemption and monitoring procedures.

In general, the ACD/POS system requires more administrative functions, particularly at the State level, than a pure POS system. The combined system may still require less administrative effort than a pure coupon system, however, because coupon systems generally have quite complicated procedures for getting coupons to recipients (except in direct mail systems).

State and local officials interviewed for the study are generally less enthusiastic about POS/ACD than about the pure POS system. One major reason is the need to operate two parallel systems, which they feel may add confusion

¹In the context of analogous claims concerning cash-dispensing ATMs, federal regulations governing electronic funds transfers place on the financial institution the burden of proving that the consumer actually received the cash. Proof may consist of a video tape record plus records indicating that the ATM was functioning correctly and that it was in balance (i.e., inventory change exactly equals total recorded disbursements).

The impact of these coordination requirements will differ greatly from State to State, and even from office to office within a State, reflecting variation in the current level of coordination. Coordination requirements will be least burdensome in States that already maintain integrated client data bases for the various assistance programs, and in local offices where generic workers handle all programs.

State and local officials were split in their opinions, with some preferring the food-stamp-only and some the multi-program approach. The proponents of multi-program systems focus on the potential saving in administrative cost, and some feel that the enforced program coordination will benefit the programs more generally. Those preferring the single-program system mainly cite difficulties associated with program coordination. They mentioned issues of possible hardware and software incompatibility, particularly in situations where the individual programs are supported by separate data centers. Another concern was the possibility of time-consuming sequences in which the need for all programs to use a single card creates bottlenecks in recipient flow (e.g., if a lost or stolen card forces the recipient to re-contact all programs, and coordinated action among all programs is then needed to issue a replacement card).

6.2 RECIPIENTS

Food stamp recipients received the Reading system enthusiastically. Surveys show they prefer the EBT system by a margin of four to one over the coupon system. They particularly appreciate the ease of making an EBT food purchase and the greater security they feel with the EBT system. They also spend substantially less time and money to obtain their benefits in the EBT system. This reduction in participation costs results largely from eliminating the need to take each month's ATP to the bank and exchange it for coupons, and also from the lower frequency with which EBT benefits are lost or stolen.

The pure POS system. The off-line POS system differs from the Reading system in two important respects. First, the off-line system recipient has to travel to the issuance machine to get benefits credited to the card (except in the mail-out system). In contrast, on-line crediting requires no recipient action. Second, if households' cards are lost or stolen in the on-line

system, the households lose only the value of any benefits used before they report the problem. In the on-line system, recipients may lose all benefits remaining on the card (some policies could call for benefit replacement, as noted in Chapter 3, but the no-replacement policy corresponds to the coupon system and seems the most likely option in an off-line approach).

These differences mean the average household will spend more time and money to participate in the Food Stamp Program in an off-line than an on-line system. In fact, analysis suggests that participation costs in an off-line system approximate those of the coupon system (Exhibit 6-1). The projections for the off-line system are based on the following key assumptions:

- Lost and stolen cards occur 20 percent less often in off-line than on-line systems, because recipients know loss of card means loss of benefits. The average card loss in the off-line system is assumed to occur half-way through the month, when households have about 25 percent of their benefits remaining.
- Trips to the issuance machine occur as frequently as trips to the bank in the coupon system and involve as much travel time. Average time to complete the issuance transaction is half as long in the off-line as the coupon system because of shorter lines and quicker transactions.
- All other elements of participation cost are the same in the off-line as the on-line system.

Given these assumptions, the issuance visit in the off-line system requires the recipient to spend about 38 minutes per month in addition to the time required in the Reading system. Associated with that visit is \$1.36 in travel and \$.06 babysitting costs. In addition, the average household loses \$.33 per month in benefits not replaced on cards lost and stolen in an off-line system.¹

¹Differing card technologies may offer slightly different levels of security to the card holder. For example, if a chip card is harder for a thief to copy or use than a magnetic stripe card, chip cards may less often be stolen. This figure might therefore be a few cents higher in the less secure systems (e.g., magnetic stripe on low quality card stock), and a few cents lower in the more secure systems (chip or laser card), other things being equal. However, the level of security depends on other aspects of system design as well, such as encryption procedures, so a clear relationship between card technology and recipient losses cannot be assumed.

Exhibit 6-1

Recipient Participation Costs
(per case month)

	READING COUPON	READING ON-LINE	PROJECTED OFF-LINE
Time in minutes			
Obtaining benefits	46	8	46
Dealing with problems	<u>2</u>	<u>4</u>	<u>4</u>
Total	48	12	50
Expenses and opportunity costs			
Obtaining benefits	\$1.43	\$0.08	\$1.51
Dealing with problems	0.04	0.08	0.41
Lost or delayed benefits	<u>0.74</u>	<u>0.10</u>	<u>0.10</u>
Total	\$2.21	\$0.26	\$2.02

The difference in participation costs suggests that recipients will prefer an on-line to an off-line EBT system, but they will probably prefer the off-line system to most coupon systems. The two reasons most often cited for favoring the Reading system -- easier checkout and greater security -- also apply to an off-line system, even though the security advantage is somewhat mitigated by non-replacement of benefits on lost cards. Thus, it is reasonable to expect that recipients will prefer an off-line system to those coupon systems involving a monthly trip to obtain benefits, which covers the systems now serving most recipients in the country. It is unclear how recipients would weigh the off-line system's ease of use and security against the convenience and related vulnerability of a direct mail coupon system.

In this study, State and local officials most commonly cited improved security and convenience as the recipients' greatest benefits from any EBT system -- off-line or on-line -- relative to the coupon system. A possible reduction of the stigma associated with being a food stamp client is also considered an important EBT benefit by this group of respondents. The officials did not see important differences between the on-line and off-line EBT approaches from the recipients' perspective.

The POS/ACD system. The POS/ACD system gives recipients the choice of using coupons or making electronic purchases. Because it increases their options, one would expect recipients to prefer POS/ACD to the pure POS off-line system.

The availability of coupons means that recipients can shop freely at stores outside the area served by the system, and provides an easy way for them to convert electronic benefits to coupons when leaving the area for an extended period. At the same time, the opportunity to make electronic purchases preserves the purchase convenience that Reading recipients value in the EBT approach. The POS/ACD system also preserves most of the security advantages of the pure electronic systems; although coupons are more vulnerable than cards, the recipient can limit the vulnerability by withdrawing coupons in smaller quantities than the full month's allotment.

Recipient participation costs are expected to be the same with POS/ACD as in the pure POS off-line system. Recipients must still make one trip to the ACD-issuance machine to have their monthly allotment credited to their card. If they decide to withdraw coupons in small amounts, they may make

several trips. Because this represents a recipient decision rather than a program requirement, however, it need not be counted as an additional participation cost.

Given these considerations, recipients are expected to prefer off-line POS/ACD systems to pure POS off-line systems. It is unclear, however, how recipients would weigh an off-line POS/ACD system against an on-line POS system like Reading's. A minority of recipients prefer the coupon system to the Reading system, so they would probably favor the POS/ACD approach. For the remainder, one might expect the optional availability of coupons to be less valued than the convenience of on-line allotment posting.

State and local officials view the greater flexibility of the POS/ACD system as its greatest advantage to recipients. Some of the respondents anticipate client confusion developing over the dual system, but none see this as more than a transitional concern.

The multi-program POS system. The multi-program system has two kinds of effects on recipients. The first, and probably most important, is the need to replace the identification and benefit access procedures in each individual program with an EBT process.

The second is the impact of having a single card serve the EBT process in all of the programs.

The impact of the pure POS off-line EBT system in the Food Stamp Program was discussed above. Recipients are expected to prefer off-line POS to coupons because of convenience and security, but not to on-line POS because of the need to visit the issuance machine.

The recipient effects of EBT in other programs are less predictable. Although pilot projects using EBT-like technology are underway for AFDC and Medicaid, no recipient impact information comparable to the Reading data is yet available. For cash assistance programs, such as AFDC and GA, EBT would typically replace a check-cashing procedure with a procedure more similar to a cash withdrawal from an Automated Teller Machine. Recipients would probably experience fewer problems with checks lost or stolen from the mail and might find the process of obtaining cash more convenient. Medicaid recipients would probably notice little difference (assuming the card is used for authorization only), although they might experience some reduction in paperwork at the point

of service. In general, then, recipients in these programs may be expected either to have a slight preference for an EBT approach or to be indifferent. Their preference between on-line and off-line systems would presumably parallel food stamp recipient preferences if the same distinction in required visits to the issuance machine exists in the other programs.

The integration of programs onto a single card could have both positive and negative consequences for recipients. On the positive side is the convenience of caring for just one card, and the likelihood that the various programs' procedures would become more similar (and thus easier to remember) in an integrated system.

Two negative effects seem possible. First, lost or stolen cards may take longer to replace, and all programs' benefits will be inaccessible during the replacement process. Second, separate program cards may help recipients remember for which programs they are eligible in a given month and when their eligibility expires, information that may not be so readily visible on a combined card.

Although it is not clear whether the net impact of combining programs on the card will be positive or negative, that impact seems likely to be less important to recipients than the various single-program effects of the electronic approach. Because those seem largely positive, most recipients would probably prefer the multi-program POS system to the coupon situation.

The majority of State and local officials believe that most recipients would favor this system over the other two off-line configurations. The added convenience of having all services on one card is the largest benefit to recipients. The respondents agree with the analysis, however, in feeling that the reliance on one card presents a potential negative impact if losing a single card makes several types of benefits unavailable to the recipient and requires the recipient to interact with multiple programs to get the card replaced.

6.3 RETAILERS

Retailers, like recipients, strongly prefer the Reading EBT system to the coupon system. Surveys in Reading showed an overall preference margin of more than three to one. Some kinds of stores are more positive than others,

but all groups favor the EBT system by substantial margins. Retailers cite the elimination of coupon handling requirements as the main factor in their preference, but also value what they perceive as a substantial reduction in food stamp fraud and abuse. The Reading evaluation also indicated that retailers are likely to incur lower costs with EBT than coupon purchases, although the impact is not large.

The pure POS system. From the retailer's point of view, the main difference between on- and off-line systems should lie in the time required to complete a transaction. The off-line system eliminates the time an on-line terminal spends to establish a dial-up connection with the EBT Center as well as the transmission time required to send messages back and forth. These two components of transaction time were estimated to take 16-19 seconds in Reading.¹ Processing time might also be reduced by eliminating delays and manual authorizations caused by central computer downtime or overloads. If manual authorization procedures in an off-line system differ substantially from those in Reading, retailers might also be sensitive to that difference. The range of possible off-line policies is too broad to predict a preference, however.

Retailers would see a further difference if an off-line system has decentralized settlement. Funds are automatically deposited to the retailer's bank account with centralized settlement, but with a decentralized approach the retailer must initiate settlement by taking transaction files to the bank. This parallels the coupon system process, but is considerably less burdensome than the coupon system's requirement for endorsing coupons and completing a redemption certificate.

These differences mean that retailer participation costs should be lowest in an off-line, centralized settlement EBT system. This is shown in Exhibit 6-2, which projects participation costs based on the following assumptions:

¹Based on data from the acceptance test for the revised EBT system in the extended demonstration.

Exhibit 6-2

Retailer Participation Cost
(per \$1,000 redeemed)

READING	READING	PROJECTED OFF-LINE (CENTRALIZED)	PROJECTED OFF-LINE (DECENTRALIZED)
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- The average purchase transaction in an off-line system will be completed in 15 fewer seconds than the Reading average.
- Decentralized settlement will add approximately one hour per month to the handling time required by the Reading EBT system. This assumes that the average store deposits EBT benefits about three times per week as part of a normal trip to the bank, and that each food stamp deposit involves an incremental five minutes.
- Decentralized settlement is also assumed to result in float costs to retailers equal to those of the coupon system rather than the EBT system in Reading (included in "Other" in the exhibit).

Given these assumptions, retailer participation costs for an off-line system with centralized settlement are projected to be about 8 percent less than the level in the Reading EBT system. The projection for an off-line system with decentralized settlement is about 9 percent higher than the Reading system, but still less than coupon system costs.

The participation cost differences are probably too small to make an appreciable difference in retailer satisfaction with the system. For the average retailer in Reading, the difference between the on-line and off-line costs would amount to only about \$3 per month.

The difference in transaction time could have an effect, however, especially if the off-line system substantially reduces the occurrence of problem transactions. Such a reduction is expected, because the off-line transactions cannot be blocked by failure of the central computer or the communications network. This could lead some retailers to prefer an off-line over an on-line system. Retailers interviewed for the present study indicated that system reliability, including the presence of fall-back procedures to minimize the number of rejected transactions, is a top priority concern. Retailers involved with commercial POS debit card networks were particularly strong on this point, expressing dissatisfaction with the frequency of non-completed transactions in their current systems. Banking organizations interviewed during the study cited faster transaction time as a primary advantage of off-line systems to retailers.

The comparisons above do not take into account the issue of compatibility with commercial POS systems. If the EBT system is implemented in

stores that do not already participate in commercial systems, compatibility may not be an issue: both on-line and off-line systems can be designed to use terminals that would be capable of interfacing with the common commercial POS technologies. Thus, the EBT terminal would not limit the retailers' ability to join commercial POS networks in the future.

This seems to be the most likely scenario, because a very small proportion of food retailers participate in commercial POS networks at present and this situation is not likely to change dramatically in the next two or three years. Despite predictions for the past decade of an imminent move to debit card payment, and numerous pilot tests, the majority of retailers have not proceeded with large-scale implementations. For the immediate future, then, most States could meet any compatibility concerns simply by ensuring that the EBT terminals can also operate in commercial systems -- which means they can read standard bank cards and have the capacity for on-line transactions.

Retailers already participating in a commercial POS system will not want a second terminal occupying space at the checkout counter. Interviews suggest, however, that they would not object to the Food Stamp Program replacing their existing terminal with a different one, as long as the new terminal can interact appropriately with the network. Whether the retailer would share in the cost of terminal replacement or merely allow FNS to execute it would be a matter for negotiation. This might limit the possible cost-sharing advantage to the program of using the in-place terminals for EBT transactions, but it will not generate higher costs than a situation in which the retailer currently has no terminal at all.

The other main issue raised in retailer interviews concerned the cost to retailers of participating in the EBT system. Retailers would clearly prefer to avoid transaction fees, although some respondents would consider cost-sharing at some level. They are interested both in making food stamp transactions and processing more efficient and in reducing the level of fraud and abuse. If an EBT system can deliver these results, they would consider participating in its costs either through paying transaction fees or through bearing terminal-related costs. No respondents were specific about the maximum costs they would find acceptable, however.

State and local officials unanimously believed that retailers would welcome implementation of an EBT system. Reduced handling and processing requirements and the potential to expand into commercial POS networks are the most frequently mentioned benefits of the system. Respondents believe that all stores would realize these benefits, but especially larger and urban-based stores. Responsibility for equipment costs is viewed as the most serious barrier to retailer participation.

The POS/ACD system. Retailers' preferences for the EBT approach rest heavily on eliminating irritation they experience with the coupon system, particularly in the coupon-handling tasks required for redemption. If the POS/ACD system does not substantially reduce coupon handling, but simply adds another form of payment and another flow of funds to track, at least some retailers can be expected to oppose the system.

The POS/ACD system introduces the possibility of varying the benefit form across retailers. One likely scenario would be that retailers with low food stamp volume would not receive POS terminals, and hence would only be able to accept coupon transactions. It is possible that this arrangement would match retailers' preferences: a minority of Reading retailers said they prefer the coupon system, and these tended to be the types of stores with lower food stamp volumes (e.g., small grocery and specialty food stores). Because it is important for retailers not to turn away customers, however, many will feel compelled to accept all types of food stamp benefits used by any substantial number of recipients, even though accepting only a single type of transaction would be more convenient. Thus any arrangement that prohibits some retailers from accepting some types of benefits, or imposes on some retailers an added cost such as paying for their own terminals, is likely to meet considerable resistance.

Retailer participation costs will clearly be higher with ACD/POS than in a pure POS system. In fact, costs could approach or exceed levels in the coupon system, depending on the distribution of coupon and electronic transactions and the degree to which coupon handling costs are fixed rather than variable. For example, if coupon handling costs were entirely fixed, implying that a retailer takes as much time to redeem \$10 as \$1,000 in coupons, then any requirement to handle some coupons and some electronic benefits would

raise the retailer's participation cost above the coupon level.¹ Because differences in participation costs amount to only a few dollars per month in the average store, however, these variations are not likely to be critical in determining retailer opinions.

It is reasonable to conclude, then, that retailers will be less satisfied with an ADC/POS than a pure POS system. How much less satisfied will depend on program rules, system design, and recipient redemption patterns. If some retailers have substantial redemptions through both the coupon and electronic systems, experiencing both systems' difficulties with no increase in sales, it is quite possible that they would even prefer coupons to the POS/ACD system.

State and local officials share this assessment of the effects of the POS/ACD system on retailers. They cite the effort to operate two systems as that system's greatest drawback to retailers. One respondent did mention the potential for greater retailer participation with this system, feeling that smaller stores could continue to accept only coupons with larger ones transacting EBT sales. This assumes that smaller stores might choose not to participate in an EBT system, a phenomenon that did not occur in Reading but might result if an EBT system incorporates transaction fees or some other form of cost-sharing.

The multi-program system. Food retailers are expected to be generally unaffected by differences between the food-stamp-only and multi-program POS systems. The major differences in a multi-program system are:

- Cash assistance recipients may make some food purchases through the EBT terminals rather than using cash. Some retailers may prefer cash and others electronic transactions, but the number of purchases involved is likely to

¹To illustrate this effect using figures from Exhibit 6-2, handling costs from the Reading coupon system (\$13) can be added to total projected costs for the off-line system (\$12). The resulting \$25 cost is much higher than the cost of the coupon system by itself (\$18). The Reading data suggest that handling costs include some fixed and some variable elements, but do not allow estimation of the proportion of each.

be too small to have much impact on retailer satisfaction.¹

- To the extent that retailers currently cash AFDC and GA checks, this activity will probably be eliminated or replaced by cash disbursements for POS transactions. Retailers' preference between paper and electronic "check cashing" will depend on the comparative transaction times and handling difficulty, and the EBT systems might have a small edge. Retailers would probably be happier to eliminate such activity altogether, and would favor a system that accomplished that.

In general, food retailers' attitudes will be determined mainly by what happens within the Food Stamp Program, so the issues discussed earlier will be more important than the choice between single- and multi-program configurations.

State and local officials were split in their opinions about whether retailers would prefer the multi-program or pure POS system. Some felt the multi-program system would have greater business potential and therefore be preferred. Others felt that retailers in their area would be neutral because they would be unaffected by the non-food stamp aspects of an EBT system.

6.4 BANKS

Local banks in Reading concur with recipients and retailers in favoring the EBT approach over the coupon system. The largest factor is the elimination of their role as issuance agents in the coupon system. Even though they are compensated for issuance activity, they feel it detracts from their primary business and are happy to forego that particular source of revenue. The banks are also happy to receive electronic funds transfers, which are indistinguishable from their normal business, rather than carry out the manual procedures for accepting coupons and forwarding them to the Federal

¹Experience in commercial POS systems indicates that only a small percentage of the consumers who have cards allowing them to make direct debit payments in supermarkets use them for that purpose, and even those who use the cards do so for only a minority of their purchases. Thus it is likely that most AFDC or GA recipients will prefer to take their benefits as cash, even though they spend some of the cash in food stores. If this occurs, non-discretionary EBT transactions (i.e., purchases using food stamp benefits) will make up the bulk of the EBT volume even when other programs are added to the EBT system.

Reserve Bank. The Reading evaluation estimated that banks incur costs in this latter activity amounting to about \$6 per \$1000 in coupons they accept, while the analogous costs with the EBT system are about \$.40 per \$1,000. Unlike their issuance activity, the banks receive no direct compensation for these redemption costs.

The pure POS system. The off-line POS system with centralized settlement looks virtually identical to the Reading on-line system from a bank's point of view. The bank's only responsibility is to receive electronic deposit items and credit them to the appropriate accounts.¹ The off-line system's impact on bank participation costs, and satisfaction with the system, should therefore be comparable to the Reading results.

Decentralized settlement in an off-line system involves the local bank more actively. The bank must receive the retailer's transaction file, read it, send the data to the Federal Reserve Bank and possibly to the EBT Center, receive an ACH transmission from the Federal Reserve Bank, and credit it to the retailer's account. This is quite similar to the coupon system process, although it eliminates the manual counting, sorting, and batching of paper coupons. Participation costs are therefore expected to be slightly under those in the coupon system, perhaps in the neighborhood of \$4 to \$5 per \$1000 redeemed, compared to \$6 for coupons. Banks that do not currently perform coupon issuance may be essentially indifferent between the coupon system and the off-line system with decentralized settlement. Those with an issuance responsibility, however, will probably prefer any system that eliminates that role.

Banking organizations interviewed for this study expressed a general preference for on-line over off-line payment systems, but the responses were more closely related to commercial payment systems than to an EBT context. Respondents feel on-line systems offer the banks greater flexibility and control, more up-to-date information, and less exposure to float and loss. The main advantage they see for off-line systems is the potential for lower

¹A few banks may also act as transmission points for retailers without telephones, but their numbers are too small in a centralized settlement system to affect the overall pattern.

costs of system operation, due to the reduced demand for handling authorization transactions. With more direct reference to the Food Stamp Program, some respondents indicated that banks would welcome any system that replaces paper coupons with electronic transactions.

State and local officials similarly feel that the elimination of paper coupons would be sufficient to elicit a favorable reaction by financial institutions toward an off-line POS system. They also expect banks which serve as issuance agents to welcome the release from that responsibility, as in Reading. Possible drawbacks of an EBT system are largely viewed as transitional (e.g., training, system design compatibility) or cost-related.

The POS/ACD system. The banks' perspective on the POS/ACD system is expected to depend on three factors:

- If the bank acts as an issuance agent, the Reading experience suggests that elimination of that function will be the primary consideration. The bank may prefer virtually any system that does not involve an issuance role.
- If the POS part of the system has centralized settlement, the system's impact on the bank's redemption function will depend on the proportion of benefits that recipients redeem as coupons. The banks will view positively any reduction in coupon redemptions, even if benefits are split between the two modes to increase the total number of redemption transactions. Any substitution of electronic deposits for coupon redemptions would probably reduce participation costs.¹
- A POS/ACD system with decentralized settlement would require the bank to operate two processes that represent exceptions from its normal operations. Although banks would prefer decentralized electronic redemption to paper

¹The costs of receiving and crediting an electronic funds transfer deposit are essentially fixed, and do not depend on the value of the transaction. The costs of coupon redemption transactions include some fixed elements (e.g., reviewing the retailer's Redemption Certificate, crediting the retailer account) and some variable elements (e.g., counting the coupons). If all retailers accept some coupon and some POS transactions, the bank may have to deal with one electronic deposit and one coupon deposit where it previously had just the coupon deposit. In this case, whether the POS/ACD system increases or reduces bank participation costs depends on how much of the coupon redemption cost is fixed and how much is variable; this cannot be estimated from the Reading data.

coupon redemption, combining the two would be the least acceptable option. Participation costs would be higher than in a pure POS system, and could exceed costs in a coupon system (if, for example, each retailer deposit involves both coupons and an electronic transaction file).

It appears then, that banks would definitely prefer a pure POS off-line system to a POS/ACD system. If recipients in a POS/ACD system choose to redeem most of their benefits in coupon form, banks would probably prefer the pure coupon system to a POS/ACD system with decentralized settlement. They would probably have no preference between a pure coupon system and a centralized settlement POS/ACD system if most benefits in the system are redeemed as coupons.

The multi-program system. For banks, the food-stamp-only and multi-program POS systems are distinguishable only if the bank currently cashes AFDC or GA checks or if the bank deploys ATMs that are used by these programs in an EBT system. Although check-cashing is among banks' normal operations, it is one of the labor-intensive activities that banks are generally attempting to reduce. Moreover, many banks have argued that cashing welfare checks creates long lines in branch lobbies and detracts from the quality of service they can offer in other, more profitable transactions. Hence, banks that currently cash assistance checks will generally be happy to eliminate this function, although they will not care whether it happens within a single-program or multi-program system.

6.5 SUMMARY

All groups interacting with the Reading on-line EBT system considered it a substantial improvement over the coupon system. Each group's costs of participating in the Food Stamp Program, where those costs could be measured, were found to be lower with EBT.

Because an off-line EBT system closely resembles an on-line system in many respects, most participants are expected to prefer an off-line system to coupons, regardless of the specific design of the off-line system. There are two possible exceptions to this general pattern. First, recipients who currently receive their coupons by mail may prefer that system to an off-line approach in which they must visit an issuance machine to claim their benefits. Second, because the POS/ACD system requires the parallel operation of

two redemption systems, retailers and State and local officials in some areas might prefer the pure coupon system, and banks might prefer coupons if the electronic part of the system involves decentralized settlement.

The comparison between off-line and on-line systems is generally less clear. For recipients, the need to visit the issuance machine implies higher participation costs. Recipients are therefore likely to prefer an on-line system, other things being equal. For other groups, the differences between on-line and off-line systems are very small, and the preference seems likely to depend more on specific features of the system design than the general choice between on- and off-line approaches.

Chapter Seven

CONCLUSIONS AND RECOMMENDATIONS

In considering the results of this feasibility study, it is useful to focus on four primary questions:

- Is it conceptually possible to design an off-line EBT system that will meet the functional requirements of the Food Stamp Program?
- If an off-line system is theoretically possible, can such a system be designed with established technology?
- What would be the impacts of an off-line EBT system on the Food Stamp Program and its various participant groups, relative to the impact of a coupon system or an on-line EBT system?
- Is there reason for FNS to proceed at this time with a demonstration of an off-line system and, if so, what should be the main characteristics of the demonstration?

This chapter reviews the findings of previous chapters in the context of these four questions.

7.1 IS AN OFF-LINE EBT SYSTEM CONCEPTUALLY FEASIBLE?

It is possible to specify the design for an off-line EBT system that will meet the functional requirements of the Food Stamp Program. This system has the following central characteristics:

- The recipient's account balance is maintained on the benefit card.
- Recipients visit issuance machines to have allotments posted to their cards, or receive a new card in the mail for each allotment.
- In a normal EBT purchase, a point-of-sale (POS) terminal deducts the amount of the purchase from the balance on the recipient's card without contacting a central computer.

- The terminal stores a record of each purchase until the end of the business day. At that time, data concerning all accumulated transactions are transmitted for settlement, resulting in dollar credits to the retailer's bank account.

Major design options exist in four areas: the use of issuance machines, the settlement procedures, the extent to which the EBT system maintains central recipient "accounts," and the use of manually authorized transactions when electronic purchases are impossible.

Issuance machines. Most of the off-line configurations envisioned here use an issuance machine to credit allotments to recipients' accounts. When recipients visit the issuance machine, it either increases the balance in benefit cards they already hold or dispenses a new card with a balance equal to the new allotment. An alternative strategy is to mail the household a new card for each new allotment.

The issuance machine can be employed with any card technology, but is costly. It also requires recipients to make a monthly trip to claim their benefits, as they do in most coupon issuance systems. The mail-out strategy avoids the cost and inconvenience of the issuance machine, but is viable only if the cards are inexpensive and protected against unauthorized use.

Settlement. An off-line EBT system could be designed with either centralized or decentralized settlement. With centralized settlement, transaction data held in the POS terminals is transmitted to the central EBT computers, which initiate an electronic funds transfer process to credit retailers. With decentralized settlement, retailers take the transaction data cartridge or an analogous storage device to their bank, which credits the retailers and requests a corresponding credit from the Federal Reserve Bank.

With decentralized settlement, most settlement-related activities are carried out by the retailer and the bank rather than the food stamp agency or its EBT contractor. Unless retailers and banks are reimbursed, then, decentralized settlement costs the Food Stamp Program less than centralized settlement, but entails higher costs for retailers and banks participating in the program.

Recipient accounts. Three choices are available for recipient account maintenance:

- the "full reconciliation" approach, in which the EBT Center periodically matches all of a recipient's transactions against the balance showing on the recipient's card;
- the "last balance" approach, in which the EBT Center maintains information on the recipient's card balance at the end of each business day, but does not reconcile the balance against transactions; and
- the "no balance" approach, in which the EBT Center maintains no data on recipient balances or purchase transactions (as in the current system with food stamp coupons).

Full reconciliation offers the greatest accountability. It allows the EBT operator to identify overdrawn accounts and illicit cards, and to reconcile total redemptions against total issuances. To achieve this, the full reconciliation approach involves obtaining transaction data and maintaining extensive files at the EBT Center. In contrast, the no balance approach avoids these file maintenance costs. It allows no identification of problematic accounts, however, and like the coupon system it cannot compare benefits issued to benefits redeemed.

Manual transactions. An off-line system has several options for handling situations in which a recipient cannot complete an electronic purchase because of card or equipment failure. Purchases may be manually authorized, or no manual authorizations may be allowed. Manual authorizations, if allowed, may or may not include a check of the prior balance. The card balance may be adjusted to reflect the manual transaction at the time of the next electronic purchase or in subsequent allotments.

Any policy involving manual authorizations entails some costs for equipment and labor and some risk of overdrafts. In general, the procedures that minimize overdraft risk are more costly. A policy of no manual authorizations eliminates both the cost and the overdraft risk. This policy means, however, that recipients will sometimes be unable to complete planned purchases. They will not be able to use their available food stamp benefits until they can get to a store with a functioning terminal or get their card replaced, depending on the nature of the problem.

Coupon dispensing and multiple programs. In addition to the "pure" off-line EBT system, it is conceptually possible to design a system with automated coupon dispensing (ACD), in which some benefits would be redeemed as

coupons and others through electronic transactions. Likewise, it is conceptually possible to design a system that would handle other assistance programs in combination with food stamps.

7.2 IS AN OFF-LINE EBT SYSTEM TECHNICALLY FEASIBLE?

An off-line EBT system can theoretically be built around any of several existing access card technologies. The card technologies can all meet the basic functional requirements of an EBT system. Nonetheless, the availability of appropriate supporting equipment, particularly issuance machines and POS terminals, varies substantially by card type. Differing card technologies also imply differing compatibility of an EBT system with commercial POS systems.

Standard magnetic stripe cards. The standard magnetic stripe card is the most thoroughly established of the card technologies, with numerous vendors of appropriate cards and POS terminals. Issuance machines, with or without a coupon dispensing feature, could be produced with some modification of existing products.

Because commercial POS systems use the standard magnetic stripe card, an off-line EBT system based on this technology has maximum compatibility with existing systems. Nearly all commercial systems use an on-line approach, however. Even if the system owners are willing to admit participation by an off-line EBT system, many existing terminals do not have the capacity to authorize off-line transactions and store them for later transmission. This means that only partial compatibility is likely: an off-line EBT system would be able to accommodate commercial POS transactions, but the reverse would seldom be true.

The standard magnetic stripe card has two limitations that must be considered in an off-line EBT application. First, the stripe is vulnerable to tampering and duplication, although with appropriate safeguards, such as a watermark, it appears sufficiently secure. Second, although the card could support an EBT system serving at least AFDC and General Assistance as well as food stamps, its data storage capacity is insufficient for some more complicated multi-program applications.

Chip card. Chip cards have now been used in numerous U.S. and foreign applications, including some in which the card performs functions directly comparable to those required in an off-line EBT system. Chip cards with relatively modest storage capacity (about one kilobyte) are sufficient even for an EBT system handling several assistance programs. The chip card offers substantial security against tampering and counterfeiting.

Some POS terminals for chip cards are now available, and at least one manufacturer of terminals for magnetic stripe cards has announced a line of modular terminals that can be ordered with either a magnetic stripe or a chip card reader, or a unit that accommodates both card types. A telephony-based terminal, widely available in Europe, can perform issuance machine functions in an on-line mode. An off-line issuance machine could be constructed that would be equivalent to that for the standard magnetic stripe card, altering only the reader/writer unit. Such machines could be constructed with or without a coupon dispensing feature.

An off-line EBT system using POS terminals that will read both magnetic stripe and chip cards would be able to accept commercial POS transactions, like the EBT system using standard magnetic stripe cards. Many observers expect chip cards to become more widely used in financial transactions in the next few years, which will tend to enhance the commercial compatibility of a chip card EBT system.

Non-standard magnetic stripe card. An off-line system using magnetic stripe technology on inexpensive, non-standard card stock is also feasible. The card would be constructed of thin plastic stock with a magnetic stripe whose placement and format conforms to bankcard standards. Such cards are readily available and could use the same POS terminals as standard magnetic stripe cards.

The non-standard magnetic stripe card is equivalent to the standard card in terms of its compatibility with commercial POS systems, its vulnerability, and its limitations for multi-program applications.

The non-standard magnetic stripe card is envisioned as a disposable card, used for just one allotment. Cards could be mailed to recipients monthly. Alternatively, the system could use an issuance machine to dispense cards; such machines are available through modification to existing products.

Laser card. The optical memory or laser card could meet the functional requirements of an off-line EBT system, and has capacity and security features similar to the chip card. The card has been used in few applications to date, however, and these have not led to the availability of suitable equipment for POS terminals or issuance machines. Thus the laser card cannot be considered technically feasible for an EBT application at this time. Moreover, the laser card does not appear likely to find significant use in EFT networks in the next few years, so an EBT system based on this technology would be wholly incompatible with commercial POS systems.

Token card. The token card is well proven in certain applications, particularly in public transportation in the United States. POS terminals and issuance machines could be produced as modifications of existing products. In the context of an EBT system, however, the token card is less secure than the other card technologies, it requires the use of cash change and cash refunds, and it is not suitable for multi-program applications. These limitations make the token card less desirable than the other card technologies, even though

Off-line vs. on-line. The technical feasibility of an on-line EBT system has been clearly demonstrated, both in Reading and in numerous commercial POS systems. Off-line system feasibility is less clearly evident because no closely analogous systems exist, at least in the United States. Nonetheless, the individual components and processes needed for an off-line system exist at an adequate level of technological and market development. The off-line EBT approach should therefore be considered feasible but not proven.

The most clearly defined difference between on-line and off-line system feasibility concerns compatibility with commercial POS systems. An on-line EBT system could be fully compatible with commercial systems: EBT transactions could be performed at the terminals of a commercial system, and conversely. An off-line system can be assured of only one-way compatibility,

years, but is possible in the longer term if chip cards become widely accepted in financial transaction systems.

Although the compatibility difference is clear, its importance is hard to judge. Despite nearly a decade of optimistic projections, commercial POS systems have enrolled only a small proportion of the stores participating in the Food Stamp Program. It would be useful for FNS to obtain continuing data on the authorized stores' participation in such networks so that compatibility issues can be assessed directly for any planned EBT system. For the near future, however, the food stamp agency will probably be responsible for placing the terminals in most or all stores in an EBT system. In this situation, one-way compatibility is sufficient and requires only that terminals be chosen to support on-line as well as off-line authorizations. In choosing between an on-line and an off-line EBT approach, then, compatibility may be a factor only in those relatively few environments where commercial networks already have POS terminals in a large number of food retail stores.

7.3 WHAT ARE THE OFF-LINE SYSTEM'S EFFECTS?

For the most part, the effects of an off-line EBT system seem likely to be quite similar to those of an on-line system. Both electronic approaches differ from the coupon system by offering greater security and user satisfaction, and the key question for any electronic system is whether its costs can be held to the level of the coupon system.

Operating cost. The operating cost of an off-line EBT system could be competitive with coupon costs or they could be higher. The cost depends on the scale of operations, the technologies chosen, several system design decisions, and the extent to which the EBT system stands alone or is integrated with other operations.

In reviewing costs, it is useful to focus on the three systems judged most promising in terms of technical feasibility: the standard magnetic stripe card system, the chip card system with telephony-based issuance machines, and the mail-out non-standard magnetic stripe card system. Costs of the "basic" versions of these three systems are projected at about \$14 to \$16 per case month in a small city, and \$3 to \$5 for large city or State-wide systems. The latter figures approach the coupon system's costs, estimated at \$3 per case month in the Reading evaluation.

Several strategies offer the potential to reduce costs below the levels cited above:

- Integrated computer facility. An EBT system's central computer facility represents a large fixed cost that increases only slowly as the size of the caseload grows. Integrating EBT operations with those of a State data processing center or some other entity provides dramatic savings for a small city system, although not for larger systems.
- Limiting issuance machines. The basic estimate assumes that one issuance machine is placed at each issuance point existing in the coupon system. Restricting the number of machines can have a substantial impact in the standard magnetic stripe card system, where issuance machines are a major cost component.
- Decentralized settlement with a "no balance" approach to account maintenance offers significant savings in all systems.
- Limiting POS terminals to a maximum of two per store, rather than one at every checkout station, yields some savings.

When all of these strategies are combined, operating costs are estimated at \$2 to \$3 per case month with large systems, and \$5 to \$6 in the small city. The mail-out non-standard magnetic stripe card system generally has the lowest costs, but the cost differences between the three card technologies are small enough that other factors would probably be more important in choosing an approach.

Another possible cost-saving strategy for the Food Stamp Program is for the EBT system to serve other programs as well, assuming that those programs would share in the costs. Projections for a system serving AFDC, GA, and Medicaid, including all of the cost reduction strategies described above, yield estimated costs of about \$3 per case month in the small city, and around \$1.50 with larger caseloads. Although it may be unrealistic to assume that all cost-saving strategies would be combined in a single system, the figures indicate that an off-line system can be operated at a cost level that is at least competitive with the coupon system, and that it might be able to offer significant savings.

Off-line EBT costs are generally comparable to those of an on-line system. An off-line system avoids some of the communications costs of an on-

line approach, and has somewhat less costly requirements for its central computer facility. On the other hand, the off-line system incurs costs for issuance machines or for mailing out benefit cards, and needs somewhat more expensive POS terminals. The net cost difference will depend on the configuration of particular systems rather than inherent characteristics of the off-line and on-line approaches.

Program integrity. The Reading evaluation indicated that an on-line EBT system has the potential to reduce the value of food stamp loss and diversion below the levels experienced in the coupon system. An off-line EBT system could achieve approximately comparable effects.

The vulnerabilities of the two electronic approaches lie at different points in the system. In an on-line system, for example, the EBT Center maintains account balances and authorizes transactions, so benefits are potentially vulnerable to computer manipulation by an EBT Center employee. The off-line system maintains the account balance on the benefit card and authorizes transactions by checking data on the card, which makes the card the logical target for an attack on the system. Security measures exist for both systems' vulnerabilities, but any security measure can be defeated. Experience with commercial on-line systems suggests that an on-line EBT system with normal security measures would have very small losses, but no equivalent experience exists for an off-line system.

Among the off-line systems, cards using magnetic stripes are somewhat more vulnerable than those based on chip or laser technologies. Equipment that will read and write information on magnetic stripes is readily available and inexpensive. Nonetheless, PIN or other user identification procedures, combined with encryption or similar manipulation of key operating data, seem to offer adequate protection even with the magnetic stripe card.

An off-line system may lead to somewhat greater losses for recipients than an on-line system. The program cannot close an account when the recipient reports a lost or stolen card, so the recipient will lose the value of benefits on the card (as is currently the case with coupons). This does not increase program costs, but diverts benefits from their intended use. These diversions in an off-line system should still be less than the value of lost and stolen coupons, however, because the PIN and other security devices

will make the benefit card less easily used than coupons, and thus a less attractive target for theft.

User satisfaction. For the most part, user satisfaction with an off-line EBT system is expected to parallel the Reading on-line experience, where all groups substantially preferred the EBT system to coupons. The only inherent differences between on-line and off-line approaches, in apparent order of importance, are as follows:

- Unless a mail-out approach is used, the off-line system recipient must visit the issuance machine to obtain allotments. This makes participation costs comparable to the ATP/coupon system. It is unclear how recipients will trade off the greater convenience of the electronic transaction against the trip to the issuance machine.
- Off-line checkout transactions should be quicker and less frequently encounter problems. This will not affect retailers' participation costs very much, but the reduction in aggravation could lead them to prefer off-line systems.
- If an off-line system uses decentralized settlement, participation costs for retailers and banks will be higher than with the on-line system, though lower than coupon system costs. This could lead banks to prefer on-line to off-line, but retailers would probably still prefer the off-line system because of the faster checkout transactions.

A potentially important feature of the off-line EBT system is its ability to incorporate retailers who do not have telephone service and for whom it is not feasible to install it. This includes retailers in certain areas where no telephone service exists, and some whose business makes it impractical, such as mobile vendors. In the on-line system, purchases from such retailers must be handled by rather difficult exception procedures, such as allowing purchases without authorization or using a broadcast communication medium. The off-line system handles the problem more easily: transaction data are simply stored in a portable medium, such as a cartridge, which is transported to a point from which the data can be transmitted forward for settlement.

7.4 SHOULD FNS CONDUCT AN OFF-LINE EBT DEMONSTRATION?

In deciding whether to conduct a demonstration, FNS must consider the extent to which an off-line EBT system promises to be an advantageous approach to food stamp issuance. This depends on two factors: whether EBT systems in general offer advantages over the existing coupon systems and, if so, whether an off-line EBT approach is preferable to on-line.

It is clear from the Reading evaluation that an electronic system has many potential advantages over the coupon system. The EBT system offers improved program integrity and positive impacts on recipients, retailers, and banks. Although the Reading experience left open the cost question, the analyses presented here strongly suggest that an electronic system can operate at levels comparable to or lower than coupon costs. These factors constitute a compelling argument for FNS to continue to consider EBT systems.

A comparison of off-line and on-line EBT approaches yields no clear winner, however. Neither system has a strong advantage in terms of cost, security, or user satisfaction. The on-line approach has greater compatibility with commercial POS systems, but this is unimportant unless a large number of food stamp stores in an EBT system's area participate in commercial systems. The off-line approach offers greater flexibility in accomodating retailers without telephones, but solutions to this problem exist in an on-line system as well.

Given these considerations, FNS might reasonably proceed with its on-line EBT explorations, since these are already underway, and forego the off-line approach. Equally reasonably, FNS might attempt to develop the off-line EBT approach with the aim of allowing State agencies a choice of electronic techniques. This would be consistent with current policy regarding coupon issuance, which permits States to select from an array of approaches.

If FNS does decide to pursue the off-line EBT approach, the necessary first step is to conduct one or more demonstrations. The demonstration(s) would have three purposes:

- Policy and design guidelines. The Reading experience shows that an EBT system involves a very large number of detailed decisions in which food stamp policy interacts with system design. An off-line system will offer new issues for resolution. Some can be anticipated, such as issues related to manual transactions and lost or damaged

cards, but others will be discovered only in the process of actually developing a system.

- Feasibility test. Although all components and processes for an off-line EBT system appear technically feasible, the only truly convincing evidence of system feasibility is a successful implementation. This is more important for an off-line system than it was for the on-line approach, because no closely comparable off-line applications exist. It is also important to test the actual availability of system components that would require modifications of existing products.
- Cost reduction strategies. Because cost looms as a decisive factor in considering EBT systems, it is important to learn about cost reduction strategies such as those suggested earlier. The key questions are how much saving actually occurs and whether the cost reduction strategy has any negative impacts on program integrity or user satisfaction.

If a demonstration is to be conducted, the first question is what system(s) should be tested. Any of the three promising systems identified earlier could reasonably be tested, but the chip card system with telephony-based issuance seems most advantageous for two main reasons. First, the chip card technology offers the greatest security and the greatest flexibility for multi-program or other enhanced applications. For these reasons, the chip card system may be the most desirable of the three in the longer term. Second, because chip cards have been used less than magnetic stripe cards, less is known about them and a demonstration offers more chance for learning. Of particular interest are the performance characteristics of the card and its supporting equipment in an EBT environment.

If two systems can be tested, the logical second choice is the mail-out non-standard magnetic stripe card system. The mail-out feature of this system raises questions of operational feasibility, cost, and recipient impact that could differ substantially from the chip card system.

A major objective in designing the demonstration will be to provide as much information as possible about cost reduction strategies. Ideally, the demonstration would test all major design options, allowing direct measurement of their effects. More realistically, a demonstration will be designed to test some options directly and to provide information from which the effect of other options can be estimated. Some examples are as follows:

- Issuance machines. The appropriate number of issuance machines can be tested by assigning different numbers of households to particular issuance machines. The evaluation of system costs would adjust the actual cost data to reflect the number of issuance machines that would be used at the level determined most appropriate.
- POS terminals. Some stores would receive terminals on every counter, and some would be limited to two terminals. Data would be collected on retailer and recipient satisfaction with both approaches.
- Centralized settlement. By incorporating centralized settlement with full reconciliation and manual transactions, the demonstration would provide direct measures of that approach's costs and effects, and information that could be used to estimate the impacts of some of the less data-intensive options. For example, full reconciliation would indicate the frequency with which out-of-balance accounts occur, and the incidence of manual transactions and their potential for overdrafts if balances were not maintained.

Information for estimating the impact of decentralized settlement could come from retailers without telephones, who would use equipment and follow procedures similar to those of decentralized settlement. The impact of decentralized settlement on central computer costs would be estimated by developing, during the design phase, detailed specifications for the central facility's requirements and obtaining estimates for the appropriate hardware and software when bids are sought for actual components.

- Central facility integration. Whether the computer facility stands alone or is integrated with other operations makes little difference in large systems, but integration is estimated to yield major savings for small systems. If the demonstration is to be mounted on a small scale, it will be desirable to have the central facility integrated to see how low costs can be held in that situation.

Three potentially important routes to cost savings are implementation for a large caseload, use of the EBT system by multiple programs, and allowing the use of EBT terminals by commercial POS systems. It is highly desirable to test these strategies, but they involve important costs and risks. If major system problems occur in a large-scale implementation, for example, the costs could be in the millions of dollars and the disruption could be commensurate. With a multi-program or commercially shared system, it may not

Appendix A

ADDITIONAL POSSIBLE OFF-LINE APPLICATIONS TO THE FOOD STAMP PROGRAM

A.1 INTRODUCTION

Application of off-line technology to the Food Stamp Program is not limited to the issuance systems analyzed in this report. To develop a sense for the full potential of applying this technology to the program, a number of additional systems were initially considered. Following some preliminary conceptual exploration with FNS staff and personnel in State and local food stamp agencies, it was agreed that the issuance applications show greater promise and should receive the majority of the analysis effort. The purpose of this appendix is to outline those systems which were excluded and briefly discuss the considerations on which the decision was based.

This appendix is organized into sections reflecting the following areas of Food Stamp Program operations:

- monitoring and tracking non-work exempt recipients' compliance with employment and training requirements;
- benefit authorization;
- benefit redemption; and
- client certification and eligibility determination.

Within each section, one or more off-line approaches to the program area is outlined. The potential benefits and disadvantages of the application are also presented.

A.2 MONITORING AND TRACKING RECIPIENT COMPLIANCE WITH EMPLOYMENT AND TRAINING REQUIREMENTS

Certified recipients who must comply with employment and training requirements are typically notified by an eligibility worker that they are required to report for an assessment of their job readiness. The assessment is performed either by another unit of the food stamp agency or by an entirely separate organization (often an office of the State employment service). The assessment determines the particular job search, training, or work activity

be clear whether the impacts (or problems) stem from basic off-line system approach or from the fact that it has multiple users. It is therefore desirable to test any of these strategies in stages, beginning with a system that operates on a small to medium scale for the Food Stamp Program only, and subsequently expanding the system's scope in as many dimensions as possible. Any such expansion must be designed from the beginning of the demonstration, so the system can accommodate its expanded version without costly redesign.

As noted above, the analysis reported here does not argue compellingly for the off-line EBT approach. If FNS wishes to make this issuance approach available to States, however, testing is the necessary next step. A demonstration with the features outlined above seems likely to produce the clearest possible information about the viability of off-line EBT systems for the Food Stamp Program.

assigned to the recipient. This assignment often takes the form of requiring the client to contact a certain number of potential employers within a defined time frame. Documentation of the client's activity and any resultant changes form the basis of a report transmitted from the assessment office back to the local food stamp office. The information on this report is reviewed by an eligibility worker and is used to measure the recipient's compliance with the program requirements.

Because the work registration and subsequent job search or training activities are decentralized, involving movement by the recipient across multiple agencies or units, maintaining accurate records is difficult. Statistical reports often provide inconsistent figures, and anecdotal evidence suggests that many individuals do not comply with requirements but still avoid penalties. Accordingly, off-line technology was considered as a possible means of obtaining better information in this area.

EMPLOYMENT AND TRAINING ACTIVITY REPORTING SYSTEM

Off-line technology applied in this area would primarily serve to enhance the flow of information associated with monitoring work requirement compliance, and tracking employment and training activity. Information flow in most tracking systems depends on eligibility workers and work readiness assessors filling out individual notification forms and sending them across agencies. Summary reports to FNS, which are intended both to describe overall activity levels and to ensure that regulations are being implemented, often have their origin in crude hand tallies developed by the office assessing the work readiness of the recipient.

The off-line application envisioned would require the following system components:

- Microcomputer system. This system would be capable of creating, maintaining, and updating databases made up of records on a work registrant's progress through the work requirements. The system could be single or multi-user. Equipment would be available at the food stamp certification office, at the assessing office, and, if applicable, at the office responsible for operating any separate program components.

- Communications network. This network could involve telephone transmission of data between microcomputer stations, or could be based on physical delivery of floppy disks or data tapes.

Both the local food stamp office and the assessment agency would maintain separate parallel databases of non-exempt recipients. Each week, the certification office would transmit the names and other identifying information of newly certified mandatory work registrants to the assessment agency. When recipients appear for assessment or return to the assessment agency with documentation of job search activity, personnel there would update their database with all compliance-related information. A file of updated records would be periodically transmitted to the local food stamp office. Software routines would check the database for non-compliant registrants and generate reports. Followup and benefit adjustment would continue as currently practiced.

The primary benefits seen from implementing a system of this type would be in reducing the manual portion of caseworker effort devoted to monitoring compliance and report generation. This would likely result in easing the flow of information and improving the accuracy and timeliness with which reports could be generated. A more efficient environment in which local food stamp offices operate could also result if the microcomputer system was used to accommodate other areas of local office responsibilities. Potential cost savings could result from implementation of this system in the areas of more timely and accurate adjustment of client benefits and reduced caseworker level of effort. This application could also possibly lead to greater intra-agency coordination of services.

System costs and the question of need prompted exclusion of this application from further consideration. State and local food stamp program personnel all agreed that this application would be useful, but felt problems with the current system are not a high enough priority to justify the off-line system's costs. Potential compatibility questions could also arise as States move toward on-line eligibility and certification systems. Although such new systems could be designed to be compatible with the off-line tracking system, respondents felt that efficiency in the design of the larger systems would receive higher priority than compatibility with the comparatively small tracking system.

It was also agreed that an on-line version of this system might be a more attractive alternative. Shared databases rather than each agency maintaining separate identical databases might be more efficient and more consistent with existing office technology. In fact, an on-line version of this system is being piloted in three New York counties. Terminals at assistance offices in these counties can communicate with a central computer to record and update employment training and job search activities of non-work exempt food stamp recipients. The primary objective of the system is to generate monthly activity reports required by the State and FNS. Reports generated by the system are expected to be more timely and accurate. The system, however, does not make an automated determination of compliance for individual recipients. It was felt that supporting an automated determination of compliance would require excessive additional data input because of the complexity of the regulations.

A.3 BENEFIT AUTHORIZATION

The areas in which off-line card technology has made the greatest commercial impact are security and personnel identification. As applied to the Food Stamp Program, the two applications discussed in this section would serve to identify an individual as being authorized to participate in the program at the point of coupon issuance. These applications would replace or complement the Authorization-to-Participate (ATP) system used in some jurisdictions as means of issuance. In those jurisdictions, recipients are mailed ATP documents each month. These documents have client identifying information and allotment amounts printed on them. Clients then take the ATP to a coupon issuance agent where they are issued a coupon allotment for the amount printed on the ATP. Proof of identification usually takes the form of an identification card on which the client's photograph, signature, and case number is placed.

This ATP-based coupon issuance process is vulnerable to several types of abuse. ATPs may be stolen from the mail or lost by the recipient and then presented by an unauthorized individual with a counterfeit ID card. Recipients may submit an ATP for coupons, and then falsely report that the ATP was lost or stolen and request a replacement, which may be granted if the recipient can not be clearly determined to have presented the first ATP.

In addition to its vulnerability, the ATP process involves recruiting and retaining a network of issuance agencies. Banks have often filled this role, but are increasingly reluctant to do so. Many program officials are interested in finding cost-effective alternatives to the ATP system.

COUPON RECEIPT CARD

The off-line coupon receipt card represents an alternative to ATP issuance that is quite similar to the on-line coupon issuance system used in many locations. In the on-line system, the client goes to an issuance office to obtain coupons. The client presents a card, typically a paper identification card. The issuance agent enters the client's case number in a terminal with an on-line connection to a central issuance file to determine the amount of the client's allotment. The agent then gives the client the coupons and enters a record of the transaction onto the central file.

An off-line approach might serve the same basic purpose as the on-line system while offering two advantages. First, eliminating the need for on-line connections to the central file could reduce communications and central processing facility costs, and possibly speed up issuance transactions. Second, it could allow a more secure identification of the client.

This application would require the following system components:

- Coupon receipt card. These cards would have the capability of storing identifying information without security threat, and could be overwritten with new information.
- Card reader/writer terminals. These terminals would be deployed at the issuance office and have the capability to read coupon receipt cards and record on the card that an allotment had been issued. The terminals would also have the capability to store issuance data transmitted from the State's data processing center and determine allotment amounts based on information from client cards. A PIN pad would complement each terminal.
- Communication network. This network would allow the transmission of issuance files from the State's data processing center to the issuance agent terminals and reconciliation data from the terminals to the data processing center.

Certified recipients would be issued coupon receipt cards with read/write capability. Each card would be recorded with an account number, personal identification number (PIN) offset, and space to record subsequent allotment amounts and authorization and issuance dates. The characteristics

Despite the potential savings, system costs are the greatest obstacle to enthusiasm for this application. State and local respondents believe that the ATP system, even with its difficulties, is less costly than a computerized system would be. They view the off-line coupon receipt approach as probably equivalent to the existing on-line issuance systems, which they consider more costly than ATPs in at least the short run.

Another issue that was raised concerns the elimination of coupons. It is felt that many of the problems with the Food Stamp Program are associated with the use of paper coupons as the transaction medium. Any approach that merely makes coupon issuance more efficient potentially solves fewer problems than a system that eliminates coupons entirely.

IDENTIFICATION CARD WITH COUPON ISSUANCE

This application would simply complement existing issuance systems with a more sophisticated recipient identification device. In an ATP system, for example, recipients would present their identification card and ATP for their monthly coupon allotment. The identification card would have a PIN offset recorded on it and a successful PIN match would identify the card holder as an authorized recipient. The agent would then proceed to issue the recipient the amount of coupons written on the ATP document. This system could equivalently be applied in conjunction with a direct delivery coupon issuance system.¹

This application would require the following main features:

- Identification card. These cards would have the capability of storing information without security threat.
- Card reader terminals. These terminals would serve only to compare the entered PIN with that encoded on the card. A PIN pad would complement each terminal.

This off-line system would be less costly to implement and operate than the system previously described, because it eliminates the need to transmit issuance files to the agent terminals and reduces equipment costs for the less sophisticated terminals. Nevertheless, the cost savings resulting

¹A PIN feature could also be added to an on-line issuance system.

from elimination of ATP documents would not be realized with this application. The only potential cost savings of this system would be the result of a more secure authorization process, which would be in the range of a few cents per case month.

The drawbacks which were identified for this system are identical to the ones outlined for the previous application. Those drawbacks, along with continued reliance on paper ATP documents, were regarded as significant enough to reject this system from further analysis.

A.4 BENEFIT REDEMPTION

The application described in this section applies off-line technology to the area of redeeming paper coupons for credit. Food Stamp Program activity is very limited in this area. Aside from monitoring and reconciliation efforts, program participants (i.e., participating retailers and banks) perform the sum of redemption activities. An off-line application in this area might reduce the burden on these participants and at the same time provide redemption monitoring data to FNS more efficiently and accurately.

ELECTRONIC REDEMPTION CERTIFICATE AND DEPOSIT DOCUMENT

An electronic "coupon reader/writer" machine could be used to reduce the time and expense retailers spend preparing coupons for deposit. Rather than manually counting, endorsing, and bundling the coupons to be deposited, the retailer would place all the coupons in the machine for automatic counting and endorsing.¹ The machine could also write an electronic record of the date, along with the total coupons and the serial number of each coupon on an electronic tape, precluding the need to fill out redemption certificates. The retailer would take the bundled coupons and the tape to the bank, which might verify the tape record on equivalent equipment. The bank would use the coupon reader to prepare a record of the coupons sent to the Federal Reserve in any batch, and would send both retailer and bank records along with the coupons.

¹Equipment to perform comparable functions exists, but generally for very large-volume applications. Equipment suitable for use in the retail store would require special development. Some redesign of coupons might also be necessary.

The Federal Reserve Bank would credit banks and destroy coupons as in the current system, but would only verify a small random sample of the bundles submitted for redemption.

The benefits of applying off-line technology in this fashion would mainly go to the participating retailers and banks. A large part of the average monthly cost associated with handling coupons (estimated at \$47.63 per store per month)¹ would be eliminated with this application. Banks would also save costs incurred in the handling and accounting errors of coupons. These costs have been estimated at \$5.52 per \$1,000 worth of coupons redeemed.²

Some small savings might accrue to FNS, mainly through reduction of data entry requirements for the FNS data center in Minneapolis, which currently enters data from the Redemption Certificates and Food Coupon Deposit Documents. Total costs for the functions performed by the Minneapolis center were estimated at \$.008 per case month in the Reading evaluation; no separate estimate is available for the data entry component of this cost. The system would also allow full reconciliation of these two data sources, permitting closer monitoring of bank redemption claims. Because bank redemptions are not believed to involve significant problems, however, this enhancement has limited value.

Because most of the benefits of this system would be realized in areas that do not currently represent expenses to the Food Stamp Program, this application was excluded from further consideration.

A.5 CLIENT CERTIFICATION AND ELIGIBILITY DETERMINATION

Applications in this area concern collecting and maintaining the necessary information to certify recipients and determine the amount of benefits to which they are eligible. Automated certification and eligibility determination procedures are currently employed in varying degrees in most jurisdictions. The applications described below would deal with some of the special problems that current systems encounter.

¹Hamilton, op. cit.

²Hamilton, op. cit.

CERTIFICATION CARD

A card with substantial storage capacity could hold most of the key information that a household needs to present at certification or recertification. A clerk in the welfare office using a card reader/writer, would enter the information on the card at initial certification. Because the card could contain more information than the central automated system (very few systems maintain data on points like the nature of the documents presented for verification), data would be dumped from the card into the automated processing system for automated eligibility and benefit determination and to establish a case record. At recertification, the eligibility worker could examine and update information on the card and use the card to then update the case file and determine any adjustment to benefits. Upon reapplication or transfer to a new office, the recipient could present the card rather than assembling documents once again.

The significant storage capacity of certification cards might reduce or eliminate a large share of the documentation requirements and hence paperwork associated with recertification. This application would create a more efficient processing of client eligibility. It could prove particularly beneficial for clients moving from one food stamp area to another.

This application would require the following system requirements:

- Certification cards. These cards would be capable of storing large quantities of information without security threat. This need would probably suggest the use of optical memory cards for this application.
- Card reader/writers. These terminals would tie into the existing data processing system employed in the jurisdiction and record and transmit information to and from cards and client records maintained by the program.

Questions of need were the primary reasons this system was rejected. State and local officials did not feel the system would solve any important problems. They did not expect it to reduce the time needed to obtain and enter information at initial certification. Indeed, more information might be formally recorded (e.g., information on verification documents might have to be key entered rather than simply making copies for insertion in the file); in this case, the system might actually increase worker time requirements. It would substitute machine readable storage for some material in the hard copy

case file, but hard copy storage was not considered a major problem. The recertification process normally focuses on changes in circumstances, and again the card would not reduce the time required to obtain or enter data. The main benefit appears to occur when a household transfers from one food stamp office to another within the State. This is not uncommon, but was not considered frequent enough to justify the overall system.

Another issue that was raised concerns the probability of lost or stolen certification cards. Certification cards retained by clients are more likely to be lost or stolen than if the information were maintained at the county office. The unnecessary risk of losing this information and subsequent re-collection expense further contributed to the rejection of this system.

MIGRANT FARM WORKER CARD

This application would simply be a special case of the certification card just described. Migrant farm workers and other households deemed very likely to change project areas without material change in circumstances would be issued the certification card, but other households would not. This would target the use of the certification card to those situations that would produce the greatest benefits (because the card would remove the need for one office to obtain and enter data that another office had gotten a short time previously).

The required system components of this application would be identical to those described in the previous application.

The arguments for and against this application largely mirrored those given above. Although targeting this application at the group most likely to benefit from it is considered an improvement over the Certification Card, the targeting itself would be difficult. Effective targeting would require correctly identifying the households likely to move and the likely origin and destination offices. The issue is further complicated by the fact that many moves will cross State lines, requiring multi-state coordination of information requirements and formats. These factors, in combination with system cost questions were sufficient to exclude this application from further consideration.

Appendix B

SURVEY OF RESPONDENTS

In this study of off-line system applications to the Food Stamp Program, relevant industry segments were sampled purposively. The data collection involved structured but largely open-ended questionnaires that were administered in face-to-face interviews or through the mail with telephone follow-up. In selecting respondents, the researchers used the rationale described below.

The selection of respondents was based on the following factors:

- Vendors who had distinguished themselves by having developed products which were recognized within their industry as being of quality;
- The respondent's knowledge of information pertinent to the study and the willingness to share that information;
- The application of the vendor's product or products to the research of the current study; and
- The general constraints of sample size and project budget.

Several organizations contacted the researchers and asked to be included in the survey. In all cases where interest was expressed, the potential respondents were provided with a questionnaire and their insights were added to the information base gathered from the selected sample. In a few cases, respondents who presented themselves for the survey were exchanged for previously selected respondents who were unable or unwilling to participate.

Survey respondents were provided with the following: a description of several potential off-line system applications to the Food Stamp Program, a glossary of relevant terms, and a questionnaire.

The questionnaires were constructed to draw information from each surveyed industry segment, as well as to solicit opinions on the activities of complementary segments. For example, terminal vendors were asked questions regarding the state of the card industry as well as developments which they expected in their own industry within the next three years. Questionnaires were a combination of factual questions regarding products, costs, and activities within industries directly related to EBT, and opinion questions as

to industry directions and willingness to participate in future EBT-like projects.

Eight categories of respondents were included in the survey. The categories were specifically designated in advance as having special relevance to EBT and closely related activities. The categories were divided into two groups. One group completed a telephone interview, while the other group completed a face-to-face interview. A summary of the categories follows.

VENDORS OF OFF-LINE ACCESS DEVICES

For the study, an off-line access device refers to a card which would allow a recipient to enter the EBT environment. Respondents selected included: several chip card vendors, based both in the United States and Europe with all of the major U.S. vendors represented; the provider of the best-known U.S. optical memory (laser) technologies which had licensed that technology for health/medical applications, publishing systems, record-keeping systems, and transaction systems; three major vendors of standard magnetic stripe technology; the proprietors of two systems using decrementing value cards; and the vendor of a product which would place within the contents of the card's magnetic stripe, an digitized imaging picture of the holder of the card. Within the constraint of the study scope, respondents were chosen to provide a cross-section of relevant card technologies as well as to provide an overview of security enhancements available when using various access devices.

VENDORS OF OFF-LINE INTERFACE EQUIPMENT

Off-line interface equipment refers to POS terminals that act with an access device to transact food purchases. The companies selected for this segment represented the holders of large market shares of POS terminals, including electronic cash registers and bar code scanners. In addition to these equipment vendors, several manufacturers of devices that could rewrite the contents of a magnetic stripe, as well as some makers of prototype devices, were selected. Included in the vendor selection were the suppliers of terminals for the major bankcard systems: MasterCard, VISA, and American Express.

ORGANIZATIONS CONDUCTING OR PLANNING OFF-LINE APPLICATIONS

Respondents in this category included organizations that are currently offering a service or preparing a product which contains off-line components. Included within this population were a smart card service and an EBT provider. Also included were two EFT software providers, an off-line utility bill collection provider, and a Regional Bell Operating Company (RBOC).

It was felt that these organizations would provide a view into the services and service providers that could be expected to be seen in the EBT environment within the next three years. All respondents were asked questions concerning which applications of an EBT system their products were most likely to serve.

OTHER ORGANIZATIONS

For the study, organizations listed in the "other" category included an electronic funds transfer consulting corporation, two national and international standards organizations, and two trade associations. The researchers felt that the group selected had special relevancy to the development of any EBT/EFT system within the next three years. The standards organizations and trade groups would have insights into what activities can be expected and the consulting corporation could offer insights based on the products and services it was being asked to develop.

STATE AND LOCAL AGENCIES

State and local food stamp agencies were included in the study because their interest in or willingness to accept any off-line system is critical to its success. These agencies have an important perspective on the current coupon system's problems and benefits, as well as the potential advantages of an off-line system and the obstacles it would face.

In selecting agencies to contact, two criteria were used. First, an attempt was made to select agencies that seemed to have given considerable thought to alternative issuance systems, particularly electronic systems. Second, where possible, agencies were selected in which earlier interviews had met with cooperative and insightful responses.

Based on these criteria, six agencies were selected. These agencies have considered or are considering electronic systems involving either point-of-sale (POS) or automatic coupon dispensing approaches. Some of the agencies contacted have interests including personalized coupon systems, on-line systems using standard magnetic stripe cards, automated systems for maintaining household information, and electronic applications in the AFDC program.

ORGANIZATIONS IN THE FOOD INDUSTRY

Much like the inclusion of state and local agencies, the food industry will play a critical role in the development and acceptance of any off-line EBT system. The food retailer is the redeemer of food stamp benefits and the wants and desires of that industry are pivotal to the acceptance and use of any EBT system.

For this study, selections from the food industry included national trade associations, a convenience store chain involved with an off-line EFT system, and two major food store chains that were previously, or are currently, involved with EFT/POS and standard magnetic stripe card programs.

ORGANIZATIONS FROM BANKING

The largest current user of card technology and a major force in any POS system is the banking industry. In addition to the cards and technology offered by this group, it would be involved in clearing EBT transactions. In the present environment, banks play a large role in the coupon issuance and redemption function and their desires are also critical to the development of a successful EBT system.

The banking organizations selected included both of the major credit card organizations, three electronic funds transfer networks with interests in point-of-sale activity, a large proprietary regional EFT network active in the Pennsylvania area, and the provider of electronic funds software and banking services whose software was selected for the upgraded Reading program.

OBSERVATION OF SYSTEMS

Initially, the researchers felt that observations of functioning systems should be completed using an on-site visit to the organization or the test site. As the study progressed, these sites were visited, but the respondents were placed into one of the other categories. Within this group were a statewide EFT system which operates in an off-line manner and uses the Automated Clearing House (ACH) to settle transactions and a U.S. bankcard organization which had in-place a chip card pilot for POS purchasing and credit authorizations.

Because of their response to the questionnaires, participation in interviews or other specific expressions of interest and cooperation, the Food and Nutrition Service, Electronic Strategy Associates, and Abt Associates would like to thank the following firms:

Vendors of Off-Line Access Devices

	<u>Respondent</u>
Common Bond Associates	Doug Brookings
Data Card Corporation	David Tushie
Distributed Intelligence Access Systems	Vern Schatz
Drexler Technology	Robert Barnes
IBM Corporation	Bill Rohland
IntelliCard International	Nabil Abujbara
Light Signatures	Paul Luxion
MAGTEK	Tom McGeary
Micro Card Technologies	Randy Boyett
Multimil	George Lissandrello
NBS Imaging Systems	Harvey Sklar
Paymatec/Schlumberger	Jacques Francoise
SmartCard International	Dick Sprague
Thorn EMI Malco	Larry Linden

Vendors of Off-Line Interface Equipment

	<u>Respondent</u>
AFI/Datatrol (Data Card)	Don Seib
Concord Computing Corporation	Jim Crane
Diebold	Vince Marasia
DMC /Norand	Doug Nielson
IBM	Cal Luker
ICOT Corporation	Roger L'Hommedieu
International Verifact	Paul Schmelzer
Lexicon Transaction Systems	Barry Huffstetler
National Business Systems, Inc.	John Rogers
NCR Corporation	Dick O'Day
Omron Business Systems	Bob Filek
Pinpoint Retail Systems	Terry McGuire
Telenet Communications	Gordon Kimble

State/Local Food Stamp Agencies

	<u>Respondent</u>
San Diego County	Bob Modell
San Francisco County	Paul Rosenberg
State of Florida	Jim Payne
State of South Carolina	Leon Love
State of Wisconsin	Susan Wood
Suffolk County, New York	Tom Brennan

Organizations Conducting/Planning Off-Line Applications

	<u>Respondent</u>
Agricultural Stabilization and Conservation Service	Dallas Smith
Bell South	Lamar Steele
Deluxe Data	Mike Shutters
Landis and Gyr	Cash Jones
Lifecard International	Jim Nakopoulos
Pharmaceutical Card System	Mark Schlesinger
TransFirst Corporation	Martin Dukler

Other Organizations

	<u>Respondent</u>
American Bankers Association	Margaret Brown
American National Standards Institute	Dan Smith
Carmody & Company	Nancy Grant
Electronic Funds Transfer Association	Dale Reistad
International Standards Organization	Don Peyton

Organizations in the Food Industry

	<u>Respondent</u>
Circle K	Anita Best
D'Agostinos	Fred Terrin
Kroger Food Stores	Tom Davies
Lucky Stores	Ron Nuti
National Association of Convenience Store Operators	Teri Richmond/ Gene Gerke

Organizations from Banking

	<u>Respondent</u>
Cactus Switch	Paul Finch
MasterCard	Larry Ladouceur
MTECH	Bob Lynch
Northwest Switching Systems	Tom Bass
Philadelphia National Bank	Dick Urban
TYME Corporation	Jack Derr
VISA	Vince Boston

Appendix C

PURCHASING GUIDELINES

Purchasing electronic funds transfer (EFT) equipment and supplies can be greatly enhanced by knowledge of the marketplace and the suppliers. This appendix summarizes the main components of an EFT/EBT system and provides the key points of dealing with the purchase of the components.

There are three critical issues for FNS or a State food stamp agency in any purchasing situation:

- Quantity or the promise of quantity will yield the best prices. FNS should consider a buyer collective for local agencies. The economies to be realized will far overshadow any short-term protection of "turf" issues or administrative costs.
- Quality at a higher price may be worthwhile. In some cases, the extra price that buys quality may make unnecessary a second purchase, a repurchase, or early setbacks or failure of a project caused by equipment problems or unreliable service.
- Vendors of quality can usually point to market share, satisfied customers, and products in use. Naturally, the small provider should not be ruled out, but size and market share usually indicate an established and accepted vendor. It should be kept in mind, however, that EFT/EBT is a relatively new field and established names and high-priced reputations from other fields do not always guarantee quality goods or services.

ACCESS CARDS

The purchase of access cards can be facilitated with the following approaches and information:

- There are many vendors of cards in the United States. Their names, addresses, and telephone numbers can be obtained from directories such as that put out by the Bank Administration Institute of Rolling Meadows, Illinois, or Bank Systems & Equipment magazine, published in New York.
- Vendors will respond to applications that allow them to win orders of quantity or to establish themselves in new markets. EBT is a potential new market and early purchases will likely be discounted, despite vendors' public statements to the contrary during the surveys.

- AQL (Acceptable Quality Level), meaning assurances of a specific quality level, such as only one manufacturing flaw per thousand cards, can usually be purchased at a modest premium. In these situations, a penalty clause should be inserted in the contract in case the level of performance is not achieved.
- The American market for chip cards is just opening. A purchaser should not be put off by claims of patents or patents filed. A contract provision saving FNS from patent infringement and associated legal fees is appropriate.

The selection of a card vendor should be based on a combination of factors, including:

- Experiences with quality in the last purchase. How did the cards hold up last time? Was color good? Did they bleed or fade? Were the graphics of consistent quality? Were the cards of consistent size to fit terminal readers without "bad reads" and other failures?

Does the vendor give a guarantee of quality or freedom from defect in the card manufacturing process?¹ It is usually a given that the cards will comply with applicable ANSI or ISO standards. A contract will normally state these conditions and spell out the assurances of quality, delivery, etc.

- The delivery and availability of the card supplies. Did the buyer have to wait for cards or service? If the supplier said "two-day turnaround," was it achieved?
- The price per thousand or other order quantity. Is the supplier price competitive? Did delivered prices match the quotes from the last order?
- Other reputational issues including established company, fiscal soundness, and which vendor others in an industry use.
- The desirability of special features or products offered by a vendor.
- The availability of special services such as fast order turnaround or special order handling;

¹This process is sometimes referred to as AQL (Acceptable Quality Level). "Certified" cards are available with up to 100% AQL at a premium price. Other quality levels are defined in terms of "failures per thousand."

Finally, vendors must understand the application and bids should be

not unusual. Bids should include unit costs, prices for colors and graphics, delivery dates, shipping costs, and all other elements that effect cost.

ISSUANCE MACHINES

There are few existing machines that can economically issue food stamps in the booklet form and the survey indicated none that can refresh the balances in cards. The easiest way to find these machines is to contact current automated teller machine (ATM) vendors with specifications and quantities. The differences between issuance machines and automatic coupon dispensing machines (ACDs) are important to the cost and construction of the machines; the dispensing and security differences are most salient. For example, an ACD can contain thousands of dollars worth of stamps and would need either a safe or to be located in a secure facility.

Telephone-based card refreshing devices are available. Typically, these devices are vended by foreign corporations or American corporations with foreign parents. While American companies may soon announce products that will fit the application, foreign providers have a current lead, perhaps because telephony, chip cards, and token cards have been common in their markets for years. For EBT, this means looking toward foreign-related vendors first and then to domestic corporations.

POS TERMINALS/BALANCE INQUIRY DEVICES

There are many suppliers of point-of-sale (POS) devices. Their names appear in directories such as those published by the Bank Administration

- The ability of the terminal to be customized for an application. This may include read/write capabilities, printers, PIN pads, software, and expanded memory.
- The availability of warranties and field maintenance staff and the time required to service problems in all geographic areas.
- The ease of equipment installation or the availability of installation assistance, as well as, the availability of customer service manuals or personnel. (i.e., How much effort is required to install the device? Is help available and, if so, at what price?)
- Availability of product to meet delivery schedules.
- The ability of the device to migrate to other uses or to be upgraded. Could the device be fitted with a new card reader or reprogrammed if the use changes?
- The availability of terminal software or programming. Projects can be significantly delayed because no software or programmers exist to develop the needed code.
- The ability of the device to handle special needs such as encryption, downloading, or interface to printers, etc. This flexibility would allow for upgrading service or changing providers without major disruptions in service.
- The reliability of the devices and components. This reliability should be expressed in the contract. The normal warranty period is 30 to 90 days, but additional time can be purchased at modest costs.

CENTRAL PROCESSOR UNITS

A number of suppliers offer hardware and peripherals. The names are well known in the mainframe markets, with the names not being as well known in the continuous processing market. The directories mentioned above will serve as good sources.

When shopping for a mainframe, the buyer needs to keep several factors in mind:

- the availability of EFT/EBT software on the mainframe;
- the size of the system and the need for and availability of peripherals;
- costs of all components and the ongoing costs of maintenance, including the environment the mainframe requires;

- whether the application calls for batch computing and/or transaction processing and continuous availability; and
- availability of tuning, training, and service personnel. Tuning means getting maximum performance from the equipment purchased.

CARD PREPARATION

Even though card preparation equipment is available in prices ranging from \$3,000 to \$400,000, the buyer has non-purchase options. Several large organizations have built their business on the preparation of cards. Rather than purchase the equipment, it may be more economical to purchase card service. Key factors in this decision include:

- the demand for a "captive" environment for card production (i.e., does it matter if the service is contracted out or must it be done in-house);
- the requirement for a secure environment for card stock and embossing/encoding machines to prevent theft of activated card stock. If these facilities do not exist, they may be costly to build;
- the number of cards required and the turnaround time necessary. If a single mass issuance is needed with only limited ongoing issuance, it may be easier and more economical to buy the initial work as a service than to purchase equipment for only a single use, equipment that will then be under-utilized; and
- the number of cards expected to be made (this figure is usually expressed in cards per hour) and the staff available.

SOFTWARE

EFT/EBT software is available from four major vendors and several smaller vendors. The software acts as a switch (central router) for an EFT network and a driver of terminals. This switching and driving capability can make an EBT system compatible with existing POS systems or allow for multi-function EBT with only minor adjustments in programming required.

The EFT system market has undergone several changes in the last few years. These changes include the availability of software for smaller systems, the desire of the major vendors to supply transaction processing with or instead of software; price competition for software systems and transaction

processing; and the acquisition of two major EFT software vendors by firms historically not in EFT.

In purchasing EFT/EBT software, there are several important factors:

- The hardware on which the software is to be operated. Some software operates on IBM or compatible mainframes, while some versions operate on continuous processing hardware such as Tandem or Stratus.
- The installed base of users is important. Contact users and learn their experiences with delivery, installation, modification, and maintenance.
- What is included with the package? An offering may be modular so that the total purchase required before having a functional system is in excess of another vendor's base system. An offering may include terminal handlers, processor connections, settlement modules, installation, training, testing, and several other services.
- Will modifications be necessary for the application desired? Will the vendor make the modifications and at what cost? If modifications are requested later, will they be available and will they be made in a timely manner?
- What is the throughput capacity of the software? In other words, how many transactions can the system handle per second? With which hardware configurations will the system function best? Can other applications be processed at the same time?
- What is the price, and is the total price (hardware/software/peripherals, etc.) competitive in the marketplace?
- Are there programmers available to maintain the system and is the code well documented and debugged?
- Will the software function properly at levels of demand (transactions/terminals/processor connections) likely to be faced in the application? What can the user do if demand shifts or increases significantly enough to effect capacity?
- What is the cost of maintenance? What does the maintenance service cover and for how long? Is there a "version control" on the system to keep it current and in line with maintenance specifications?

COMMUNICATIONS

Since the breakup of the Bell system, communications and network services have been an area for competition. In purchasing services, the buyer should consider:

- The reputation of the offeror. Has service been of high quality, are outages repaired quickly and does the seller have a plan to introduce future services to keep current with market changes?
- What is the price per line/packet, etc.? Are there discounts for volume or off-hours use?
- The buyer should not be fooled into believing that the best vendor is the lowest price vendor. In EFT/EBT, there is a premium on quality and consistent service; an EFT/EBT system that is inconsistent and not available when needed loses users and credibility.
- The terminals to be driven and processor connections required often determine the type of communications choices for the purchaser. These choices can also be required by the network. For example, ECRs require dedicated circuits or the network may require specific communications modes such as SNA/SDLC (Systems Network Architecture/Synchronous Data Link Control).
- The vendor should be willing to learn and model the buyer's application before a purchase or commitment is made. Costs vary depending on the areas to be served and only an analysis can determine the best solution for the buyer's application.

TERMINAL CHARACTERISTICS

Certain terminal characteristics are necessary to support an off-line EBT system. The type of access device used (magnetic stripe, laser, etc.) is not addressed here because, whichever is chosen, a terminal with the following minimal hardware requirements will still be required. The choice of an access card may, however, require changes in the reader and the internal programming.

DISPLAY

- Twenty position, high visibility, full alphanumeric display.

KEYBOARD

- Minimum of 16 keys. Ten will be for numeric input (0-9). The remaining six must be programmable for special functions. There should be an easy way for the operator to input alphabetic characters.

DEVICE READER INTERFACE

- The terminal must support the chosen access device or devices (i.e., magnetic stripe, laser, etc.). Most device chassis will be in the third generation and the ergonomics are generally worked out and set.

TRANSACTION STATUS INDICATION

- The terminal should have separate LED status indicators or the ability to use the display to show transaction status (i.e., indicate to the user what is happening with the course of a transaction).

MEMORY CAPACITY

- Considerations that will determine memory size are the expected number of transactions to be stored, the length of the items, and the frequency of delivery of stored items to the EBT Center. The figures that follow represent devices that would be adequate for most off-line EBT merchants. If the device were used also for terminal draft capture within a commercial system, the capacity might need to be expanded. For illustrative purposes, consider a terminal with 32K bytes, either totally soft configurable or pre-divided into four areas with the following suggested breakdown:

- 8K bytes operating system ROM
- 8K bytes operating system RAM
- 8K bytes application code RAM or ROM
- 8K bytes for storing 100 transactions

Obviously, if the operating system and the application code do not require 24K bytes, the memory requirements can be reduced. But there must be a minimum of 8K bytes available for transactions. All RAM should be protected by a memory checksum or some other error detection scheme. All RAM should be battery backed-up. All RAM should have a parity bit on every byte.

PROGRAMMING

- The terminal must have either a user accessible programming language in order to develop the application program or the manufacturer must provide the application code to the user's specifications.

DIAGNOSTICS

- The terminal must do a self-test at power-up. It should also provide operator diagnostics for all devices (display, keyboard, PIN pad, printer, access device reader/writer, and data communications).

DATA COMMUNICATIONS

- The terminal should offer dial-up and/or leased line capabilities. The dial-up terminal should have an FCC registered modem that is either Bell 103 and/or Bell 212A compatible. The modem should be an internal auto-dial modem capable of detecting line-in-use and the presence of dial tone. The modem must be able to dial using both pulse and DTMF methods.

The leased line modem should be Bell 202T compatible. The leased line version should be offered in a standalone version and locally concentrated version for multi-lane applications. The vendor will supply the desired communications protocol embedded in the terminal's operating system.

PRINTER

- Both journal and slip printers with 40 characters per line should be offered. The printer should print in an off-line mode and it should be able to re-print a receipt under terminal control.

PIN PAD

- The PIN pad shall have a minimum of twelve keys (0-9, CLEAR and ENTER). PIN data should be DES encrypted at the PIN pad. There should be a way to download working keys into the PIN pad.

EXTERNAL CONNECTIONS

- The terminal shall have, at a minimum, the following connections:
 - RJ-11 for the phone line
 - power cord
 - printer
 - PIN pad

PHYSICAL

- UL approved.
FCC registered for telephone interface.
FCC compliant for EMI emissions (Class A, Rule Part 15, Subpart J).
115 VAC, 60 cycle.
Temperature operating range: 32 - 100 degrees Fahrenheit.
Relative operating humidity: 10 - 90%, non-condensing.

During the course of the survey, several respondents identified products which will meet all of the basic requirements. The names of vendors associated with these products are provided directly below. The listing of the vendors is not an endorsement of the specific devices or vendors, but is provided only as an example. A full listing of product vendors can be found in the directories provided by the Bank Administration Institute of Rolling Meadows, Illinois or by Bank Systems and Equipment magazine, published in New York.

AFI/Datatrol (Data Card)
Concord Computing Corporation
Diebold, Inc.
DMC/Norand Corporation
IBM
ICOT Corporation
International Verifact
Lexicon Transaction Systems
National Business Systems, Inc.
NCR Corporation
Omron Business Systems
Pinpoint Retail Systems

ACCESS DEVICES

As with the terminal characteristics described above, there will be no specific breakout for the various types of cards (i.e., standard magnetic stripe card, optical memory card, chip card, etc.). Several characteristics will be needed regardless of the access device chosen and those characteristics are provided below.

PHYSICAL

- Must comply with appropriate ANSI and ISO standards for contacts and physical characteristics. These standards include ISO 7813 and ISO 7816 for chip cards.
- Must allow for color graphics without color bleeding.

- Must be available with sufficient quality to last the expected eight-month lifetime of a recipient in the program but with an expectation of a full two-year lifetime.
- Should be able to accept embossing which will identify the name and account number of a recipient.

MEMORY CAPACITY FOR CHIP CARDS

- Must contain at least 1K bytes memory with some division into programmable and non-programmable memory.
- Should support an irreversible algorithm, such as DES.

During the course of the survey, several vendors indicated that their products would meet the minimum standards and requirements for participation in an off-line EBT system. The names of those vendors are presented below as examples of sources for access devices. The listing of the vendors is not an endorsement of the specific devices or vendors, but is provided only as an example. A full listing of product vendors can be found in the directories provided by the Bank Administration Institute of Rolling Meadows, Illinois or by Bank Systems and Equipment magazine, published in New York.

IntelliCard International
 Multimil
 MAGTEK
 Micro Card Technologies
 Drexler Technology
 Paymatec/Schlumberger
 Data Card Corporation
 Thorn EMI Malco
 Smart Card International

EBT/EFT SOFTWARE

To operate an on-line or off-line EBT system, it is likely that EFT switch software will be purchased. A switch allows the routing of transactions to multiple data bases. Highly desirable characteristics of a switch include:

- the ability to process at least five transactions per second. This capacity varies based on the expected number and arrival patterns of transactions.
- the ability to drive a variety of terminal devices.

- the ability to interface with a number of authorizing data bases.
- card management modules which allow the issuance, tracking, and production of management reports about a cardbase.
- the availability of software on both continuous processing and mainframe-type hardware.
- the presence of settlement modules sufficient to indicate the balance in a cardholder's account, the sum of all activity in a given period of time, and the sum of activity summarized by individual terminal and by merchant location.
- the availability of a maintenance contract and sufficient resources to provide both initial modifications and ongoing maintenance.
- the availability of several installed sites with appropriate references.

During the course of the survey, two vendors indicated that their products would meet the minimum standards and requirements for participation in an off-line EBT system. The names of those vendors are presented below as examples of sources for EFT/EBT software. The listing of the vendors is not an endorsement of the specific software or vendors, but is provided only as an example. A full listing of product vendors can be found in the directories provided by the Bank Administration Institute of Rolling Meadows, Illinois or by Bank Systems and Equipment magazine, published in New York.

Deluxe Data Systems
MTECH

CUSTOM HARDWARE APPLICATIONS

In several situations, the researchers inquired whether a vendor would be willing to construct new hardware or modify its current hardware to meet off-line EBT program specifications. Several vendors expressed both interest and willingness to participate in such development and they are listed below. The listing of the vendors should not be seen as an endorsement of the specific devices or vendors, but are provided only as an example. A full listing of product vendors, again, can be found in the directories provided by the Bank Administration Institute of Rolling Meadows, Illinois or by Bank Systems and Equipment magazine, published in New York. Further, the listing

in no way obligates the companies to participate in the development of products without the presence of a mutually acceptable contract. The names of those firms are:

International Verifact
National Business Systems, Inc.
Micro Card Technologies
Paymatec/Schlumberger
Data Card Corporation
Omron Business Systems
Lexicon Transaction Systems
NCR Corporation
Diebold
AFI/Datatrol (Data Card)
Landis & Gyr

Appendix D

STANDARDS

D.1 INTRODUCTION

Standards can apply to many areas of an EBT system. They would include, but not be limited to, the following:

- physical attributes of the access device
- electrical signal strength of communication devices
- performance standards of the data processing equipment and software
- standardized programming languages, and standardized message formats.

All of the possible "standardized" items will fall into one or more standards categories. These classifications are presented hierarchically from lowest to highest in importance. They are:

- 1) vendor standards;
- 2) de facto standards;
- 3) industry standards;
- 4) national standards; and
- 5) international standards.

Vendor standards. These standards are typical of most products, whether they be hardgoods or services. These are the designs and specifications for products offered by a particular supplier. An example would be standards for operating systems in the personal computer industry in the early 1970's. At that time, there were over ten producers, each with its own standard. The problem was that programs written on one machine would not run on any other.

De facto standards. These are standards that become generally accepted within a user community because of their overwhelming acceptance by most parties. To carry on the previous example, the IBM personal computer, introduced in the late 1970's, led the way for the PC/DOS and MS/DOS operating systems to become de facto standards due to IBM's dominant position in the industry.

Industry standards. These are standards that have been written and agreed upon by a specific industry group, such as The American Bankers Association (ABA). This type of standard usually applies to many providers/manu-

facturers within a particular vertical market. An example of this standard would be the ABA's Coin and Currency Wrapping Color Guide.

National standards. These are standards that are set at the national level. Most industrialized nations have a single national organization whose charter it is to set standards for a wide variety of goods and services at the national level. In the United States, it is The American National Standards Institute (ANSI). ANSI is responsible for setting standards on everything from plumbing pipe specifications to methods of electronic data communications.

International standards. These are standards that are agreed upon internationally by the national standards groups. This group is called The International Organization for Standardization (ISO). The United States' member body is ANSI. An example of this type of standard would be ISO's Bank Operations - International Securities Identification Numbering System (ISIN).

As can be seen from the above examples, a standard can enter at any of the five levels and propagate up and down through the levels, or it may stay at its entry level.

Standards are exactly what their name implies, a set of rules or guidelines that are generally accepted as the criteria for the specified product. Since standards are just guidelines, there is usually no enforcement arm in a standards group. Standards are voluntary and are accepted for the purpose of furthering the particular industry or product.

To understand how standards are created, a discussion of the ANSI process will follow. There will be no discussion of the other four standards methods because Industry and International Standards groups act much like ANSI in developing their standards, and because vendor and de facto standards have no formal development process.

D.2 THE ANSI STANDARDS DEVELOPMENT PROCESS

ANSI is one of the most prominent and frequently mentioned organizations in standards work, but its role is often misunderstood. For example, ANSI itself develops absolutely no standards. This includes not only the parent organization, but also all committees, boards, or other entities sponsored by ANSI. While representing the U.S. in international activities, on

the domestic scene ANSI has two major responsibilities: coordination of private sector standards development and approving standards as American National Standards (ANS) when it has verified that requirements for due process and consensus are met.

ANSI was founded in 1918 to solve a national problem. At that time, there were many independent organizations developing standards. When the interests and needs of their constituents overlapped, these groups found they were often duplicating their efforts or producing conflicting standards. Waste of limited resources and confusion resulted. Five of these standards-developing organizations and three government agencies decided that a coordinator was needed. As a result of this, ANSI was established.

Ten different groups make up the ANSI organization. While each part of the organization is important, there are four key groups in the area of domestic standards development:

- Audit and Accreditation Board. This group evaluates the methods and procedures used by standards-developing groups in preparing and processing proposed American National Standards. It also extends ANSI accreditation to those whose procedures meet ANSI guidelines for due process and consensus. Determination of due process and consensus is made by the Board of Standards Review (see below).
- Executive Standards Council (ExSC). The ExSC has overall responsibility for coordinating the voluntary development of national standards. It must assure that standards meet national needs, do not significantly overlap or conflict and are produced efficiently without duplication of effort.
- Standards Board. To assist the ExSC in carrying out its overall responsibility, there are sixteen Standards Boards. Each addresses a specific area, such as banking and data processing, plumbing, and electronics.
- Board of Standards Review. This board, after determining that a consensus exists among those concerned, acts on American National Standards approval, reaffirmation, or withdrawal of proposed standards. This board has the final say. It determines with information supplied by the Audit and Accreditation Board, if due process and consensus have been met.

The procedures for developing standards and having them processed as American National Standards are described in the documents listed below which are available from ANSI at the address listed later in this section:

- Procedures for the Development and Coordination of American National Standards;
- Operating Procedures of the Boards of Standards Review;
and
- Bylaws of the American National Standards Institute.

Seven key elements required by ANSI in the development of standards are summarized in the following paragraphs.

Open proceedings and sufficient notice of activities. Participation in standards development must be open to everyone who is directly and materially affected by the activity, and may not be restricted to members of the sponsoring organization, by undue financial barriers, or unreasonable technical qualifications. Timely and adequate notice of standards activities must be provided to all known affected interests. This notice should provide a description of the activity, a contact point for obtaining further information, and should allow enough time for interested parties to respond and prepare to take part in the work.

Balanced membership with all those affected represented. All directly and materially affected interests must have the opportunity for fair and equitable participation without dominance by a single interest. ANSI recognizes three basic categories of interest: producer, user, and general interest. Ideally, committee membership should be divided equally among the three and in no case may any of the three constitute a majority of the membership. This practice assures all those affected the opportunity to participate.

Written procedures for standards development. Written procedures must be established by the standards developer and must be followed in its activities. These procedures must be readily available to interested parties and, in the case of ANSI accredited entities, must be reviewed and accepted by the ANSI Audit and Accreditation Board. (See first publication listed above).

Established appeal procedures. The written appeal procedures must contain a realistic and readily available method for the impartial handling of

substantive and procedural complaints regarding any action or inaction of the standards developer.

Announcing proposed actions in ANSI's "Standards Action." Just as all proposed government regulations are announced in the "Federal Register," so also do proposed American National Standards appear in "Standards Action". Normally there is a 60-day period after publication of this notice during which interested parties may obtain copies of the proposed standard and comment. Any such comment must be addressed and resolution attempted before the document is considered by the Board of Standards Review.

Prompt consideration of views, objections, and proposed projects. A majority of the standards-developing entity is not permitted to force its views on others without responding to objections. A concerted effort must be made to resolve all objections and all voting members must be advised of unresolved objections in the event that they may wish to change their vote.

Maintenance of adequate records of all actions. Records, including draft and final standards, reports of meetings, reports of ballots, and disposition of objections must be maintained by the standards developer. These records should be retained for a reasonable period and must be reasonably accessible to those having a material interest in them.

The Board of Standards Review (BSR) normally determines, on behalf of

ANSI, if consensus has been reached on any standards activity. Even if a significant majority of the members endorse a proposed American National Standard, the BSR may block it if a major segment of any of the three interest groups discussed earlier objected.

There are three methods of applying the criteria for developing American National Standards. While providing the same results, they differ in procedure. Briefly, they include:

- The Accredited Organization Method, in which the overall procedures of the organization for all standards activi-

There is a common misconception that an Accredited Standards Committee is a part of ANSI. In reality, such a committee is no more a part of ANSI than, for example, an Accredited Organization. The ABA's "X9 - Financial Services Committee" would be an example of this group.

- The Canvas Method, in which the sponsor develops a proposed American National Standard and, to establish consensus, circulates it to a cross section of interested parties for comment. Due process must be observed in resolving comments, and the parties canvassed must represent all interests substantially and materially affected by the standard. Underwriter's Laboratory (UL) has traditionally used the Canvas Method to upgrade the safety standards it develops to American National Standards.

Coordinating standards development is the second main function of ANSI in the domestic arena. While ANSI has no authority to force a standards developer to take or refrain from any action, its role of impartial mediator is highly respected by all. As a disinterested neutral, ANSI is uniquely able to exert peer pressure among standards developers to resolve conflicts and avoid duplicate standards.

ANSI, while developing no domestic standards itself, plays a key role in domestic standards development. It serves as a coordinator for standards developers to avoid conflicts and duplications. By establishing development procedures, it assures that the standards adopted as American National Standards represent a consensus of all affected interests.

D.3 COMPUTER AND DATA COMMUNICATION STANDARDS

When an industry is in its infancy, there are usually no standards available. Each manufacturer/provider will deliver its product in whatever form, fit, or function it feels is "best". As an industry matures, it is in everyone's interest for standards to be developed and adopted.

In the early days of the computer and data communications industries, each manufacturer designed and built its computers to work with its own printers, disk drives, and communications protocols. When buyers purchased hardware from one vendor, they would be "locked-in" to that vendor's equipment. As user needs outgrew the capabilities of a single vendor, two things occurred:

- third party manufacturers built interfaces to connect unlike equipment; and

- vendors were forced to standardize their equipment interfaces to the outside world.

The result was the emergence of industry standards.

In an electronic benefit transfer (EBT) system, there are three main reasons for using system components that meet specified standards: time to market; cost; and connectability to other networks.

- Time To Market. The EBT provider, through the use of industry standard authorization terminals, access devices, automated teller machines, etc., will be able to bring a product to market much faster than if standardized hardware were not used. The longer delivery cycle will be partly due to engineering, de-bugging, and manufacturing issues that have already been addressed in standardized hardware.
- Cost. Developing a proprietary product involves research and development costs as well as higher manufacturing costs because of a smaller market for the product.
- Connectability. In the multi-program point-of-sale (POS) scenario, it will be necessary for the EBT system to communicate with other POS systems. The EBT provider can easily accomplish this by adopting standard financial message formats for information interchange. The alternative will be overhead software that will convert EBT message formats to industry standard formats.

There are many applicable standards that would play a part in an EBT system. These would include the obvious, such as "RJ-11" connections to the phone system and "115 Volt Alternating Current" requirements for the in-store terminals. There would also be the not-so-obvious standards, ones that must be spelled out explicitly, such as "X.25" protocol for the packet network, and physical requirements of the access device, specifically "X4.13, X4.16 and X9.1" for magnetic stripe cards. Lastly are the in-house developed standards, to include performance objectives and loss control. FNS' use of applicable standards will help accomplish all of these results that lower costs and increase the likelihood of connectability to other systems. A second benefit would be the development of an EBT system that could be used on a nationwide basis.

D.4 STANDARDS DOCUMENTATION

The following standards represent a cross-section of applicable documents available from the specified groups. For a complete list, contact directly the groups listed at the end of this section.

INDUSTRY STANDARDS - FOR FINANCIAL SERVICES

There are many industry organizations that provide standards for the financial marketplace. This includes, but is not limited to, The American Bankers Association (ABA), The National Automated Clearing House Association (NACHA), and The Shared Network Executives Association (SNEA).

ABA documents include:

- Accredited Standards Committee X9 - Financial Services Information Booklet. This booklet was developed to describe the role and activities of the X9 Financial Services committee as it relates to the development of national and international standards applicable to the financial services industry.
- Implementation Guidelines for On Line Debit Card Systems at the Point of Sale. This document, currently being written by the Payment Systems Policy Board Retail Payments Task Force, an Ad Hoc Committee of the ABA, is being developed as a guideline for a national debit card point of sale interchange system. After comments by interested parties and review and refinement by the appropriate ABA committees, sections of these guidelines will be submitted to ANSI and to ISO with a request for the development of standards.
- EFT Regulation E Comprehensive Compliance Manual (1982) and EFT Regulation E Comprehensive Compliance Manual - 1985 Supplement. This manual meets the financial industry's need for a convenient, easy-to-use guide to Regulation E, the consumer protection stipulations for dealing with EFT. The manual includes a complete text of the Electronic Funds Transfer Act and Regulation E, a compliance examination checklist and a glossary of EFT terms.
- ISO Register. The ISO Register of Card Issuer Identification Numbers is produced quarterly by the American Bankers Association (ABA) Standards Department. Any group wishing to issue cards that will be used in a shared network, such as a multipurpose or pure POS scenario, would have to apply to the ABA for its

unique identifying number. (See ANSI document X9.5). This Register is available only from the ABA.

NACHA documents include:

- 1987 ACH Rules. Including the local rules of eight ACH associations, The Federal Reserve Uniform Operating Circular, The Automated Clearing House Agreement, The Treasury's GREEN BOOK and most recent NEWSGRAMS, and Regulation E and the Official Staff Commentary.

SNEA documents include:

- National Node Operation Specifications. These technical specifications facilitate communications between networks using neutral, third-party data processing companies. The rules are characterized as neutral and purely technical.

ANSI STANDARDS - FOR FINANCIAL SERVICES

- X3.92 DATA ENCRYPTION ALGORITHM - This standard provides a means for the cryptographic protection of digital data that are considered sensitive by an authority that is responsible for the data. In an EBT system, this would include the PIN and possibly the PAN fields. Other fields could optionally be encrypted. (See X9.17 below, FINANCIAL INSTITUTION KEY MANAGEMENT).
- X4.13 FINANCIAL TRANSACTION CARDS - The purpose of this standard is to achieve uniformity of issued financial transaction cards. The standard specifies physical card attributes as well as embossing and account numbering systems. Use of this standard for the off-line magnetic stripe bank card scenario will result in lower transaction processing costs, more efficient processing of interchange transactions, and the use of lower priced equipment that uses transaction cards.
- X4.16 MAGNETIC-STRIPE ENCODING - This standard describes the physical and magnetic characteristics for a magnetic stripe on a plastic financial transaction card, the encoding technique, the coded character set, and the encoding formats.
- X9.1 MAGNETIC STRIPE DATA CONTENT FOR TRACK III - This standard is to be used in conjunction with X4.16. It provides specifications to facilitate the interchange of information encoded on magnetic stripes. It specifies the data content of Track III, which is read/write information. This standard is intended for use in completing transactions at attended and unattended machines, including cash dispensers and automated teller

machines. The Track III data content is designed for both on-line and off-line use.

- X9.2 INTERCHANGE MESSAGE SPECIFICATION FOR DEBIT AND CREDIT MESSAGE EXCHANGE AMONG FINANCIAL INSTITUTIONS - This standard establishes format and contents of interchange messages for communication of debit and credit card activity between acquiring and issuing financial institutions or their agents. This standard defines a sufficient number of message types and data elements within specified message types to facilitate exchange of debit and credit card information. In a POS/EFT system, it is usually necessary to implement these transaction sets to communicate with other service providers in the network or the switch.
- X9.5 FINANCIAL INSTITUTION NUMBERING SYSTEM (FINS) - This document is a listing of the numbering system used to identify the financial institution portion of the primary account number (PAN) on financial transaction cards. (See ISO Register above).
- X9.8 PERSONAL IDENTIFICATION NUMBER (PIN) MANAGEMENT AND SECURITY - Provides both guidelines and requirements for protection, use, and management of a PIN during its life cycle. The standard was developed to address the two primary fraud threats in the event of PIN disclosure: use of lost or stolen cards; and production and use of counterfeit cards. This standard specifies procedures for managing PINs, using PINs to authenticate the initiation of a transaction, and the prevention of unauthorized PIN disclosure by organizations involved in handling PINs. The standard applies to all elements of the verification process including interchange, network, switch, individuals, and other end-user organizations.
- X9.9 FINANCIAL INSTITUTION MESSAGE AUTHENTICATION - This standard establishes a method to authenticate financial messages. The authentication method is applicable to both coded character sets and binary data. The standard also provides a method of detection of accidental and deliberate alteration of financial messages.
- X9.17 FINANCIAL INSTITUTION KEY MANAGEMENT - The key management standard, utilized in conjunction with DATA ENCRYPTION ALGORITHM STANDARD (X3.92), can be used to protect messages and other sensitive information. This standard provides a uniform process for the protection and exchange of these cryptographic keys for authentication and encryption. To provide security, this standard establishes methods for the generation, exchange, use, storage and destruction of keys.

- X9.19 FINANCIAL INSTITUTION RETAIL MESSAGE AUTHENTICATION - This standard establishes a universally applicable method to authenticate messages between originator and recipient for retail transactions. The authentication process includes the computation, transmission and validation of a Message Authentication Code (MAC).

INDUSTRY STANDARDS - FOR COMPUTERS & INFORMATION PROCESSING

- RS-232-C ELECTRICAL SPECIFICATIONS FOR COMMUNICATIONS DEVICES, was created by the Electronic Industries Association (EIA), it specifies the physical and electrical specifications for interconnection of communicating devices to computers. This standard is the most widely used and accepted interface for computers that need to communicate data.
- RS-422 ELECTRICAL SPECIFICATIONS FOR COMMUNICATIONS DEVICES, was created by EIA, much like RS-232-C, it was developed as a specification for interconnection of communicating devices. Its application is for devices that will communicate at speeds greater than those attainable with the RS-232-C specification.
- SCSI SMALL COMPUTER SYSTEMS INTERFACE, developed by the Institute of Electrical and Electronic Engineers (IEEE), allows for connection of peripheral devices to computer systems. The main user of this interface is disk drive manufacturers, but suppliers of tape drives and local area networks, to name a few, also use the specification for interconnection.
- ISDN INTEGRATED SERVICES DIGITAL NETWORKS, is the coming standard for a total communications network. It is the marriage of three technologies: circuit switching, packet switching and private lines. The standards are being developed by over twelve different international groups, each involved in a different aspect of the technology. At some point, they will be merged as a single international standard. The International Telegraph and Telephone Consultative Committee (CCITT), located in Geneva, Switzerland, has Plenary Assemblies which will publish recommendations that have been adopted for ISDN. CCITT study group XVIII is the focal point for nearly all ISDN activities.

ANSI STANDARDS - FOR COMPUTERS & INFORMATION PROCESSING

- X3.23 PROGRAMMING LANGUAGE COBOL. This document has become the groundwork for the most widely used programming language in the business sector of the data processing community.

X3.4 CODE FOR INFORMATION INTERCHANGE (ASCII). There are two main character sets for data representation. One is IBM's Binary Coded Decimal (BCD & EBCDIC) and the second is ASCII. BCD/EBCDIC was first a vendor standard and then became an industry standard. On the other hand, ASCII was developed as a national standard for all computer vendors. Its acceptance has made data interchange between computers much simpler. It has allowed for direct data communications and magnetic tape transfer between systems without the need to convert data to a language that the receiving system understands. Indeed, a few years ago, IBM began offering, for the first time, terminals and communication devices that used ASCII data representation.

D.5 DOCUMENT ORDERING INFORMATION

The "X." standards can be ordered directly from ANSI or ABA. These standards can also be found at most major libraries in the Industry Standards Section. Photocopying them at the library is normally the fastest and least expensive way of obtaining these documents.

All other documents can be ordered from the authoring group.

ADDRESSES

American Bankers Association (ABA)
Order Processing Department
44-B Industrial Park Circle
Waldorf, MD 20601
(202) 663-5068

American National Standards Institute (ANSI)
1430 Broadway
New York, NY 10018
(212) 354-3300

Corporation for Open Systems (COS)
8619 Westwood Center
Suite 700
Vienna, VA 22180
(703) 848-2100

International Telegraph and Telephone Consultative Committee (CCITT)
c/o International Telecommunication Union (ITU)
CH-1211 Geneva 20
Switzerland
41 22 99.51.11

Electronic Industries Association (EIA)
2001 I Street, NW
Washington, DC 20018
(202) 457-4900

Exchange Carriers Standards Association (ECSA)
4 Century Drive
3rd Floor
Parsippany, NJ
(201) 538-6111

Institute for Electrical and Electronic Engineers (IEEE)
c/o T. C. White
345 East 47th Street
New York, NY 10017
(212) 705-7867

National Automated Clearing House Association (NACHA)
Suite 640
1901 L Street, NW
Washington, DC 20036
(202) 659-4343

Shared Network Executives Association (SNEA)
P.O. Box 140636
Orlando, FL 32814-0636

Appendix E

COST ELEMENTS AND ASSUMPTIONS

This appendix presents a detailed breakdown of the operating cost estimates for the basic off-line EBT systems examined in Chapter 5 and documentation of the assumptions used in developing these estimates. Detailed cost information is presented on three different caseload scenarios (5,300, 130,000 and 400,000) for the following issuance systems:

- Point-of-Sale (POS) system with standard magnetic stripe bankcards;
- POS system with chip cards;
- POS system with laser cards;
- POS system with token cards;
- POS system with telephony issuance using chip cards;
- POS system with mail-out issuance of non-standard magnetic stripe bankcards;
- POS/Automated Coupon Dispenser (POS/ACD) system with standard magnetic stripe bankcards;
- POS/ACD system with chip cards;
- Multiprogram POS system with standard magnetic stripe bankcards;
- Multiprogram POS system with chip cards;
- Multiprogram POS system with telephony issuance using chip cards; and
- Multiprogram POS system with mail-out issuance of non-standard magnetic stripe bankcards.

The cost estimates are based on a large number of assumptions about the likely design of each system and the products from which it might be constructed. Specific technical features and products referenced in this section are presented solely for the illustrative purpose of preparing cost estimates, however, and do not constitute a blueprint for an actual EBT system configuration.

There are two basic features of all the systems discussed in this appendix:

- Issuance approach. System operating costs are based on a universal refreshment approach to issuance. With universal refreshment, each household must have its issuance entered into its card every month. The household visits an issuance machine, which is storing information about the household's allotment for the month. The issuance machine refreshes the card by increasing the balance it holds by the amount of the allotment. In the token card system the issuance machine dispenses new benefit cards for each allotment. In the non-standard magnetic stripe card system, a new card is mailed to the recipient for each allotment.
- Centralized settlement. Settlement of retailer credits is assumed to be done centrally in each of the systems, i.e., store terminals are polled daily by the central computer to get transaction information. This approach differs from that in the Reading EBT demonstration. In that system, transaction information is transmitted to the central computer as the transaction occurs. A decentralized approach to off-line settlement would require store terminals to possess the additional capability of writing transaction information onto a physical medium, e.g., computer tape. The retailer would then "deposit" the tape at the bank. The bank would possess the necessary equipment to read the tape and would then credit the retailer account on the basis of this information.

This appendix is organized into sections corresponding to the major cost categories presented in Chapter 5. These categories include: providing recipients with access devices; benefit authorization; recipient use of benefits; housekeeping operations at the computer center; and other Food Stamp Program costs. Within each section is a brief outline of the major assumptions used and procedures followed in estimating individual cost components. Detailed cost breakdowns are presented as Exhibits E-1 through E-5 and summarized in Chapter 5.

System Parameters

This section outlines the main parameters used throughout other parts of the model in estimating operating costs of each system.

- Food Stamp Caseload. Operating costs for each system are based on three hypothetical caseload scenarios: a medium-sized county with 5,300 participating households, a major metropolitan area with 130,000 participating households and a large State with 400,000 participating households. These scenarios were chosen to make use of available data on the Food Stamp Program operations in Berks County, Pennsylvania, Philadelphia, Pennsylvania, and the State of Pennsylvania for purposes of estimating the number of retailers, issuance offices, and other factors related to system scale.
- Interest Rate. Assumed to be 5.0 percent in all systems and represents the cost of funds used in purchasing system components.

The following additional data are used as parameters in the multi-program systems:

- Proportion of food stamp only cases in scenario caseload. This statistic represents the proportion of the food stamp caseload which participates only in the Food Stamp Program. Estimates are based on data presented in Concurrent Multiple Program Participation, Mathematica Policy Research, Inc., October 15, 1986.
- Average number of applicable programs in which food stamp households participate. This statistic represents the average number of programs (among AFDC, General Assistance, Medicaid and food stamps) in which food stamp households participate. Estimates are based on data presented in Concurrent Multiple Program Participation.

E.1 PROVIDING RECIPIENTS WITH ACCESS DEVICES

This section outlines cost components associated with providing recipients cards for accessing benefits. Magnetic stripe cards, chip cards and laser cards are considered for this purpose. All off-line systems presume the use of a single card for each household to access benefits except the non-standard magnetic stripe and token card approaches. In the token card system, recipients are provided with a standard magnetic stripe card which is used to access machine-issued disposable cards. The disposable card is encoded with a monthly allotment and used at the point-of-sale to make purchases. A variation to this approach precludes the use of standard magnetic stripe cards and issuance machines by mailing non-standard magnetic stripe cards directly to recipients.

a. Raw Card Stock

The card in the off-line electronic systems is assumed to be encoded with identifying information (e.g., an account number and a PIN offset), and operational data including a current balance, and the date and amount of the last issuance. The card must be rewritable or must have some other means to have the current balance recorded on the card when a transaction is completed.

In multi-program systems, roughly comparable information will be required for each of the other participating programs. The card is not assumed to carry a photo ID.

The following information is used to estimate monthly requirements for new cards:

Card Needs

- Total annual applications. Based on FNS Program Activity Report (FNS-366B) for the State of Pennsylvania in fiscal year 1986.
- Annual approval rate. Based on FNS Program Activity Report (FNS-366B) for the State of Pennsylvania in fiscal year 1986.
- Annual number of new food stamp households. The product of total annual applications and annual approval rate.
- Annual number of damaged cards. Based on the following manufacturer estimates of expected monthly damaged cards:

Standard magnetic stripe card	.05% of cards per month
Chip card	.10% of cards per month
Laser card	.10% of cards per month

Annual number of damaged cards for scenarios in which disposable cards are used are based on standard magnetic stripe card estimates. Estimates of damaged disposable cards are not included due to the limited number of transactions they are expected to process.

- Proportion of lost/stolen cards per month. Based on number of lost or stolen cards in Reading demonstration during 1985.
- Annual number of lost/stolen cards. Product of case-load, proportion of monthly lost/stolen cards and twelve (months).

- Annual number of cards needed. Summation of annual number of new food stamp households, annual number of damaged cards and annual number of lost/stolen cards.
- Monthly number of cards needed. Annual number of cards needed divided by twelve (months).
- Monthly number of disposable cards needed. Equals the number of issuances (regular and non-recurring) in scenarios using non-standard magnetic stripe cards (assumption of 106.0% of caseload based on Berks County experience). Token cards are assumed able to handle allotments up to \$180.00 (180 \$1 fields are available per token card). Allotments greater than \$180.00 but less than \$360.00 will require two cards and so on for larger allotments. Monthly number of token cards needed incorporates this requirement and is based on allotment data from Berks county.

Card Costs

- Price per blank card. Based on manufacturer quoted prices.
- Price per blank disposable card. Based on manufacturer quoted prices.
- Total cost per case month. Product of price per blank card and monthly number of cards needed, divided by caseload. This cost item is assumed to be shared among all participating programs in the multi-program systems based on program participation levels. The cost sharing formula is calculated using the following data:

% of food stamp households participating
in Food Stamp Program only 21.0

average number of other participating
programs in which food stamp households
participate (among AFDC, Medicaid, and
General Assistance): 2.19

The Food Stamp Program must pay the full cost for 21.0% of the monthly card needs and share the cost for the remaining 79.0% with 2.19 other programs.

Let (a) = cost per blank card
(b) = monthly number of cards needed
(c) = food stamp caseload

Then

card cost per casemonth = $(.21 + (.79/2.19)) * (a) * (b) / (c)$

b. Equipment for Card Fabrication/Encoding

Benefit cards must be fabricated (i.e., embossed or printed with the recipient's name and account number) and encoded with machine-readable identification information prior to their distribution. The required card fabrication/encoding equipment needs are based on the productivity of available hardware (i.e., the number of cards which can be fabricated and encoded in a given time period) and the relevant caseload. Efficient and productive equipment is currently available to fabricate and encode standard magnetic stripe cards. It is assumed that only one equipment unit is needed to meet the fabricating/encoding needs in the three caseload scenarios for systems based on this access device. Furthermore, it is assumed that this equipment will be located in a county office in the county and large city scenario and at the State data processing center in the state-wide scenario. Current fabricating/encoding equipment for chip and laser cards is simpler and can less efficiently process cards. As a result, chip card fabrication/encoding equipment is deployed locally in all three caseload scenarios.

Amortized Capital Costs

- Number of machines required. Based on expected card requirements and fabricating/encoding abilities of available equipment.
- Purchase price. Based on manufacturer quoted price.
- Expected lifetime (months). Manufacturer estimate of 60 months.
- Monthly amortized capital costs/machine. The cost to amortize the purchase price of one machine over the machine's expected lifetime at an annual rate of 5.0%. This cost is the monthly amount that would be paid to purchase one machine.

Maintenance Costs

- Monthly maintenance cost/machine. Assumed to be .79 percent of purchase price (based on industry practice annual maintenance cost at 9.5 percent of purchase price).

Total Cost

Total monthly cost. Product of total monthly machine cost (amortized capital and maintenance) and the number of required machines.

Total cost per case month. Equals total monthly cost divided by caseload in non-multiprogram scenarios. The cost sharing formula in the multi-program systems is slightly different from that used previously. For these

positive communications cost. This cost accounts for the communication requirements of accessing client records off the State participation file and using that information to encode on the card.

Communications Costs

- Average cost per connect. Assumed to be \$.07 per local call, and average \$.13 per call in state-wide scenario.
- Monthly number of initializations. Based on the monthly number of initializations due to newly certified recipients and recipients with damaged, lost or stolen cards.
- Monthly proportion of caseload making queries. Based on proportion of clients making account queries during Reading demonstration. Account queries to not involve the issuance of a new card but require a communication between the county office and computer center.
- Number of queries per month. Product of monthly proportion of caseload making queries and caseload.

Postage Cost

- Postage cost. This cost item is applicable only in state-wide scenarios using standard magnetic stripe access devices. In these scenarios, postage costs are based on daily shipments to each county (67 assumed as in Pennsylvania) by regular certified mail at a cost of \$.75 plus \$.17 per ounce (approximately five cards). It is assumed that regular certified mail will provide an adequate level of security against the threat of lost or stolen cards in this stage of operations.

Total Cost

Total cost per case month. Sum of monthly communication and postage costs divided by caseload. Cost sharing in multiprogram scenarios utilizes the formula described in Section 1a above.

d. Labor for Fabrication, Initialization, Training, etc.

The item includes labor for embossing or printing the recipient's name and account number on the card; placing the machine-readable information on the card; training recipients; and other problems related to the cards or their issuance.

- Labor cost per case month. Based on cost estimates of similar activities during the Reading demonstration. Cost sharing in multiprogram scenarios utilizes the formula outlined in section 1b above.

e. Indirect Costs

These calculations are from the following sources and are applied only to cost per month estimates.

- Indirect labor cost ratio. Based on estimate of indirect labor cost rate at Berks County Assistance Office (BCAO) for scenarios in which fabricating, initializing and training are done locally. Based on average of indirect labor cost rate at BCAA and the Pennsylvania Department of Public Welfare (PDPW) for scenarios in which fabricating and initializing are done centrally.
- Indirect labor cost per case month. Product of indirect labor cost rate, labor cost per case month, and caseload.
- Indirect non-labor cost ratio. Based on estimate of indirect non-labor cost rate at Berks County Assistance Office (BCAO) for scenarios in which fabricating and initializing are done locally. Based on average of indirect non-labor cost rate at BCAA and the Pennsylvania Department of Public Welfare (PDPW) for scenarios in which fabricating and initializing are done centrally.
- Indirect non-labor cost per case month. Product of indirect non-labor cost rate, total costs per case month for fabricating/encoding equipment and initialization communication/postage and caseload.

Total indirect cost per case month. Sum of monthly indirect costs for labor and non-labor, divided by caseload.

E.2 BENEFIT AUTHORIZATION

Data in this section cover the cost of authorizing benefits to recipients. Issuance in all systems is assumed to take place at issuance machines. The issuance machines have to: receive a near-daily issuance transmission; maintain a file listing the total monthly allotment for each household; read households' cards, conduct a PIN match, and check to see whether the client has already received an issuance; add the appropriate

amount to the balance on the card, record the date of the issuance to prevent the client from receiving a duplicate issuance at another machine; print out a statement of the amount issued; maintain a record of these issuance transactions; and transmit the record of issuance transactions back to the computer center daily.

The functional requirements for all of the systems are basically the same. The point-of-sale/automatic coupon dispensing (POS/ACD) machine is assumed to issue an allotment in paper coupons and to distinguish between coupon and EBT issuances in a way that is identifiable to the central computer in addition to performing the functions described above.

a. Issuance Machines

This element is the cost of purchasing, operating and maintaining the issuance machines.

Equipment Requirements

- Number of machines. Based on the number of authorization-to-participate (ATP) issuance sites in Berks County and Philadelphia, Pennsylvania and the State of Pennsylvania. This choice follows the assumption that changes in recipient access should be minimized.

Amortized Capital Costs

- Purchase price/machine. Manufacturer quoted prices.
- Installation cost/machine. Manufacturer estimate.
- Expected lifetime (months). Manufacturer estimate of 60 months.
- Monthly amortized capital cost/machine. The cost to amortize the purchase price and installation cost of one machine over the machine's expected lifetime at an annual rate of 5.0%. This cost is the monthly amount that would be paid to purchase one machine.

Maintenance Costs

- Monthly maintenance cost/machine. Assumed to be .83 percent per month (10 percent annually) of the purchase per machine and is based on industry practice.

Stocking Costs

- Monthly stocking cost/machine. Covers the cost of stocking the machines. This cost item is only applicable in non-standard magnetic stripe card, token card and POS/ACD systems.

Supply Costs

- Monthly supply cost/machine. This covers the cost of printer paper and ribbons and is based on the cost of these items for ATM machines, adjusted to reflect a fewer number of expected transactions through issuance machines.

Environment Costs

- Monthly space rental cost/machine. Based on industry average for ATM machines.
- Monthly utilities cost/machine. Based on industry average for ATM machines.
- Monthly environment cost/machine. Summation of space rental and utilities costs per machine.

Total Cost

Total cost per case month. Product of the total machine costs (amortized capital, maintenance, supply, stocking and environment) and number of machines divided by caseload. Cost sharing in multiprogram scenarios follows the formula described in section 1b above.

b. Issuance File Creation

This element includes the cost to the States for creating food stamp issuance files and delivering these files on tape to the computer center.

Regular Issuance File Creation Costs

- Cost per regular issuance. Based on estimated costs associated with creating regular issuance files during the original Reading demonstration.
- Number of regular issuances. Assumed to be two in the county-wide scenario and ten in both the large city and state-wide scenarios. That is, a file with issuances for one-half (one-tenth) of the recipients is created for each regular issuance day in the county-wide (large city and state-wide) scenarios.

- Monthly regular issuance cost. Product of cost per regular issuance and number of regular issuances.

Non-recurring Issuance File Creation Costs

- Cost per non-recurring issuance. Based on estimated costs for creating supplemental and pro-rated issuances during the original Reading demonstration.
- Number of non-recurring issuances. Non-recurring issuances are assumed to take place on every business day (22).
- Monthly non-recurring issuance cost. Product of cost per non-recurring issuance and number of non-recurring issuances.

Issuance tape daily delivery fee. Assumption of \$5.00 per delivery based on estimate of costs for contracted courier delivery service between State and county offices.

- Number of deliveries. Assumed to be every working day (22).
- Monthly tape delivery cost. Product of delivery fee and number of deliveries.

Total Cost

Total cost per case month. Summation of monthly costs for regular and non-recurring issuance file creation and deliveries divided by caseload. Cost sharing in multiprogram scenarios follows the formula outlined in section 1a above.

c. Issuance Posting

these tasks are conducted at the computer center and cover the cost of getting the allotment information from the State files into the appropriate issuance machines. It is assumed that each recipient will be assigned to the three most conveniently located issuance machines from which they may access their benefits. This assumption was made arbitrarily to reduce the communications costs and issuance machine memory requirements associated with this function.

Transmission Run Costs

- Average daily transmission run cost. This item represents the labor cost associated with transmitting issuance files from the computer center to the issuance machines. Estimates are based on time for transmitting non-recurring issuances from the State data center to the EBT center during the original Reading demonstration (regular issuance files were hand delivered on tape during the Reading demonstration). Large city and state-wide estimates represent the same percentage of computer center labor as assigned in the county scenario. Estimates of total computer center labor are presented in Section 4d below.
- Number of transmission runs/month. Assumed to be one every business day (22).
- Monthly transmission run cost. Product of average daily run cost and number of monthly transmission runs.

Communication Costs

- Communications cost per transmission. Estimates based on transmitting issuance record into three different machines between 10:00 p.m. and 8:00 a.m. using a 2400 baud modem.
- Number of transmission/month. Assumed to be twenty-two in all scenarios.
- Monthly communication cost. Product of communications cost per transmission and number of transmissions per month.

d. Coupons (where applicable)

This cost element is only applicable in the POS/ACD scenarios and represents the cost of producing and storing a coupon stock and delivering and stocking the physical coupons in the ACD machines. It is assumed that 18.0% of the caseload will pick up their issuances in coupons (based on system preference rates during the Reading demonstration). This element represents 18.0% of the estimated coupon cost for an entire caseload using coupons only.

- Total cost per case month. The design of ACD machines might require modifications to the physical characteristics of coupon books which would likely affect their cost. In the absence of more extensive information on ACD design requirements, Reading estimates of coupon cost per case month are used.

e. Recipient Access

This cost element is assumed to equal zero. That is, it is assumed that issuance machine transactions involve no incremental costs beyond those outlined in the issuance machine section above (section 3a). Transaction statistics are presented for information purposes only and are based on data collected from the Reading demonstration.

f. Issuance Reconciliation

This section covers the cost of transmitting issuance reconciliation information from the issuance machines to the central computer facility, reconciling that information with the issuance authorization file, and transmitting the reconciled information to the State.

Transmission Run Costs

- Average daily transmission cost. Includes the labor associated with monitoring the transmission of reconciliation records. Estimate based on costs associated with transmitting acknowledgment records of supplemental issuances between the State data center and EBT computer center during the original Reading demonstration.
- Number of transmissions/month. Assumed to be one every business day.
- Total monthly transmission run costs. Product of average daily transmission cost and number of transmissions per month.

Communication Costs

- Communication cost per transmission. Assumes that reconciliation records will be transmitted from the issuance machine to the computer center using the same communication connection as issuance file posting. since charges for local calls are based on connection and not duration, transmitting reconciliation records represents no additional communication costs in the county and large city scenarios (in which the computer center is locally based).
- Number of transmissions/month. Assumed to be one every business day (22).

- Total monthly communications cost. Product of communication cost per transmission and number of transmissions per month.

Archiving and Summary Runs (Where Applicable)

- Monthly archiving and summary run cost. Applicable in POS/ACD scenarios only and accounts for the labor cost of storing information on coupon issuances in recipient files for audit purposes and summarizing that information for later reconciliation with reports of coupons placed in issuance machines. Estimates based on 18.0% of coupon reconciliation processing costs during 1985 in the State of Pennsylvania.

Report Reconciliation Costs (Where Applicable)

- Monthly manual reconciliation costs. Applicable in POS/ACD scenarios only and accounts for the labor cost of comparing (probably manually) the summarized information on coupon issuances with a report on the amount of coupons placed in issuance machines. Estimates based on 18.0% of coupon report generation costs during 1985 in the State of Pennsylvania.

Reconciliation Run Costs

- Monthly reconciliation run cost. This cost element refers to labor costs of reconciling the electronically posted allotments with the issuance files. Estimate based on labor costs of reconciling issuance information during the Reading demonstration. 82.0% of the monthly cost is used in POS/ACD systems to reflect the expected caseload proportion receiving electronic issuances.

Total Cost

Total cost per case month. The summation of transmission run, communications, archiving and summary run and report reconciliation (where applicable) and reconciliation run costs divided by caseload.

g. Indirect Costs

Based on indirect cost factors estimated during Reading demonstration.

Indirect Cost Ratios

- Indirect cost ratio (State functions). Estimate of indirect cost ratio for PDPW.

- Indirect cost ratio (computer center functions). Estimate of indirect cost ratio estimated for the EBT computer center during the original Reading demonstration.
- Monthly indirect cost. Sum of indirect cost rate (State functions) applied to issuance file creation costs and indirect cost rate (computer center functions) applied to all other benefit authorization activities.
- Total cost per case month. Monthly indirect cost divided by caseload.

E.3 RECIPIENTS' USE OF BENEFITS

This section outlines the costs associated with allowing recipients to use their benefits and crediting retailers for the amount of benefits redeemed.

a. Store Equipment

These are the point-of-sale terminals recipients use to buy groceries with their benefits; balance only terminals recipients use to check their remaining card balance, and manual transaction recorders used by retailers to indicate the completion of a manual transaction on recipient cards. The POS terminal must: read the recipient's card, accept PIN entry and conduct a match, accept a purchase amount entry, check purchase amount against balance and authorize or reject, debit (or credit) the available balance by the amount of the transaction, and print out a receipt. The terminal must also store information on the transaction in an internal file and have the contents of the file polled daily by the computer center.

The balance only terminals must read the recipient's card, accept PIN entry and conduct a match, and display the available benefit balance on screen. The manual transaction recorder reads and writes to a card that a manual transaction has taken place and records the value of that transaction.

Equipment Requirements

- Number of one-terminal stores. Based on estimates of one-terminal stores in Berks county and Philadelphia, Pennsylvania and the State of Pennsylvania developed for the analysis of the Reading demonstration.

- Number of multi-terminal stores. Based on estimates of multi-register stores in Berks county and Philadelphia, Pennsylvania and the State of Pennsylvania developed for the analysis of the Reading demonstration.
- Average number of terminals. Based on estimates of the average number of cash registers in multi-terminal stores in Berks county and Philadelphia, Pennsylvania and the State of Pennsylvania developed for the analysis of the Reading demonstration.
- Number of POS terminals. One per one-terminal store plus the product of the number of multi-terminal stores and average number of terminals.
- Number of balance inquiry terminals. Based on the number of balance inquiry terminals in the Reading demonstration. Terminal needs in larger scenarios based on number of multi-terminal stores.
- Number of manual transaction recorders. It is assumed that manual transaction recorders will only be issued to one-terminal stores. This assumption is based on the expectation that manual transactions will only be required in the event of terminal failure

POS Terminals

- Purchase price/terminal. Based on manufacturer quoted price.
- Installation cost/terminal. Based on manufacturer estimate.
- Expected lifetime (months). Based on manufacturer estimate of 36 months.
- Monthly amortized cost/terminal. The monthly cost to amortize the purchase price of one machine over its expected lifetime at 5.0% annual rate of interest.

POS Terminal Maintenance Costs

- Monthly maintenance cost/terminal. Assumed at a monthly rate of .83 percent of purchase price (10.0 percent annually).

Balance Inquiry Terminals

- Purchase price/terminal. Based on manufacturer quoted price.
- Expected lifetime. Based on manufacturer estimate of 60 months.

- Monthly amortized cost/terminal. The monthly cost to amortize the purchase price of one terminal over its expected lifetime at 5.0% annual interest.

Balance Inquiry Terminal Maintenance Costs

- Monthly maintenance cost/machine. Assumed at a monthly rate of .83 percent of purchase price (10.0 percent annually).

Manual Transaction Recorder

- Purchase price. Based on manufacturer expected price. Recorders will have read/write capabilities and be battery operated with an optional AC power adaptor.
- Expected lifetime. Based on manufacturer estimate of 60 months.
- Monthly amortized cost/recorder. The monthly cost to amortize the purchase price of one recorder over its expected lifetime at 5.0% annual rate of interest.

Supply Costs

- Monthly supply costs. Based on Reading demonstration estimates of terminal supply and manual transaction receipt costs.

Total Cost

Total cost per case month. Summation of all costs in this section divided by caseload. The formula used in sharing these costs with other programs in multiprogram scenarios differs from other cost sharing formulae. The formula is based on the expected number of purchase transactions from various benefit accounts among all participants and utilizes the following parameters:

% of total cases (defined as above) participating in Food Stamp Program (excluding Medicaid)	69.0
average number of food stamp purchases per food stamp household (from Reading)	8.05
estimated number of non-food stamp purchases per participating client	1.0

Then the weighted proportion of food stamp purchases to total purchases is given by the formula:

$$(.69*8.05)/((.69*8.05)+(.31*1.0))$$

Medicaid participation is excluded from this computation because Medicaid benefits cannot be used to purchase food.

b. Other Terminals

In the multi-program POS system, there will be additional kinds of terminals. AFDC and General Assistance will require cash-dispensing terminals. Medicaid could require terminals to verify eligibility and record participants' case numbers; more complicated terminals might be used actually to file claims and change the reimbursement process.

We assume that these other terminals have no cost implications for the Food Stamp Program although it is possible that if all terminals (albeit different) were ordered from the same manufacturer, a somewhat better purchase price could be negotiated for the POS terminals.

c. Transaction Costs

None of the scenarios outlined in this report have a marginal cost for actually conducting an electronic transaction. This cost element would be non-zero only in a piggy backing scenario, where the Food Stamp Program pays a fee to some other organization that deploys the terminals. At the same time, the additional fee will be offset by a reduction in some terminal costs previously cited.

Electronic Transaction Costs

- Cost per electronic transaction. Assumed to equal zero.
- Number of monthly purchase transactions/household. Estimates based on statistics generated from the Reading demonstration.
- Number of credit transactions/household. Estimates based on statistics generated from the Reading demonstration.
- Number of balance inquiries/household. Estimates based on statistics generated from the Reading demonstration.
- Number of rejections/household. Estimates based on statistics generated from the Reading demonstration.
- Number of monthly transactions/household. Summation of monthly household purchase, credit, balance and rejected transactions.

- Monthly electronic transaction cost. Assumed to equal zero.

Manual Transaction Costs

- Cost per manual transaction. Based on Reading labor costs to manually authorize transactions and to post and later reconcile temporary debits.
- Failure rate. Based on the number of transactions manually authorized in the Reading demonstration during the first six months of 1987 factored by one-half to account for the off-line nature of the systems (i.e., purchase transactions on off-line systems are independent of the operational status of the central computer).
- Number of purchase transactions. Product of caseload and number of monthly purchase transactions above.
- Number of manual transactions. Product of number of purchase transactions and failure rate.
- Monthly manual transaction cost. Product of number of manual transactions and cost per manual transaction.

d. Settlement Cost

Settlement is conducted at the computer center and may include two components, one for benefits redeemed through electronic POS transactions and one for coupon redemptions. The coupon redemption process is assumed to be the same as that in Reading. POS redemption differs from Reading in that store terminals have to be polled daily to get transaction information, rather than having it transmitted as the transactions occur. Once the transaction is received at the computer center, settlement is assumed to be the same as Reading (i.e., an ACH transfer followed by a wire funds request).

The 18.0% factor is applied to coupon functions and 82.0% to EBT functions in this section for POS/ACD scenarios.

Coupon Settlement Costs

- Total monthly coupon settlement costs. Based on Reading cost estimates and mainly includes fees paid to the Federal Reserve Bank to settle retailer deposits of food stamp coupons.

POS Settlement Costs

- Cost per polling run. This cost represents the labor cost involved with polling retailer terminals and is based on normal system monitoring time of file transmissions during the Reading demonstration.
- Communication cost per polling run. Based on communicating 75 byte records from terminals to the computer center through 300 baud modems.
- Total monthly polling run cost. Polling is assumed to be conducted every day of the month (30). Total monthly polling run cost is the product of thirty days and the sum of communication and labor cost per polling run.
- Cost per file preparation run. This item represents the labor cost associated with preparing the daily Automated Clearing House (ACH) file and is based on estimates of daily bundle up procedure labor costs during the Reading demonstration.
- Total monthly file preparation run cost. The product of thirty (days) and cost per file preparation run.
- Cost per transmission. This item represents the cost of transmitting the ACH file to the originating bank and is based on labor costs associated with monitoring file transmissions during the Reading demonstration.
- Total monthly transmission cost. The ACH file is assumed to be transmitted every business day (22).
- ACH and wire transfer fees per run. Based on estimates of these items for the analysis of the Reading demonstration.
- Total monthly settlement fees. The product of twenty-two (days) and ACH and wire transfer fees per run.
- Total monthly POS settlement costs. Summation of monthly polling run, communication, file preparation, transmission and ACH and wire transfer costs.

Total cost per case month. Sum of total monthly coupon settlement (where applicable) and POS cost divided by caseload. Cost sharing formula used in multi-program scenarios is described in section 3a above.

e. Settlement Reconciliation Cost

Two forms of reconciliation are required daily: a check of the funds transfers to grocer accounts against the transaction totals calculated by the computer center, and a check of total transfers against the amount of the wire funds transfer request. Reconciliation is assumed to occur twenty-two times each month and is conducted at the computer center.

Reconciliation Costs

- Cost per reconciliation run. Estimate based on labor costs to reconcile retailer accounts with retailer credits during the Reading demonstration.
- Total reconciliation run cost per month. The product of twenty-two (days) and cost per reconciliation run.

Total cost per case month. Total reconciliation run cost per month divided by caseload. Cost sharing used in multi-program scenarios is described in section 3a above.

f. Archiving and Report Generation Costs

To maintain an audit trail and handle recipient problems, all transactions will have to be recorded in recipient files on a daily basis. This section covers the cost to the computer center of the run to post polled transaction records into the recipient files. Getting the information from the store terminal to the computer center is assumed to be part of settlement. In addition, monthly and special reports will have to be generated to assist in the auditing of accounts. Cost elements in this section include that aspect of system auditing.

- Cost per run. Based on Reading cost estimates to generate monthly activity reports and recording transactions in recipient files.
- Total monthly archiving/report run cost. It is assumed that runs will be conducted daily.

Total cost per case month. Total monthly archiving/report

g. Handling Recipient Balance Problems

Recipients will inevitably encounter problems with their account balance beyond the issues of lost, stolen and damaged cards covered previously in this appendix. The problems generally involve a telephone call or visit to the welfare office, and are handled by the caseworker. This section covers the cost of dealing with such problems.

- Labor cost. Based on Reading hotline labor cost estimates for dealing with recipient balance problems.
- Equipment cost. Prorated share of monthly hotline equipment costs. Allocation based on share of estimated hotline labor required to handle recipient balance problems. Monthly hotline equipment costs assumed to be amortized purchase price of \$3,500 (IBM-AT, printer and modem) over five year at 5.0 percent interest. Large city scenario is twenty times county scenario. State-wide scenario is large city cost adjusted to reflect larger caseload.

Total cost per case month. Monthly labor and equipment cost divided by caseload. Cost sharing formula used in multi-program scenarios is described in Section 1a above.

h. Handling Grocer Problems

Grocers have problems ranging from equipment failure to inability to reconcile their accounts. The direct costs of servicing the equipment and providing supplies were covered under POS terminal maintenance costs. In addition, however, it is necessary to provide a "hotline" type of service for grocers to call in their problems. The hotline operation receives the calls, dispatches the repair service if necessary, accesses recipient or grocer account information if necessary, and records the call and its resolution.

- Labor cost. Based on Reading labor cost estimates for handling grocer problems.
- Equipment cost. Prorated share of monthly Hotline equipment costs. Allocation based on labor cost to handle grocer problems. Monthly Hotline equipment costs assumed to be amortized purchase price of \$3,500 (IBM-AT, printer and modem) over five years at 5.0 percent interest. Large city scenario is twenty times county scenario. State-wide scenario is large city cost adjusted to reflect larger caseload.

Total cost per case month. Monthly labor and equipment costs divided by caseload. Cost sharing formula used in multi-program scenarios is described in section 3a above.

i. Indirect Cost

Cost factors are based on estimates developed for the Reading demonstration.

Indirect Cost Rates

- Indirect cost rate (computer center). Estimate of indirect costs rates for the EBT center during Reading demonstration.
- Indirect cost rate (State/local). Estimates of indirect cost rate for PDPW used in statewide scenario and for BCAO in county and large city scenarios.
- Total monthly indirect cost. Summation of indirect cost rate (computer center) applied to computer center activities and indirect cost rate (State/local) applied to costs for handling grocer and recipient balance problems.

Total cost per case month. Total monthly indirect cost divided by caseload.

E.4 HOUSEKEEPING OPERATIONS AT THE COMPUTER CENTER

It is assumed that each of the systems requires a centrally based computer center. This stand-alone facility contains the main computer for maintaining accounts, generating records, managing issuance machines and store terminals, and providing recipient and merchant support. In both the 5,300 and 130,000 case scenarios, the computer center is assumed to be located locally. In the state-wide scenario, the computer center is assumed to be located in the same city as the State's data processing center. Data elements in this section cover the monthly cost of operating the computer center.

a. Hardware Costs

Items in this section account for the purchase of the computer and peripherals required to operate the off-line system.

- Purchase price. Based on manufacturer quoted price for the following equipment needs.

<u>5,300 caseload</u>	<u>COST</u>
1 - IBM Batch Processor	345,000
1 - 3705 Communications Controller	57,500
1 - Tape drive	22,135
1 - Disk drive	77,000
1 - Printer	28,000
	<u>\$529,635</u>

<u>130,000 caseload</u>	
1 - IBM Batch Processor	\$345,000
1 - 3705 Communications Controller (with additional communications ports and transaction handling capabilities)	92,500
2 - Tape drives	44,270
1 - Disk drive	77,000
1 - Printer	28,000
	<u>\$586,770</u>

<u>400,000 caseload</u>	
1 - IBM 4361 Batch Processor	345,000
1 - 3705 Communications Controller (further enhanced with communications ports and transaction handling capabilities)	102,500
2 - Tape drives	44,270
1 - Disk drive	77,000
1 - Printer	28,000
	<u>\$596,770</u>

- Expected lifetime. Manufacturer estimate of 60 months.
- Total monthly amortized hardware costs. Monthly cost to amortize hardware purchase price over the expected lifetime at 5.0% annual rate of interest.

b. Software Costs

This item accounts for the monthly licensing software fee.

- Monthly maintenance fee. 1.0% of purchase price (based on purchase price of \$200,000. See system development section in Chapter 5).

c. Fixed Communication Costs

This item accounts for the monthly (fixed) cost for communications between the central computer facility and issuance machines, store terminals and the State data processing center.

- Monthly line costs. Represents the monthly cost for the following level of service:

<u>5,300 case scenario</u>	<u>Cost</u>
7 - local lines @\$31.30 per line	\$219.10
<u>130,000 case scenario</u>	
46 - local lines @\$31.30 per line	\$1,439.80
<u>400,000 case scenario</u>	
17 - local lines @\$31.30 per line	\$532.10
20 - WATS lines @\$39.50 per line	790.00
12 - 800 lines @\$39.50 per line	474.00
2 - X.25 lines @\$2,700.00 per line	<u>3,400.00</u>
	\$7,696.10

All costs do not include any local, State or federal taxes.

All pricing for X.25 Value Added Network (VAN) communications is based on currently available contracted discount levels as of June, 1987. All pricing for non-X.25 communications is based on levels set for the following services by the Pennsylvania Public Service Commission as of June, 1987:

- local dial measured service;
- intrastate WATS service (out-going calls); and
- intrastate 800 service (in-coming calls).

For the county and large city scenarios, all calls will be made via local dial measure service. The computer center will employ two separate dial-in rotaries for terminal settlement. The first will be the primary larger rotary. The second will be the back-up should there be problems with the primary rotary.

For the state-wide scenario, 3% of the caseload will be within the local dial area of the computer center. Further, 15% will be service with local dial access via a concentrator in the largest caseload city in the State for terminal settlement. The breakdown of incoming calls will be:

- 17% local dial
- 73% X.25 VAN service; and
- 10% 800 service.

- Hardware Purchase Price of Communications Equipment and Installation. Represents the purchase price for the following pieces of equipment:

<u>5,300 case scenario</u>	<u>Cost</u>
7 - local line installation @ \$100.00 per line	\$700.00
9 - modems @ \$500.00 per modem	\$4,500.00
1 - Network Control Center (NCC) @ \$15,000.00 per NCC	\$15,000.00
7 - NCC connections @ \$600.00 per line	\$4,200.00
	<u>\$24,400.00</u>

<u>130,000 case scenario</u>	
46 - local line installation @ \$100.00 per line	\$4,600.00
52 - modems @ \$500.00 per modem	\$26,000.00
1 - NCC @ \$15,000.00 per NCC	\$15,000.00
46 - NCC connections @ \$600.00 per line	\$27,600.00
	<u>\$73,200.00</u>

<u>400,000 case scenario</u>	
17 - local line installation @ \$100.00 per line	\$1,700.00
20 - WATS line installation @ \$100.00 per line	\$2,000.00
12 - 800 line installation @ \$100.00 per line	\$1,200.00
2 - X.25 line installation @ \$1,750.00 per line	\$3,500.00
56 - modems @ \$500.00 per modem	\$28,000.00
52 - NCC connections @ \$600.00 per line	\$31,200.00
1 - concentrator @ \$75,000 + \$4,000 installation per concentrator	\$79,000.00
	<u>\$146,600.00</u>

- Expected lifetime. Based on manufacturer estimate of 36 months.
- Total monthly cost. Monthly cost to amortize hardware costs over the expected lifetime of the equipment at 5.0% annual rate of interest.

d. Labor Costs

- Total monthly labor cost. Estimates based on the following assumed computer center staffing requirements and annual salaries:

5,300 case scenario

<u>Description</u>	<u>Total Cost</u>
2 - entry level @\$17,500.00 per person	\$35,000.00
1 - entry level 3rd shift @\$19,250.00	\$19,250.00
1 - regular level (experienced based) staffer @\$20,000.00	\$20,000.00
1 - staff supervisor @\$24,000.00	\$24,000.00
1 - manager @\$28,000.00	\$28,000.00
1 - programmer @\$25,000.00	\$25,000.00
	<u>\$151,250.00</u>
+ fringe @ 40.0%	\$211,750.00
+ 12 = Total monthly salary	\$17,645.83
Labor assigned to specific tasks	\$7,239.13
Unassignable labor	\$10,406.70

130,000 case scenario

4 - entry level @\$17,500.00 per person	\$70,000.00
2 - entry level 3rd shift @\$19,250.00	\$38,500.00
2 - regular level (experienced based) staffer @\$20,000.00	\$40,000.00
2 - staff supervisor @\$24,000.00	\$48,000.00
2 - manager @\$28,000.00	\$28,000.00
2 - programmer @\$25,000.00	\$50,000.00
	<u>\$274,500.00</u>
+ fringe @ 40.0%	\$384,300.00
+ 12 = Total monthly salary	\$32,025.00
Labor assigned to specific tasks	\$13,138.13
Unassignable labor	\$18,886.87

400,000 case scenario

5 - entry level @\$17,500.00 per person	\$87,500.00
3 - entry level 3rd shift @\$19,250.00	\$57,750.00
2 - regular level (experienced based) staffer @\$20,000.00	\$40,000.00
2 - staff supervisor @\$24,000.00	\$48,000.00
2 - manager @\$28,000.00	\$56,000.00
4 - programmer @\$25,000.00	\$100,000.00
	<u>\$389,250.00</u>
+ fringe @ 40.0%	\$544,950.00
+ 12 = Total monthly salary	\$45,383.50
Labor assigned to specific tasks	\$18,618.50
Unassignable labor	\$26,765.00

- Total monthly unassignable labor cost. This item is the difference between total monthly labor costs and the summation of labor assigned to specific tasks which are conducted at the computer center. Assignable tasks include:
 - issuance posting transmission run costs (section 2c);
 - issuance reconciliation transmission run costs (section 2f);
 - issuance reconciliation archiving and summary run (where applicable) (section 2f);
 - issuance reconciliation report reconciliation (where applicable) (section 2f);
 - issuance reconciliation run costs (section 2f);
 - POS settlement polling run costs (section 3d);
 - POS settlement file preparation run costs (section 3d);
 - POS settlement file transmission run costs (section 3d); and
 - archiving and report generation run costs (section 3f).

Assignable labor for these functions in the county scenarios is based on Reading cost estimates for comparable tasks. Assignable labor in the two larger scenarios represent the same percentage of total monthly labor cost assigned to a task in the countywide scenario.

e. Environment Costs

- Rent. Total space requirements assumed to be 4,000 square feet (computer room 2,000 sq. ft. and offices 2,000 sq. ft.). Rent assumed to be \$1.42 per square foot.
- Preparation. One-time cost associated with preparing the computer room for operations (e.g., raising floor, installing A/C, etc.). Monthly cost represents amortized total costs (\$9,000) over 60 months at 5.0 percent interest.
- Utilities. Systems assumed to require approximately 50 KVA per month at \$60 per KVA.
- Maintenance (UPS, A/C). Additional requirements assumed to be \$3,000 per year for uninterruptible power source and \$2,100 per year for air conditioning.
- Total monthly environment cost. Summation of monthly costs of rent, preparation, utilities and maintenance.

f. Total Direct Cost Per Case Month

Summation of monthly costs for hardware, fixed communications, software, labor and environment divided by caseload. The formula used to share the costs in multiprogram scenarios is described in Section 1b above.

g. Indirect Costs

Factors based on Reading demonstration indirect cost estimates and account for costs other than those described above.

Indirect Cost

- Indirect cost rate. Based on the indirect cost rate for the EBt center during the Reading demonstration.
- Monthly indirect cost. Product of the indirect cost rate and total cost per case month for housekeeping operations at the computer center.

Total indirect cost per case month. Monthly indirect cost divided by caseload.

E.5 OTHER FOOD STAMP PROGRAM COSTS

a. Retailer Management

FNS, through its Regional and Field Offices, receives applications from establishments that wish to participate in the Food Stamp Program, reviews information and grants or denies authorization, provides information on Food Stamp Program operations and regulations to authorized stores, monitors reports of store activity and recommends investigations as necessary, periodically checks on store operations, and handles the close-out procedure for stores terminating their participation in the program. In addition, the FNS Compliance Branch conduct investigations of stores suspected of violating program rules and develops evidence for the sanctioning of violators.

Most of these functions are essentially the same in all systems. the one important difference is that retailers in an electronic system must be equipped and must receive training beyond that for the paper system. Equipment and installation costs were covered in the recipient use of benefits section so this element covers the general functions and special training.

Training Cost

- Total monthly cost. Based on Reading cost estimates for training new retailers adjusted to reflect differences in the number of retailers.

General Management Cost

- Total monthly cost. Based on Reading cost estimates adjusted to reflect number of retailers.

Total Cost

Total cost per case month. The sum of total monthly training and general management costs divided by case-load. The formula used to share the costs in multiprogram scenarios is described in section 3a above.

b. Redemption Monitoring

Data on total redemptions by store and by bank are received and analyzed by the FNS data center in Minneapolis. This function occurs for all systems. The main difference is that a POS system provides data in machine-readable form, while the coupon system provides hard copy data that must be entered. The Reading analysis found that the unit cost of the two procedures was equivalent because the electronic processing was a small and specialized part of the operation and could not take advantage of potential economies of scale. The same assumption will be maintained here, because a system serving a single city or county is probably an equivalent exception to normal procedures.

- Total monthly cost. Based on Reading cost estimates adjusted to reflect number of retailers.

c. Indirect Costs

Based on indirect cost rates estimated for the Compliance Branch, the Administrative Review Office, Minneapolis Data Center, FNS, and PDPW during the Reading demonstration.

Exhibit E-1

DETAILED BREAKDOWN OF OPERATING COSTS*
 PURE POS SYSTEMS
 WITH
 STANDARD MAGNETIC STRIPE AND CHIP CARD ACCESS DEVICES

SYSTEM PARAMETERS	SYSTEM: CARD TYPE:	POS STANDARD MAG STRIPE	POS STANDARD MAG STRIPE	POS STANDARD MAG STRIPE	POS CHIP CARD	POS CHIP CARD	POS CHIP CARD
Food stamp caseload		5300	130000	400000	5300	130000	400000
* Interest rate		0.05	0.05	0.05	0.05	0.05	0.05
1. PROVIDING RECIPIENTS WITH ACCESS DEVICES							
a. Raw Card Stock							
Card needs							
* Total annual applications		4862	119257	366945	4862	119257	366945
* Annual approval rate		0.79	0.79	0.79	0.79	0.79	0.79
Annual number of new FS households		3824	93799	288612	3824	93799	288612
* Annual number of damaged cards		32	780	2400	64	1560	4800
* Proportion lost/stolen cards per month		0.01	0.01	0.01	0.01	0.01	0.01
Annual number of lost/stolen cards		852	20904	64320	852	20904	64320
Annual number of cards needed		4708	115483	355332	4740	116263	357732
Monthly number of cards needed		392	9624	29611	395	9689	29811
Monthly number of disposable cards needed		N/A	N/A	N/A	N/A	N/A	N/A
Card costs							
* Price per blank card		\$0.40	\$0.30	\$0.12	\$12.00	\$7.75	\$6.25
* Price per blank disposable card		N/A	N/A	N/A	N/A	N/A	N/A
Total cost per case month		\$0.03	\$0.02	\$0.01	\$0.89	\$0.58	\$0.47
b. Equipment for Card Fabrication/Encoding							
Amortized capital costs							
* Number of machines required		1	1	1	1	20	100
* Purchase price		\$8,845.00	\$31,955.00	\$41,530.00	\$1,200.00	\$1,200.00	\$1,200.00
* Expected lifetime (months)		60	60	60	60	60	60
Monthly amortized capital costs/machine		\$166.92	\$603.03	\$783.72	\$22.65	\$22.65	\$22.65
Maintenance costs							
* Monthly maintenance cost/machine		\$70.02	\$252.98	\$328.78	\$9.50	\$9.50	\$9.50
Total monthly cost		\$236.94	\$856.01	\$1,112.50	\$32.15	\$642.91	\$3,214.55
Total cost per case month		\$0.04	\$0.01	\$0.00	\$0.01	\$0.00	\$0.01

*Operating costs are defined in the text portion of Appendix E. For a discussion of design, development and implementation costs, see Chapter 5, Section 12.

Exhibit E-1
(continued)

	POS STANDARD MAG STRIPE	POS STANDARD MAG STRIPE	POS STANDARD MAG STRIPE	POS CHIP CARD	POS CHIP CARD	POS CHIP CARD
c. Communications/Postage Costs for Initialization						
Communications costs						
* Average cost per connect	\$0.07	\$0.07	\$0.13	\$0.07	\$0.07	\$0.13
Monthly number of initializations	392	9624	N/A	395	9689	29811
* Monthly proportion of caseload making queries	0.12	0.12	0.12	0.12	0.12	0.12
Number of queries per month	632	15496	47680	632	15496	47680
Communications cost per month	\$71.69	\$1,758.37	\$6,198.40	\$71.87	\$1,762.92	\$10,073.83
Postage cost						
* Monthly card mailing cost	\$0.00	\$0.00	\$2,358.40	\$0.00	\$0.00	\$0.00
Total cost per case month	\$0.01	\$0.01	\$0.02	\$0.01	\$0.01	\$0.03
d. Labor for Fabrication, Initialization, Training, etc.						
* Labor cost per case month	\$0.45	\$0.45	\$0.45	\$0.45	\$0.45	\$0.45
e. Indirect Costs						
* Indirect labor cost ratio	0.08	0.08	0.06	0.08	0.08	0.06
Indirect labor cost per case month	\$0.04	\$0.04	\$0.03	\$0.04	\$0.04	\$0.03
* Indirect non-labor cost ratio	0.08	0.08	0.06	0.08	0.08	0.06
Indirect non-labor cost per case month	\$0.01	\$0.00	\$0.00	\$0.07	\$0.05	\$0.03
Total cost per case month	\$0.04	\$0.04	\$0.03	\$0.11	\$0.08	\$0.06

Exhibit E-1
(continued)

	POS STANDARD MAG STRIPE	POS STANDARD MAG STRIPE	POS STANDARD MAG STRIPE	POS CHIP CARD	POS CHIP CARD	POS CHIP CARD
2. BENEFIT AUTHORIZATION						
a. Issuance Machines						
Equipment requirements						
* Number of machines	27	62	1587	27	62	1587
Amortized capital costs						
* Purchase price/machine	\$8,000.00	\$7,600.00	\$6,700.00	\$9,000.00	\$8,600.00	\$7,700.00
* Installation cost/machine	\$1,500.00	\$1,500.00	\$1,500.00	\$1,500.00	\$1,500.00	\$1,500.00
* Expected lifetime (months)	60	60	60	60	60	60
Monthly amortized capital cost/machine	\$179.28	\$171.73	\$154.74	\$198.15	\$190.60	\$173.62
Maintenance costs						
* Monthly maintenance cost/machine	\$66.67	\$63.33	\$55.83	\$75.00	\$71.67	\$64.17
Stocking costs						
* Monthly stocking cost/machine	N/A	N/A	N/A	N/A	N/A	N/A
Supply costs						
* Monthly supply cost/machine	\$2.50	\$2.50	\$2.50	\$2.50	\$2.50	\$2.50
Environment costs						
* Monthly space rental cost/machine	\$300.00	\$300.00	\$300.00	\$300.00	\$300.00	\$300.00
* Monthly utilities cost/machine	\$50.00	\$50.00	\$50.00	\$50.00	\$50.00	\$50.00
Monthly environment cost/machine	\$350.00	\$350.00	\$350.00	\$350.00	\$350.00	\$350.00
Total cost per case month	\$3.05	\$0.28	\$2.23	\$3.19	\$0.29	\$2.14
b. Issuance File Creation						
Regular issuance file creation costs						
* Cost per regular issuance	\$214.99	\$1,054.69	\$3,245.19	\$214.99	\$1,054.69	\$3,245.19
* Number of regular issuances/month	2	10	10	2	10	10
Monthly regular issuance cost	\$429.99	\$10,546.88	\$32,451.94	\$429.99	\$10,546.88	\$32,451.94
Non-recurring issuance file creation costs						
* Cost per non-recurring issuance	\$2.11	\$51.67	\$158.99	\$2.11	\$51.67	\$158.99
* Number of non-recurring issuances/month	22	22	22	22	22	22
Monthly non-recurring issuance cost	\$46.35	\$1,136.81	\$3,497.88	\$46.35	\$1,136.81	\$3,497.88
Issuance tape daily delivery fee						
* Number of deliveries	\$5.00	\$5.00	\$5.00	\$5.00	\$5.00	\$5.00
* Monthly tape delivery cost	\$110.00	\$110.00	\$110.00	\$110.00	\$110.00	\$110.00
Total cost per case month	\$0.11	\$0.09	\$0.09	\$0.11	\$0.09	\$0.09

Exhibit E-1
(continued)

	POS STANDARD MAG STRIPE	POS STANDARD MAG STRIPE	POS STANDARD MAG STRIPE	POS CHIP CARD	POS CHIP CARD	POS CHIP CARD
c. Issuance Posting						
Transmission run costs						
* Average daily transmission run cost	\$78.29	\$142.08	\$201.35	\$78.29	\$142.08	\$201.35
Number of transmissions runs/month	22	22	22	22	22	22
Monthly transmission run cost	\$1,722.35	\$3,125.86	\$4,429.73	\$1,722.35	\$3,125.86	\$4,429.73
Communication costs						
* Communication cost per transmission	\$0.81	\$1.86	\$194.90	\$0.81	\$1.86	\$194.90
Number of transmissions/month	22	22	22	22	22	22
Monthly communication cost	\$17.82	\$40.92	\$4,287.76	\$17.82	\$40.92	\$4,287.76
Total cost per case month	\$0.33	\$0.02	\$0.02	\$0.33	\$0.02	\$0.02
d. Coupons (where applicable)						
* Total cost per case month	N/A	N/A	N/A	N/A	N/A	N/A
e. Recipient Access						
Transaction costs						
* Proportion of caseload - regular issuance	1.00	1.00	1.00	1.00	1.00	1.00
* Proportion of caseload - non-recurring issuance	0.06	0.06	0.06	0.06	0.06	0.06
* Proportion of issuances not picked up	0.09	0.09	0.09	0.09	0.09	0.09
Number of monthly issuance transactions	5155	126451	389080	5155	126451	389080
* Proportion of caseload making balance inquiries	2.63	2.63	2.63	2.63	2.63	2.63
* Proportion of caseload trying unauthorized access	0.25	0.25	0.25	0.25	0.25	0.25
Number of other monthly transactions	15225	373451	1149080	15225	373451	1149080
* Cost per transaction	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Total monthly transaction costs	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Total cost per case month	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

Exhibit E-1
(continued)

	POS STANDARD MAG STRIPE	POS STANDARD MAG STRIPE	POS STANDARD MAG STRIPE	POS CHIP CARD	POS CHIP CARD	POS CHIP CARD
f. Issuance Reconciliation						
Transmission run costs						
* Average daily transmission cost	\$104.94	\$190.45	\$269.89	\$104.94	\$190.45	\$269.89
Number of transmissions/month	22	22	22	22	22	22
Total monthly transmission run costs	\$2,308.68	\$4,189.96	\$5,937.69	\$2,308.68	\$4,189.96	\$5,937.69
Communication costs						
* Communication cost per transmission	\$0.00	\$0.00	\$186.80	\$0.00	\$0.00	\$186.80
Number of transmissions/month	22	22	22	22	22	22
Total monthly communication cost	\$0.00	\$0.00	\$4,109.70	\$0.00	\$0.00	\$4,109.70
Archiving and Summary runs (applicable in coupon scenarios only)						
* Monthly archiving and summary run cost	N/A	N/A	N/A	N/A	N/A	N/A
Report reconciliation costs (where applicable)						
* Monthly manual reconciliation cost	N/A	N/A	N/A	N/A	N/A	N/A
Reconciliation run costs						
* Monthly reconciliation run cost	\$815.11	\$1,479.32	\$2,096.38	\$815.11	\$1,479.32	\$2,096.38
Total cost per case month	\$0.59	\$0.04	\$0.03	\$0.59	\$0.04	\$0.03
g. Indirect Costs						
Indirect cost ratios						
* Indirect cost ratio (computer center functions)	0.08	0.08	0.08	0.08	0.08	0.08
* Indirect cost ratio (state functions)	0.06	0.06	0.06	0.06	0.06	0.06
Monthly indirect cost	\$1,718.28	\$4,355.94	\$75,403.74	\$1,777.05	\$4,490.87	\$78,857.63
Total cost per case month	\$0.32	\$0.03	\$0.19	\$0.34	\$0.03	\$0.20

Exhibit E-1
(continued)

	POS STANDARD MAG STRIPE	POS STANDARD MAG STRIPE	POS STANDARD MAG STRIPE	POS CHIP CARD	POS CHIP CARD	POS CHIP CARD
3. RECIPIENTS USE OF BENEFITS						
a. Store Equipment						
Equipment requirements						
* Number of one-terminal stores	143	2976	6529	143	2976	6529
* Number of multi-terminal stores	30	402	1623	30	402	1623
* Average number of terminals	6.05	4.14	6.36	6.05	4.14	6.36
Number of POS terminals	324	4640	16851	324	4640	16851
* Number of balance inquiry terminals	12	343	1330	12	343	1330
Number of manual transaction recorders	143	2976	6529	143	2976	6529
POS terminals						
* Purchase price/terminal	\$678.00	\$565.00	\$427.00	\$748.00	\$635.00	\$497.00
* Installation cost/terminal	\$50.00	\$50.00	\$50.00	\$50.00	\$50.00	\$50.00
* Expected lifetime (months)	36	36	36	36	36	36
Monthly amortized capital cost/terminal	\$21.82	\$18.43	\$14.30	\$23.92	\$20.53	\$16.39
POS terminal maintenance costs						
* Monthly maintenance cost/terminal	\$5.65	\$4.71	\$3.56	\$6.23	\$5.29	\$4.14
Balance inquiry terminals						
* Purchase price/terminal	\$220.00	\$150.00	\$135.00	\$300.00	\$200.00	\$165.00
* Expected lifetime	60	60	60	60	60	60
Monthly amortized cost per terminal	\$4.15	\$2.83	\$2.55	\$5.66	\$3.77	\$3.11
Balance inquiry terminal maintenance costs						
* Monthly maintenance cost/machine	\$1.83	\$1.25	\$1.13	\$2.50	\$1.67	\$1.38
Manual transaction recorder						
* Purchase Price	\$330.00	\$317.00	\$191.00	\$430.00	\$417.00	\$291.00
* Expected lifetime	60	60	60	60	60	60
Monthly amortized cost/recorder	\$6.23	\$5.98	\$3.60	\$8.11	\$7.87	\$5.49
Supply costs						
* Monthly supply costs (overall)	\$399.01	\$5,714.29	\$20,752.46	\$399.01	\$5,714.29	\$20,752.46
Number of POS purchases						
* Ave. number POS purchases by non-FS/month	N/A	N/A	N/A	N/A	N/A	N/A
* Ave. number POS purchases by FS-only/month	8.05	8.05	8.05	8.05	8.05	8.05
Total cost per case month	\$1.94	\$1.02	\$0.88	\$2.16	\$1.16	\$1.02

**Exhibit E-1
(continued)**

	POS STANDARD MAG STRIPE	POS STANDARD MAG STRIPE	POS STANDARD MAG STRIPE	POS CHIP CARD	POS CHIP CARD	POS CHIP CARD
b. Other Terminals (assume no cost implications for the Food Stamp Program)						
c. Transaction Costs						
Electronic transaction costs						
* Cost per electronic transaction	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
* Number of purchase transactions/household	8.05	8.05	8.05	8.05	8.05	8.05
* Number of credit transactions/household	0.04	0.04	0.04	0.04	0.04	0.04
* Number of balance inquiries/household	2.63	2.63	2.63	2.63	2.63	2.63
* Number of rejections/household (bad PIN, insufficient balance, etc.)	0.25	0.25	0.25	0.25	0.25	0.25
Number of monthly transactions/household	10.97	10.97	10.97	10.97	10.97	10.97
Monthly electronic transaction cost	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Manual transaction costs						
* Cost per manual transaction	\$0.63	\$0.63	\$0.63	\$0.63	\$0.63	\$0.63
* Failure rate	0.00195	0.00195	0.00195	0.00195	0.00195	0.00195
* Number of purchase transactions	42665	1046500	3220000	42665	1046500	3220000
Number of manual transactions	83	2041	6279	83	2041	6279
Monthly manual transaction cost	\$52.31	\$1,283.18	\$3,948.24	\$52.31	\$1,283.18	\$3,948.24
Total cost per case month	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01
d. Settlement Cost						
Coupon settlement costs (where applicable)						
* Total monthly coupon settlement costs	N/A	N/A	N/A	N/A	N/A	N/A
POS settlement costs						
* Cost per polling run	\$9.03	\$16.39	\$23.23	\$9.03	\$16.39	\$23.23
* Communication cost per polling run	\$16.25	\$232.00	\$1,922.70	\$16.25	\$232.00	\$1,922.70
Total monthly polling run cost	\$158.49	\$7,451.82	\$58,377.95	\$158.49	\$7,451.82	\$58,377.95
* Cost per file preparation run	\$9.03	\$16.39	\$23.23	\$9.03	\$16.39	\$23.23
Total monthly file preparation run	\$270.99	\$491.82	\$696.97	\$270.99	\$491.82	\$696.97
* Cost per transmission	\$32.09	\$58.24	\$82.54	\$32.09	\$58.24	\$82.54
Total monthly transmission cost	\$706.01	\$1,281.33	\$1,815.80	\$706.01	\$1,281.33	\$1,815.80
* ACH and wire transfer fees per run	\$47.69	\$931.10	\$2,246.99	\$47.69	\$931.10	\$2,246.99
Total monthly settlement fees	\$1,049.07	\$20,484.19	\$49,433.73	\$1,049.07	\$20,484.19	\$49,433.73
Total monthly POS settlement costs	\$2,784.57	\$29,709.15	\$110,324.44	\$2,784.57	\$29,709.15	\$110,324.44
Total cost per case month	\$0.53	\$0.23	\$0.28	\$0.53	\$0.23	\$0.28

**Exhibit E-1
(continued)**

	POS STANDARD MAG STRIPE	POS STANDARD MAG STRIPE	POS STANDARD MAG STRIPE	POS CHIP CARD	POS CHIP CARD	POS CHIP CARD
e. Settlement Reconciliation Cost						
Reconciliation costs	\$41.53	\$75.37	\$106.81	\$41.53	\$75.37	\$106.81
* Cost per reconciliation run	\$913.63	\$1,658.12	\$2,349.76	\$913.63	\$1,658.12	\$2,349.76
Total reconciliation run cost per month						
Total cost per case month	\$0.17	\$0.01	\$0.01	\$0.17	\$0.01	\$0.01
f. Archiving and Report Generation Costs						
* Cost per run	\$7.71	\$14.00	\$19.83	\$7.71	\$14.00	\$19.83
Total monthly archiving/report run cost	\$231.37	\$419.90	\$595.05	\$231.37	\$419.90	\$595.05
Total cost per case month	\$0.04	\$0.00	\$0.00	\$0.04	\$0.00	\$0.00
g. Handling Recipient Balance Problems						
* Labor cost	\$272.74	\$6,689.75	\$20,583.85	\$272.74	\$6,689.75	\$20,583.85
* Equipment cost	\$5.82	\$116.33	\$357.95	\$5.82	\$116.33	\$357.95
Total cost per case month	\$0.05	\$0.05	\$0.05	\$0.05	\$0.05	\$0.05
h. Handling Grocer Problems						
* Labor cost	\$2,824.21	\$5,648.42	\$13,631.11	\$2,824.21	\$5,648.42	\$13,631.11
* Equipment cost	\$60.23	\$1,204.65	\$3,706.62	\$60.23	\$1,204.65	\$3,706.62
Total cost per case month	\$0.54	\$0.05	\$0.04	\$0.54	\$0.05	\$0.04
i. Indirect Cost						
Indirect cost rates						
* Indirect cost rate (computer center)	0.08	0.08	0.08	0.08	0.08	0.08
* Indirect cost rate (state/local)	0.08	0.08	0.06	0.08	0.08	0.06
Total monthly indirect cost	\$1,457.77	\$15,076.19	\$41,826.38	\$1,556.30	\$16,643.31	\$46,783.01
Total cost per case month	\$0.28	\$0.12	\$0.10	\$0.29	\$0.13	\$0.12

Exhibit E-1
(continued)

	POS STANDARD MAG STRIPE	POS STANDARD MAG STRIPE	POS STANDARD MAG STRIPE	POS CHIP CARD	POS CHIP CARD	POS CHIP CARD
b. Redemption Monitoring						
• Total monthly cost	\$850.12	\$20,852.00	\$64,160.00	\$850.12	\$20,852.00	\$64,160.00
Total cost per case month	\$0.16	\$0.16	\$0.16	\$0.16	\$0.16	\$0.16
c. Indirect Costs						
Indirect labor costs						
• Indirect cost rate (Compliance Branch)	0.12	0.12	0.12	0.12	0.12	0.12
• Indirect cost rate (Administrative Review Office)	0.01	0.01	0.01	0.01	0.01	0.01
• Indirect cost rate (Minneapolis Data Center)	0.01	0.01	0.01	0.01	0.01	0.01
• Indirect cost rate (FNS)	0.27	0.27	0.27	0.27	0.27	0.27
• Indirect cost rate (PDFW/OIS)	0.06	0.06	0.06	0.06	0.06	0.06
Monthly indirect non-labor cost	\$28.09	\$689.00	\$2,120.00	\$28.09	\$689.00	\$2,120.00
Total cost per case month	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01
TOTAL SYSTEM OPERATING COST PER CASE MONTH	\$15.97	\$3.35	\$5.09	\$17.25	\$4.12	\$5.86

Exhibit E-2

DETAILED BREAKDOWN OF OPERATING COSTS
PURE POS SYSTEMS
WITH
LASER AND TOKEN CARD ACCESS DEVICES

SYSTEM PARAMETERS	SYSTEM:	POS	POS	POS	POS	POS	POS
	CARD TYPE:	LASER CARD	LASER CARD	LASER CARD	TOKEN CARD	TOKEN CARD	TOKEN CARD
Food stamp caseload		5300	130000	400000	5300	130000	400000
* Interest rate		0.05	0.05	0.05	0.05	0.05	0.05
1. PROVIDING RECIPIENTS WITH ACCESS DEVICES							
a. Raw Card Stock							
Card needs							
* Total annual applications		4862	119257	366945	4862	119257	366945
* Annual approval rate		0.79	0.79	0.79	0.79	0.79	0.79
* Annual number of new FS households		3824	93799	288612	3824	93799	288612
* Annual number of damaged cards		64	1560	4800	32	780	2400
* Proportion lost/stolen cards per month		0.01	0.01	0.01	0.01	0.01	0.01
Annual number of lost/stolen cards		852	20904	64320	852	20904	64320
Annual number of cards needed		4740	116263	357732	4708	115483	355332
Monthly number of cards needed		395	9689	29811	392	9624	29611
Monthly number of disposable cards needed		N/A	N/A	N/A	6519	159900	492000
Card costs							
* Price per blank card		\$10.00	\$2.50	\$1.50	\$0.40	\$0.30	\$0.12
* Price per blank disposable card		N/A	N/A	N/A	\$0.45	\$0.35	\$0.20
Total cost per case month		\$0.75	\$0.19	\$0.11	\$0.58	\$0.45	\$0.25
b. Equipment for Card Fabrication/Encoding							
Amortized capital costs							
* Number of machines required		1	20	100	1	1	1
* Purchase price		\$4,500.00	\$4,500.00	\$4,500.00	\$8,845.00	\$31,955.00	\$41,530.00
* Expected lifetime (months)		60	60	60	60	60	60
Monthly amortized capital costs/machine		\$84.92	\$84.92	\$84.92	\$166.92	\$603.03	\$783.72
Maintenance costs							
* Monthly maintenance cost/machine		\$35.63	\$35.63	\$35.63	\$70.02	\$252.98	\$328.78
Total monthly cost		\$120.55	\$2,410.91	\$12,054.56	\$236.94	\$856.01	\$1,112.50
Total cost per case month		\$0.02	\$0.02	\$0.03	\$0.04	\$0.01	\$0.00

Exhibit E-2
(continued)

	POS LASER CARD	POS LASER CARD	POS LASER CARD	POS TOKEN CARD	POS TOKEN CARD	POS TOKEN CARD
c. Communications/Postage Costs for Initialization						
Communications costs	\$0.07	\$0.07	\$0.13	\$0.07	\$0.07	\$0.13
* Average cost per connect	395	9689	29811	392	9624	N/A
Monthly number of initializations	0.12	0.12	0.12	0.12	0.12	0.12
* Monthly proportion of caseload making queries	632	15496	47680	632	15496	47680
Number of queries per month	\$71.87	\$1,762.92	\$10,073.83	\$71.69	\$1,758.37	\$6,198.40
Communications cost per month						
Postage cost	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$2,358.40
* Monthly card mailing cost						
Total cost per case month	\$0.01	\$0.01	\$0.03	\$0.01	\$0.01	\$0.02
d. Labor for Fabrication, Initialization, Training, etc.						
* Labor cost per case month	\$0.45	\$0.45	\$0.45	\$0.45	\$0.45	\$0.45
e. Indirect Costs						
* Indirect labor cost ratio	0.08	0.08	0.06	0.08	0.08	0.06
Indirect labor cost per case month	\$0.04	\$0.04	\$0.03	\$0.04	\$0.04	\$0.03
* Indirect non-labor cost ratio	0.08	0.08	0.06	0.08	0.08	0.06
Indirect non-labor cost per case month	\$0.06	\$0.02	\$0.01	\$0.05	\$0.04	\$0.02
Total cost per case month	\$0.10	\$0.05	\$0.04	\$0.09	\$0.07	\$0.05

**Exhibit E-2
(continued)**

	POS LASER CARD	POS LASER CARD	POS LASER CARD	POS TOKEN CARD	POS TOKEN CARD	POS TOKEN CARD
2. BENEFIT AUTHORIZATION						
a. Issuance Machines						
Equipment requirements						
• Number of machines	27	62	1587	27	62	1587
Amortized capital costs						
• Purchase price/machine	\$9,000.00	\$8,600.00	\$7,700.00	\$45,000.00	\$35,000.00	\$30,000.00
• Installation cost/machine	\$1,500.00	\$1,500.00	\$1,500.00	\$1,500.00	\$1,500.00	\$1,500.00
• Expected lifetime (months)	60	60	60	60	60	60
Monthly amortized capital cost/machine	\$198.15	\$190.60	\$173.62	\$877.51	\$688.80	\$594.44
Maintenance costs						
• Monthly maintenance cost/machine	\$75.00	\$71.67	\$64.17	\$375.00	\$291.67	\$250.00
Stocking costs						
• Monthly stocking cost/machine	N/A	N/A	N/A	\$25.00	\$25.00	\$25.00
Supply costs						
• Monthly supply cost/machine	\$2.50	\$2.50	\$2.50	\$2.50	\$2.50	\$2.50
Environment costs						
• Monthly space rental cost/machine	\$300.00	\$300.00	\$300.00	\$300.00	\$300.00	\$300.00
• Monthly utilities cost/machine	\$50.00	\$50.00	\$50.00	\$50.00	\$50.00	\$50.00
Monthly environment cost/machine	\$350.00	\$350.00	\$350.00	\$350.00	\$350.00	\$350.00
Total cost per case month	\$3.19	\$0.29	\$2.34	\$8.30	\$0.65	\$4.85
b. Issuance File Creation						
Regular issuance file creation costs						
• Cost per regular issuance						
• Number of regular issuances/month	\$214.99	\$1,054.69	\$3,245.19	\$214.99	\$1,054.69	\$3,245.19
Monthly regular issuance cost	2	10	10	2	10	10
	\$429.99	\$10,546.88	\$32,451.94	\$429.99	\$10,546.88	\$32,451.94
Non-recurring issuance file creation costs						
• Cost per non-recurring issuance						
• Number of non-recurring issuances/month	\$2.11	\$51.67	\$158.99	\$2.11	\$51.67	\$158.99
Monthly non-recurring issuance cost	22	22	22	22	22	22
	\$46.35	\$1,136.81	\$3,497.88	\$46.35	\$1,136.81	\$3,497.88
Issuance tape daily delivery fee						
• Number of deliveries	\$5.00	\$5.00	\$5.00	\$5.00	\$5.00	\$5.00
Monthly tape delivery cost	22	22	22	22	22	22
	\$110.00	\$110.00	\$110.00	\$110.00	\$110.00	\$110.00
Total cost per case month	\$0.11	\$0.09	\$0.09	\$0.11	\$0.09	\$0.09

Exhibit E-2
(continued)

	POS LASER CARD	POS LASER CARD	POS LASER CARD	POS TOKEN CARD	POS TOKEN CARD	POS TOKEN CARD
c. Issuance Posting						
Transmission run costs						
* Average daily transmission run cost	\$78.29	\$142.08	\$201.35	\$78.29	\$142.08	\$201.35
Number of transmissions runs/month	22	22	22	22	22	22
Monthly transmission run cost	\$1,722.35	\$3,125.86	\$4,429.73	\$1,722.35	\$3,125.86	\$4,429.73
Communication costs						
* Communication cost per transmission	\$0.81	\$1.86	\$194.90	\$0.81	\$1.86	\$194.90
Number of transmissions/month	22	22	22	22	22	22
Monthly communication cost	\$17.82	\$40.92	\$4,287.76	\$17.82	\$40.92	\$4,287.76
Total cost per case month	\$0.33	\$0.02	\$0.02	\$0.33	\$0.02	\$0.02
d. Coupons (where applicable)						
* Total cost per case month	N/A	N/A	N/A	N/A	N/A	N/A
e. Recipient Access						
Transaction costs						
* Proportion of caseload - regular issuance	1.00	1.00	1.00	1.00	1.00	1.00
* Proportion of caseload - non-recurring issuance	0.06	0.06	0.06	0.06	0.06	0.06
* Proportion of issuances not picked up	0.09	0.09	0.09	0.09	0.09	0.09
Number of monthly issuance transactions	0.09	0.09	0.09	0.09	0.09	0.09
* Proportion of caseload making balance inquiries	5155	126451	389080	5155	126451	389080
* Proportion of caseload trying unauthorized access	2.63	2.63	2.63	2.63	2.63	2.63
Number of other monthly transactions	0.25	0.25	0.25	0.25	0.25	0.25
* Cost per transaction	15225	373451	1149080	15225	373451	1149080
Total monthly transaction costs	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Total cost per case month	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

Exhibit E-2
(continued)

	POS LASER CARD	POS LASER CARD	POS LASER CARD	POS TOKEN CARD	POS TOKEN CARD	POS TOKEN CARD
f. Issuance Reconciliation						
Transmission run costs						
* Average daily transmission cost	\$104.94	\$190.45	\$269.89	\$104.94	\$190.45	\$269.89
Number of transmissions/month	22	22	22	22	22	22
Total monthly transmission run costs	\$2,308.68	\$4,189.96	\$5,937.69	\$2,308.68	\$4,189.96	\$5,937.69
Communication costs						
* Communication cost per transmission	\$0.00	\$0.00	\$186.80	\$0.00	\$0.00	\$186.80
Number of transmissions/month	22	22	22	22	22	22
Total monthly communication cost	\$0.00	\$0.00	\$4,109.70	\$0.00	\$0.00	\$4,109.70
Archiving and Summary runs (applicable in coupon scenarios only)						
* Monthly archiving and summary run cost	N/A	N/A	N/A	N/A	N/A	N/A
Report reconciliation costs (where applicable)						
* Monthly manual reconciliation cost	N/A	N/A	N/A	N/A	N/A	N/A
Reconciliation run costs						
* Monthly reconciliation run cost	\$815.11	\$1,479.32	\$2,096.38	\$815.11	\$1,479.32	\$2,096.38
Total cost per case month	\$0.59	\$0.04	\$0.03	\$0.59	\$0.04	\$0.03
g. Indirect Costs						
Indirect cost ratios						
* Indirect cost ratio (computer center functions)	0.08	0.08	0.08	0.08	0.08	0.08
* Indirect cost ratio (state functions)	0.06	0.06	0.06	0.06	0.06	0.06
Monthly indirect cost	\$1,777.05	\$4,490.87	\$78,857.63	\$3,946.47	\$8,177.15	\$159,053.42
Total cost per case month	\$0.34	\$0.03	\$0.20	\$0.74	\$0.06	\$0.40

Exhibit E-2
(continued)

	POS LASER CARD	POS LASER CARD	POS LASER CARD	POS TOKEN CARD	POS TOKEN CARD	POS TOKEN CARD
3. RECIPIENTS USE OF BENEFITS						
a. Store Equipment						
Equipment requirements						
* Number of one-terminal stores	143	2976	6529	143	2976	6529
* Number of multi-terminal stores	30	402	1623	30	402	1623
* Average number of terminals	6.05	4.14	6.36	6.05	4.14	6.36
Number of POS terminals						
* Number of balance inquiry terminals	324	4640	16851	324	4640	16851
* Number of manual transaction recorders	12	343	1330	12	343	1330
	0	0	0	N/A	N/A	N/A
POS terminals						
* Purchase price/terminal	\$1,000.00	\$860.00	\$684.00	\$1,500.00	\$1,200.00	\$1,000.00
* Installation cost/terminal	\$50.00	\$50.00	\$50.00	\$50.00	\$50.00	\$50.00
* Expected lifetime (months)	36	36	36	36	36	36
Monthly amortized capital cost/terminal	\$31.47	\$27.27	\$22.00	\$46.45	\$37.46	\$31.47
POS terminal maintenance costs						
* Monthly maintenance cost/terminal	\$8.33	\$7.17	\$5.70	\$12.50	\$10.00	\$8.33
Balance inquiry terminals						
* Purchase price/terminal	\$900.00	\$760.00	\$584.00	\$400.00	\$380.00	\$300.00
* Expected lifetime	60	60	60	60	60	60
Monthly amortized cost per terminal	\$16.98	\$14.34	\$11.02	\$7.55	\$7.17	\$5.66
Balance inquiry terminal maintenance costs						
* Monthly maintenance cost/machine	\$7.50	\$6.33	\$4.87	\$3.33	\$3.17	\$2.50
Manual transaction recorder						
* Purchase Price	N/A	N/A	N/A	N/A	N/A	N/A
* Expected lifetime	N/A	N/A	N/A	N/A	N/A	N/A
Monthly amortized cost/recorder	N/A	N/A	N/A	N/A	N/A	N/A
Supply costs						
* Monthly supply costs (overall)	\$399.01	\$5,714.29	\$20,752.46	\$399.01	\$5,714.29	\$20,752.46
Number of POS purchases						
* Ave. number POS purchases by non-FS/month	N/A	N/A	N/A	N/A	N/A	N/A
* Ave. number POS purchases by FS-only/month	8.05	8.05	8.05	8.05	8.05	8.05
Total cost per case month	\$2.56	\$1.33	\$1.27	\$3.70	\$1.77	\$1.76

E-1-8

Exhibit E-2
(continued)

	POS LASER CARD	POS LASER CARD	POS LASER CARD	POS TOKEN CARD	POS TOKEN CARD	POS TOKEN CARD
b. Other Terminals (assume no cost implications for the Food Stamp Program)						
c. Transaction Costs						
Electronic transaction costs						
* Cost per electronic transaction	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
* Number of purchase transactions/household	8.05	8.05	8.05	8.05	8.05	8.05
* Number of credit transactions/household	0.04	0.04	0.04	0.04	0.04	0.04
* Number of balance inquiries/household	2.63	2.63	2.63	2.63	2.63	2.63
* Number of rejections/household (bad PIN, insufficient balance, etc.)	0.25	0.25	0.25	0.25	0.25	0.25
Number of monthly transactions/household	10.97	10.97	10.97	10.97	10.97	10.97
Monthly electronic transaction cost	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Manual transaction costs						
* Cost per manual transaction	\$0.63	\$0.63	\$0.63	\$0.63	\$0.63	\$0.63
* Failure rate	0.00195	0.00195	0.00195	0.00195	0.00195	0.00195
* Number of purchase transactions	42665	1046500	3220000	42665	1046500	3220000
Number of manual transactions	83	2041	6279	83	2041	6279
Monthly manual transaction cost	\$52.31	\$1,283.18	\$3,948.24	\$52.31	\$1,283.18	\$3,948.24
Total cost per case month	\$0.01	\$0.01	\$0.01	\$0.00	\$0.00	\$0.00
d. Settlement Cost						
Coupon settlement costs (where applicable)						
* Total monthly coupon settlement costs	N/A	N/A	N/A	N/A	N/A	N/A
POS settlement costs						
* Cost per polling run	\$9.03	\$16.39	\$23.23	\$9.03	\$16.39	\$23.23
* Communication cost per polling run	\$16.25	\$232.00	\$1,922.70	\$16.25	\$232.00	\$1,922.70
Total monthly polling run cost	\$758.49	\$7,451.82	\$58,377.95	\$758.49	\$7,451.82	\$58,377.95
* Cost per file preparation run	\$9.03	\$16.39	\$23.23	\$9.03	\$16.39	\$23.23
Total monthly file preparation run	\$270.99	\$491.82	\$696.97	\$270.99	\$491.82	\$696.97
* Cost per transmission	\$32.09	\$58.24	\$82.54	\$32.09	\$58.24	\$82.54
Total monthly transmission cost	\$706.01	\$1,281.33	\$1,815.80	\$706.01	\$1,281.33	\$1,815.80
* ACH and wire transfer fees per run	\$47.69	\$911.10	\$2,246.99	\$47.69	\$911.10	\$2,246.99
Total monthly settlement fees	\$1,049.07	\$20,484.19	\$49,433.73	\$1,049.07	\$20,484.19	\$49,433.73
Total monthly POS settlement costs	\$2,784.57	\$29,709.15	\$110,324.44	\$2,784.57	\$29,709.15	\$110,324.44
Total cost per case month	\$0.53	\$0.23	\$0.28	\$0.53	\$0.23	\$0.28

Exhibit E-2
(continued)

	POS LASER CARD	POS LASER CARD	POS LASER CARD	POS TOKEN CARD	POS TOKEN CARD	POS TOKEN CARD
e. Settlement Reconciliation Cost						
Reconciliation costs						
* Cost per reconciliation run	\$41.53	\$75.37	\$106.81	\$41.53	\$75.37	\$106.81
Total reconciliation run cost per month	\$913.63	\$1,658.12	\$2,349.76	\$913.63	\$1,658.12	\$2,349.76
Total cost per case month	\$0.17	\$0.01	\$0.01	\$0.17	\$0.01	\$0.01
f. Archiving and Report Generation Costs						
* Cost per run	\$7.71	\$14.00	\$19.83	\$7.71	\$14.00	\$19.83
Total monthly archiving/report run cost	\$231.37	\$419.90	\$595.05	\$231.37	\$419.90	\$595.05
Total cost per case month	\$0.04	\$0.00	\$0.00	\$0.04	\$0.00	\$0.00
g. Handling Recipient Balance Problems						
* Labor cost	\$272.74	\$6,689.75	\$20,583.85	\$272.74	\$6,689.75	\$20,583.85
* Equipment cost	\$5.82	\$116.33	\$357.95	\$5.82	\$116.33	\$357.95
Total cost per case month	\$0.05	\$0.05	\$0.05	\$0.05	\$0.05	\$0.05
h. Handling Grocer Problems						
* Labor cost	\$2,824.21	\$5,648.42	\$13,631.11	\$2,824.21	\$5,648.42	\$13,631.11
* Equipment cost	\$60.23	\$1,204.65	\$3,706.62	\$60.23	\$1,204.65	\$3,706.62
Total cost per case month	\$0.54	\$0.05	\$0.04	\$0.54	\$0.05	\$0.04
i. Indirect Cost						
Indirect cost rates						
* Indirect cost rate (computer center)	0.08	0.08	0.08	0.08	0.08	0.08
* Indirect cost rate (state/local)	0.08	0.08	0.06	0.08	0.08	0.06
Total monthly indirect cost	\$1,739.29	\$18,487.25	\$55,243.68	\$2,246.26	\$23,196.89	\$71,383.97
Total cost per case month	\$0.33	\$0.14	\$0.14	\$0.42	\$0.18	\$0.18

Exhibit E-2
(continued)

	POS LASER CARD	POS LASER CARD	POS LASER CARD	POS TOKEN CARD	POS TOKEN CARD	POS TOKEN CARD
4. HOUSEKEEPING OPERATIONS AT THE COMPUTER CENTER						
a. Hardware Costs						
* Purchase price	\$529,635.00	\$586,770.00	\$596,770.00	\$529,635.00	\$586,770.00	\$596,770.00
* Expected lifetime (months)	60	60	60	60	60	60
Total monthly amortized hardware costs	\$9,994.87	\$11,073.07	\$11,261.79	\$9,994.87	\$11,073.07	\$11,261.79
b. Software Costs						
* Monthly maintenance fee	\$2,000.00	\$2,000.00	\$2,000.00	\$2,000.00	\$2,000.00	\$2,000.00
c. Fixed Communications Costs						
* Monthly line costs	\$219.10	\$1,439.80	\$7,696.10	\$219.10	\$1,439.80	\$6,906.10
* Hardware purchase and installation of communications equipment	\$24,400.00	\$73,200.00	\$146,600.00	\$24,400.00	\$73,200.00	\$146,600.00
* Expected lifetime (months)	36	36	36	36	36	36
Total monthly cost	\$950.39	\$3,633.67	\$12,089.83	\$950.39	\$3,633.67	\$11,299.83
d. Labor Costs						
* Total monthly labor cost	\$17,645.83	\$32,025.00	\$45,383.33	\$17,645.83	\$32,025.00	\$45,383.33
* Total monthly unassignable labor cost	\$10,406.70	\$18,886.87	\$26,765.00	\$10,406.70	\$18,886.87	\$26,765.00
e. Environment Costs						
* Rent	\$5,666.00	\$5,666.00	\$5,666.00	\$5,666.00	\$5,666.00	\$5,666.00
* Preparation	\$1,698.41	\$1,698.41	\$1,698.41	\$1,698.41	\$1,698.41	\$1,698.41
* Utilities	\$3,000.00	\$3,000.00	\$3,000.00	\$3,000.00	\$3,000.00	\$3,000.00
* Maintenance (UPS, A/C)	\$425.00	\$425.00	\$425.00	\$425.00	\$425.00	\$425.00
* Total monthly environment cost	\$10,789.41	\$10,789.41	\$10,789.41	\$10,789.41	\$10,789.41	\$10,789.41
Total direct cost per case month	\$6.44	\$0.36	\$0.16	\$6.44	\$0.36	\$0.16
f. Indirect Costs						
Indirect cost						
* Indirect cost rate	0.08	0.08	0.08	0.08	0.08	0.08
Monthly indirect cost	\$2,731.31	\$3,710.64	\$5,032.48	\$2,731.31	\$3,710.64	\$4,969.28
Total indirect cost per case month	\$0.52	\$0.03	\$0.01	\$0.52	\$0.03	\$0.01
5. Other Food Stamp Program Costs						
a. Retailer Management						
Training cost						
* Total monthly cost	\$182.85	\$4,485.00	\$13,800.00	\$182.85	\$4,485.00	\$13,800.00
General management cost						
* Total monthly cost	\$1,421.46	\$34,866.00	\$107,280.00	\$1,421.46	\$34,866.00	\$107,280.00
Total cost per case month	\$0.30	\$0.30	\$0.30	\$0.30	\$0.30	\$0.30

Exhibit E-2
(continued)

	POS LASER CARD	POS LASER CARD	POS LASER CARD	POS TOKEN CARD	POS TOKEN CARD	POS TOKEN CARD
b. Redemption Monitoring						
• Total monthly cost	\$850.12	\$20,852.00	\$64,160.00	\$850.12	\$20,852.00	\$64,160.00
Total cost per case month	\$0.16	\$0.16	\$0.16	\$0.16	\$0.16	\$0.16
c. Indirect Costs						
Indirect labor costs						
• Indirect cost rate (Compliance Branch)						
• Indirect cost rate (Administrative Review Office)	0.12	0.12	0.12	0.12	0.12	0.12
• Indirect cost rate (Minneapolis Data Center)	0.01	0.01	0.01	0.01	0.01	0.01
• Indirect cost rate (FNS)	0.01	0.01	0.01	0.01	0.01	0.01
• Indirect cost rate (PDPW/OIS)	0.27	0.27	0.27	0.27	0.27	0.27
Monthly indirect non-labor cost	0.06	0.06	0.06	0.06	0.06	0.06
	\$28.09	\$689.00	\$2,120.00	\$28.09	\$689.00	\$2,120.00
Total cost per case month	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01
TOTAL SYSTEM OPERATING COST PER CASE MONTH	----- \$17.55	----- \$3.89	----- \$5.78	----- \$24.15	----- \$5.02	----- \$9.12

Exhibit E-3

DETAILED BREAKDOWN OF OPERATING COSTS
 PURE POS SYSTEMS
 WITH
 CHIP CARD ACCESS DEVICE USING TELEPHONY ISSUANCE AND
 NON-STANDARD MAGNETIC STRIPE ACCESS DEVICE USING MAIL-OUT ISSUANCE

SYSTEM PARAMETERS	SYSTEM: CARD TYPE:	POS MAIL-OUT		POS MAIL-OUT		POS MAIL-OUT		POS TELEPHONY		POS TELEPHONY		POS TELEPHONY	
		NS	MAG	NS	MAG	NS	MAG	NS	MAG	NS	MAG	NS	MAG
* Food stamp caseload			5300		130000		400000		5300		130000		400000
* Interest rate			0.05		0.05		0.05		0.05		0.05		0.05
1. PROVIDING RECIPIENTS WITH ACCESS DEVICES													
a. Raw Card Stock													
Card needs													
* Total annual applications			N/A		N/A		N/A		4862		119257		366945
* Annual approval rate			N/A		N/A		N/A		0.79		0.79		0.79
* Annual number of new FS households			N/A		N/A		N/A		3824		93799		288612
* Annual number of damaged cards			N/A		N/A		N/A		64		1560		4800
* Proportion lost/stolen cards per month			N/A		N/A		N/A		0.01		0.01		0.01
Annual number of lost/stolen cards			N/A		N/A		N/A		852		20904		64320
Annual number of cards needed			N/A		N/A		N/A		4740		116263		357732
Monthly number of cards needed			N/A		N/A		N/A		395		9689		29811
Monthly number of disposable cards needed			5618		137800		424000		N/A		N/A		N/A
Card costs													
* Price per blank card			N/A		N/A		N/A		\$12.00		\$7.75		\$6.25
* Price per blank disposable card			\$1.34		\$0.15		\$0.13		N/A		N/A		N/A
Total cost per case month			\$1.42		\$0.16		\$0.14		\$0.89		\$0.58		\$0.47
b. Equipment for Card Fabrication/Encoding													
Amortized capital costs													
* Number of machines required			1		1		1		1		20		100
* Purchase price			\$10,845.00		\$33,955.00		\$43,530.00		\$1,200.00		\$1,200.00		\$1,200.00
* Expected lifetime (months)			60		60		60		60		60		60
Monthly amortized capital costs/machine			\$204.66		\$640.77		\$821.46		\$22.65		\$22.65		\$22.65
Maintenance costs													
* Monthly maintenance cost/machine			\$85.86		\$268.81		\$344.61		\$9.50		\$9.50		\$9.50
Total monthly cost			\$290.51		\$909.58		\$1,166.08		\$32.15		\$642.91		\$1,214.55
Total cost per case month			\$0.05		\$0.01		\$0.00		\$0.01		\$0.00		\$0.01

**Exhibit E-3
(continued)**

	POS MAIL-OUT		POS MAIL-OUT		POS MAIL-OUT		POS TELEPHONY		POS TELEPHONY	
	NS	MAG CARD	NS	MAG CARD	NS	MAG CARD	CHIP CARD	CHIP CARD	CHIP CARD	CHIP CARD
c. Communications/Postage Costs for Initialization										
Communications costs										
* Average cost per connect	\$0.07		\$0.07		\$0.13		\$0.07		\$0.07	\$0.11
Monthly number of initializations	N/A		N/A		N/A		395		9689	29811
* Monthly proportion of caseload making queries	0.12		0.12		0.12		0.12		0.12	0.12
Number of queries per month	632		15496		47680		632		15496	47680
Communications cost per month	\$44.22		\$1,084.72		\$6,198.40		\$71.87		\$1,762.92	\$10,073.83
Postage cost										
* Monthly card mailing cost	\$955.06		\$23,426.00		\$72,080.00		\$0.00		\$0.00	\$0.00
Total cost per case month	\$0.19		\$0.19		\$0.20		\$0.01		\$0.01	\$0.03
d. Labor for Fabrication, Initialization, Training, etc.										
* Labor cost per case month	\$0.45		\$0.45		\$0.45		\$0.45		\$0.45	\$0.45
e. Indirect Costs										
* Indirect labor cost ratio	0.06		0.06		0.06		0.08		0.08	0.06
Indirect labor cost per case month	\$0.03		\$0.03		\$0.03		\$0.04		\$0.04	\$0.03
* Indirect non-labor cost ratio	0.06		0.06		0.06		0.08		0.08	0.06
Indirect non-labor cost per case month	\$0.10		\$0.02		\$0.02		\$0.07		\$0.05	\$0.03
Total cost per case month	\$0.13		\$0.05		\$0.05		\$0.11		\$0.08	\$0.06

Exhibit E-3
(continued)

	POS MAIL-OUT			POS TELEPHONY		
	NS	MAG	CARD	NS	MAG	CARD
2. BENEFIT AUTHORIZATION						
a. Issuance Machines						
Equipment requirements						
* Number of machines	N/A	N/A	N/A	27	62	1587
Amortized capital costs						
* Purchase price/machine	N/A	N/A	N/A	\$2,300.00	\$2,300.00	\$1,250.00
* Installation cost/machine	N/A	N/A	N/A	\$200.00	\$200.00	\$200.00
* Expected lifetime (months)	N/A	N/A	N/A	60	60	60
Monthly amortized capital cost/machine	N/A	N/A	N/A	\$47.18	\$47.18	\$27.36
Maintenance costs						
* Monthly maintenance cost/machine	N/A	N/A	N/A	\$19.17	\$19.17	\$10.42
Stocking costs						
* Monthly stocking cost/machine	N/A	N/A	N/A	N/A	N/A	N/A
Supply costs						
* Monthly supply cost/machine	N/A	N/A	N/A	\$2.50	\$2.50	\$2.50
Environment costs						
* Monthly space rental cost/machine	N/A	N/A	N/A	\$25.00	\$25.00	\$25.00
* Monthly utilities cost/machine	N/A	N/A	N/A	\$25.00	\$25.00	\$25.00
Monthly environment cost/machine	N/A	N/A	N/A	\$50.00	\$50.00	\$50.00
Total cost per case month	N/A	N/A	N/A	\$0.61	\$0.06	\$0.36
b. Issuance File Creation						
Regular issuance file creation costs						
* Cost per regular issuance	\$214.99	\$1,054.69	\$3,245.19	\$143.33	\$1,054.69	\$3,245.19
* Number of regular issuances/month	2	10	10	3	10	10
Monthly regular issuance cost	\$429.99	\$10,546.88	\$32,451.94	\$429.99	\$10,546.88	\$32,451.94
Non-recurring issuance file creation costs						
* Cost per non-recurring issuance	\$2.11	\$51.67	\$158.99	\$2.00	\$51.67	\$158.99
* Number of non-recurring issuances/month	22	22	22	22	22	22
Monthly non-recurring issuance cost	\$46.35	\$1,136.81	\$3,497.88	\$44.03	\$1,136.81	\$3,497.88
Issuance tape daily delivery fee						
* Number of deliveries	N/A	N/A	N/A	\$5.00	\$5.00	\$5.00
Monthly tape delivery cost	N/A	N/A	N/A	\$110.00	\$110.00	\$110.00
Total cost per case month	\$0.09	\$0.09	\$0.09	\$0.11	\$0.09	\$0.09

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**Exhibit E-3
(continued)**

	POS MAIL-OUT			POS MAIL-OUT			POS MAIL-OUT			POS TELEPHONY		POS TELEPHONY		POS TELEPHONY	
	NS	MAG	CARD	NS	MAG	CARD	NS	MAG	CARD	CHIP	CARD	CHIP	CARD	CHIP	CARD
c. Issuance Posting															
Transmission run costs															
* Average daily transmission run cost	N/A			N/A			N/A			N/A		N/A		N/A	
Number of transmissions runs/month	N/A			N/A			N/A			22		22		22	
Monthly transmission run cost	N/A			N/A			N/A			N/A		N/A		N/A	
Communication costs															
* Communication cost per transmission	N/A			N/A			N/A			\$0.10		\$0.10		\$0.10	
Number of transmissions/month	N/A			N/A			N/A			5814		142612		438805	
Monthly communication cost	N/A			N/A			N/A			\$581.42		\$14,261.17		\$43,880.51	
Total cost per case month	N/A			N/A			N/A			\$0.11		\$0.11		\$0.11	
d. Coupons (where applicable)															
* Total cost per case month	N/A			N/A			N/A			N/A		N/A		N/A	
e. Recipient Access															
Transaction costs															
* Proportion of caseload - regular issuance	1.00			1.00			1.00			1.00		1.00		1.00	
* Proportion of caseload - non-recurring issuance	0.06			0.06			0.06			0.06		0.06		0.06	
* Proportion of issuances not picked up	0.09			0.09			0.09			0.09		0.09		0.09	
Number of monthly issuance transactions	5155			126451			389080			5155		126451		389080	
* Proportion of caseload making balance inquiries	2.63			2.63			2.63			2.63		2.63		2.63	
* Proportion of caseload trying unauthorized access	0.25			0.25			0.25			0.25		0.25		0.25	
Number of other monthly transactions	15225			373451			1149080			15225		373451		1149080	
* Cost per transaction	\$0.00			\$0.00			\$0.00			\$0.00		\$0.00		\$0.00	
Total monthly transaction costs	\$0.00			\$0.00			\$0.00			\$0.00		\$0.00		\$0.00	
Total cost per case month	\$0.00			\$0.00			\$0.00			\$0.00		\$0.00		\$0.00	

**Exhibit E-3
(continued)**

	POS MAIL-OUT		POS MAIL-OUT		POS MAIL-OUT		POS TELEPHONY		POS TELEPHONY		POS TELEPHONY	
	NS	MAG CARD	NS	MAG CARD	NS	MAG CARD	CHIP CARD	CHIP CARD	CHIP CARD	CHIP CARD	CHIP CARD	CHIP CARD
f. Issuance Reconciliation												
Transmission run costs												
* Average daily transmission cost	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Number of transmissions/month	N/A	N/A	N/A	N/A	N/A	N/A	22	22	22	22	22	22
Total monthly transmission run costs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Communication costs												
* Communication cost per transmission	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Number of transmissions/month	N/A	N/A	N/A	N/A	N/A	N/A	22	22	22	22	22	22
Total monthly communication cost	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Archiving and Summary runs (applicable in coupon scenarios only)												
* Monthly archiving and summary run cost	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Report reconciliation costs (where applicable)												
* Monthly manual reconciliation cost	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Reconciliation run costs												
* Monthly reconciliation run cost	\$815.11	\$1,479.32	\$2,096.38	\$815.11	\$1,479.32	\$2,096.38	\$815.11	\$1,479.32	\$2,096.38	\$815.11	\$1,479.32	\$2,096.38
Total cost per case month	\$0.15	\$0.01	\$0.01	\$0.15	\$0.01	\$0.01	\$0.15	\$0.01	\$0.01	\$0.15	\$0.01	\$0.01
g. Indirect Costs												
Indirect cost ratios												
* Indirect cost ratio (computer center functions)	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
* Indirect cost ratio (state functions)	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Monthly indirect cost	\$94.88	\$846.24	\$2,407.38	\$94.88	\$846.24	\$2,407.38	\$404.81	\$2,581.46	\$717.62	\$404.81	\$2,581.46	\$717.62
Total cost per case month	\$0.02	\$0.01	\$0.01	\$0.02	\$0.01	\$0.01	\$0.02	\$0.02	\$0.02	\$0.02	\$0.02	\$0.02

Exhibit E-3
(continued)

	POS MAIL-OUT HS MAG CARD	POS MAIL-OUT HS MAG CARD	POS MAIL-OUT HS MAG CARD	POS TELEPHONY CHIP CARD	POS TELEPHONY CHIP CARD	POS TELEPHONY CHIP CARD
1. RECIPIENTS USE OF BENEFITS						
a. Store Equipment						
Equipment requirements						
* Number of one-terminal stores	143	2976	6529	143	2976	6529
* Number of multi-terminal stores	30	402	1623	30	402	1623
* Average number of terminals	6.05	4.14	6.36	6.05	4.14	6.36
Number of POS terminals	324	4640	16851	324	4640	16851
* Number of balance inquiry terminals	12	143	1330	12	343	1330
Number of manual transaction recorders	N/A	N/A	N/A	143	2976	6529
POS terminals						
* Purchase price/terminal	\$678.00	\$565.00	\$427.00	\$748.00	\$635.00	\$497.00
* Installation cost/terminal	\$50.00	\$50.00	\$50.00	\$50.00	\$50.00	\$50.00
* Expected lifetime (months)	36	36	36	36	36	36
Monthly amortized capital cost/terminal	\$21.82	\$18.43	\$14.30	\$23.92	\$20.53	\$16.39
POS terminal maintenance costs						
* Monthly maintenance cost/terminal	\$5.65	\$4.71	\$3.56	\$6.23	\$5.29	\$4.14
Balance inquiry terminals						
* Purchase price/terminal	\$220.00	\$150.00	\$135.00	\$300.00	\$200.00	\$165.00
* Expected lifetime	60	60	60	60	60	60
Monthly amortized cost per terminal	\$4.15	\$2.83	\$2.55	\$5.66	\$3.77	\$3.11
Balance inquiry terminal maintenance costs						
* Monthly maintenance cost/machine	\$1.83	\$1.25	\$1.13	\$2.50	\$1.67	\$1.38
Manual transaction recorder						
* Purchase Price	N/A	N/A	N/A	\$430.00	\$417.00	\$291.00
* Expected lifetime	N/A	N/A	N/A	60	60	60
Monthly amortized cost/recorder	N/A	N/A	N/A	\$8.11	\$7.87	\$5.49
Supply costs						
* Monthly supply costs (overall)	\$199.01	\$5,714.29	\$20,752.46	\$399.01	\$5,714.29	\$20,752.46
Number of POS purchases						
* Ave. number POS purchases by non-FS/month	N/A	N/A	N/A	N/A	N/A	N/A
* Ave. number POS purchases by FS-only/month	8.05	8.05	8.05	8.05	8.05	8.05
Total cost per case month	\$1.77	\$0.88	\$0.82	\$2.16	\$1.16	\$1.02

Exhibit E-3
(continued)

	POS MAIL-OUT		POS MAIL-OUT		POS MAIL-OUT		POS TELEPHONY		POS TELEPHONY		POS TELEPHONY	
	NS	MAG CARD	NS	MAG CARD	NS	MAG CARD	CHIP CARD	CHIP CARD	CHIP CARD	CHIP CARD	CHIP CARD	CHIP CARD
b. Other Terminals (assume no cost implications for the Food Stamp Program)												
c. Transaction Costs												
Electronic transaction costs												
* Cost per electronic transaction	\$0.00		\$0.00		\$0.00		\$0.00		\$0.00		\$0.00	
* Number of purchase transactions/household	8.05		8.05		8.05		8.05		8.05		8.05	
* Number of credit transactions/household	0.04		0.04		0.04		0.04		0.04		0.04	
* Number of balance inquiries/household	2.63		2.63		2.63		2.63		2.63		2.63	
* Number of rejections/household (bad PIN, insufficient balance, etc.)	0.25		0.25		0.25		0.25		0.25		0.25	
Number of monthly transactions/household	10.97		10.97		10.97		10.97		10.97		10.97	
Monthly electronic transaction cost	\$0.00		\$0.00		\$0.00		\$0.00		\$0.00		\$0.00	
Manual transaction costs												
* Cost per manual transaction	\$0.63		\$0.63		\$0.63		\$0.63		\$0.63		\$0.63	
* Failure rate	0.00195		0.00195		0.00195		0.00195		0.00195		0.00195	
* Number of purchase transactions	42665		1046500		3220000		42665		1046500		3220000	
Number of manual transactions	83		2041		6279		83		2041		6279	
Monthly manual transaction cost	\$52.31		\$1,283.18		\$3,948.24		\$52.31		\$1,283.18		\$1,948.24	
Total cost per case month	\$0.00		\$0.00		\$0.00		\$0.01		\$0.01		\$0.01	
d. Settlement Cost												
Coupon settlement costs (where applicable)												
* Total monthly coupon settlement costs	N/A		N/A		N/A		N/A		N/A		N/A	
POS settlement costs												
* Cost per polling run	\$9.03		\$16.39		\$23.23		\$9.03		\$16.39		\$23.23	
* Communication cost per polling run	\$16.25		\$232.00		\$1,922.70		\$16.25		\$232.00		\$1,922.70	
Total monthly polling run cost	\$758.49		\$7,451.82		\$58,377.95		\$758.49		\$7,451.82		\$58,377.95	
* Cost per file preparation run	\$9.03		\$16.39		\$23.23		\$9.03		\$16.39		\$23.23	
Total monthly file preparation run	\$270.99		\$491.82		\$696.97		\$270.99		\$491.82		\$696.97	
* Cost per transmission	\$32.09		\$58.24		\$82.54		\$32.09		\$58.24		\$82.54	
Total monthly transmission cost	\$706.01		\$1,281.33		\$1,815.80		\$706.01		\$1,281.33		\$1,815.80	
* ACH and wire transfer fees per run	\$47.69		\$931.10		\$2,246.99		\$47.69		\$931.10		\$2,246.99	
Total monthly settlement fees	\$1,049.07		\$20,484.19		\$49,433.73		\$1,049.07		\$20,484.19		\$49,433.73	
Total monthly POS settlement costs	\$2,784.57		\$29,709.15		\$110,324.44		\$2,784.57		\$29,709.15		\$110,324.44	
Total cost per case month	\$0.53		\$0.23		\$0.28		\$0.53		\$0.23		\$0.28	

**Exhibit E-3
(continued)**

	POS MAIL-OUT NS MAG CARD	POS MAIL-OUT NS MAG CARD	POS MAIL-OUT NS MAG CARD	POS TELEPHONY CHIP CARD	POS TELEPHONY CHIP CARD	POS TELEPHONY CHIP CARD
e. Settlement Reconciliation Cost						
Reconciliation costs						
* Cost per reconciliation run	\$41.53	\$75.37	\$106.81	\$41.53	\$75.37	\$106.81
Total reconciliation run cost per month	\$913.63	\$1,658.12	\$2,349.76	\$913.63	\$1,658.12	\$2,349.76
Total cost per case month	\$0.17	\$0.01	\$0.01	\$0.17	\$0.01	\$0.01
f. Archiving and Report Generation Costs						
* Cost per run	\$7.71	\$14.00	\$19.83	\$7.71	\$14.00	\$19.83
Total monthly archiving/report run cost	\$231.37	\$419.90	\$595.05	\$231.37	\$419.90	\$595.05
Total cost per case month	\$0.04	\$0.00	\$0.00	\$0.04	\$0.00	\$0.00
g. Handling Recipient Balance Problems						
* Labor cost	\$272.74	\$6,689.75	\$20,583.85	\$272.74	\$6,689.75	\$20,583.85
* Equipment cost	\$5.82	\$116.33	\$357.95	\$5.82	\$116.33	\$357.95
Total cost per case month	\$0.05	\$0.05	\$0.05	\$0.05	\$0.05	\$0.05
h. Handling Grocer Problems						
* Labor cost	\$2,824.21	\$5,648.42	\$13,631.11	\$2,824.21	\$5,648.42	\$13,631.11
* Equipment cost	\$60.23	\$1,204.65	\$3,706.62	\$60.23	\$1,204.65	\$3,706.62
Total cost per case month	\$0.54	\$0.05	\$0.04	\$0.54	\$0.05	\$0.04
i. Indirect Cost						
Indirect cost rates						
* Indirect cost rate (computer center)	0.08	0.08	0.08	0.08	0.08	0.08
* Indirect cost rate (state/local)	0.08	0.08	0.06	0.08	0.08	0.06
Total monthly indirect cost	\$1,378.24	\$13,467.41	\$39,589.50	\$1,556.30	\$16,643.31	\$46,783.01
Total cost per case month	\$0.26	\$0.10	\$0.10	\$0.29	\$0.13	\$0.12

Exhibit E-3
(continued)

	POS MAIL-OUT		POS MAIL-OUT		POS MAIL-OUT		POS TELEPHONY		POS TELEPHONY		POS TELEPHONY	
	NS	MAG CARD	NS	MAG CARD	NS	MAG CARD	CHIP CARD	CHIP CARD	CHIP CARD	CHIP CARD	CHIP CARD	CHIP CARD
4. HOUSEKEEPING OPERATIONS AT THE COMPUTER CENTER												
a. Hardware Costs												
• Purchase price	\$529,635.00	\$586,770.00	\$596,770.00	\$562,635.00	\$689,770.00	\$699,770.00						
• Expected lifetime (months)	60	60	60	60	60	60						
Total monthly amortized hardware costs	\$9,994.87	\$11,073.07	\$11,261.79	\$10,617.62	\$13,016.81	\$13,205.52						
b. Software Costs												
• Monthly maintenance fee	\$2,000.00	\$2,000.00	\$2,000.00	\$2,000.00	\$2,000.00	\$2,000.00						
c. Fixed Communications Costs												
• Monthly line costs	\$219.10	\$1,439.80	\$6,906.10	\$219.10	\$1,439.80	\$7,696.10						
• Hardware purchase and installation of communications equipmen	\$24,400.00	\$73,200.00	\$121,600.00	\$24,400.00	\$73,200.00	\$146,600.00						
• Expected lifetime (months)	36	36	36	36	36	36						
Total monthly cost	\$950.39	\$3,633.67	\$10,550.56	\$950.39	\$3,633.67	\$12,089.83						
d. Labor Costs												
• Total monthly labor cost	\$17,645.83	\$32,025.00	\$45,383.33	\$17,645.83	\$32,025.00	\$45,383.33						
• Total monthly unassignable labor cost	\$14,437.73	\$26,202.69	\$37,132.41	\$14,437.73	\$26,202.69	\$37,132.41						

**Exhibit E-3
(continued)**

	POS MAIL-OUT NS MAG CARD	POS MAIL-OUT NS MAG CARD	POS MAIL-OUT NS MAG CARD	POS TELEPHONY CHIP CARD	POS TELEPHONY CHIP CARD	POS TELEPHONY CHIP CARD
b. Redemption Monitoring						
• Total monthly cost	\$850.12	\$20,852.00	\$64,160.00	\$850.12	\$20,852.00	\$64,160.00
Total cost per case month	\$0.16	\$0.16	\$0.16	\$0.16	\$0.16	\$0.16
c. Indirect Costs						
Indirect labor costs						
• Indirect cost rate (Compliance Branch)						
• Indirect cost rate (Administrative Review Office)	0.12	0.12	0.12	0.12	0.12	0.12
• Indirect cost rate (Minneapolis Data Center)	0.01	0.01	0.01	0.01	0.01	0.01
• Indirect cost rate (FNS)	0.01	0.01	0.01	0.01	0.01	0.01
• Indirect cost rate (PDPW/OIS)	0.27	0.27	0.27	0.27	0.27	0.27
Monthly indirect non-labor cost	0.06	0.06	0.06	0.06	0.06	0.06
	\$28.09	\$689.00	\$2,120.00	\$28.09	\$689.00	\$2,120.00
Total cost per case month	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01
TOTAL SYSTEM OPERATING COST PER CASE MONTH	=====	=====	=====	=====	=====	-----
	\$14.12	\$3.21	\$2.90	\$14.70	\$4.00	\$1.82

Exhibit E-4

DETAILED BREAKDOWN OF OPERATING COSTS
POS/ACD SYSTEMS
WITH
STANDARD MAGNETIC STRIPE AND CHIP CARD ACCESS DEVICES

SYSTEM PARAMETERS	SYSTEM:	POS/ACD	POS/ACD	POS/ACD	POS/ACD	POS/ACD	POS/ACD
	CARD TYPE:	STANDARD MAG STRIPE	STANDARD MAG STRIPE	STANDARD MAG STRIPE	CHIP CARD	CHIP CARD	CHIP CARD
Food stamp caseload		5300	130000	400000	5300	130000	400000
* Interest rate		0.05	0.05	0.05	0.05	0.05	0.05
1. PROVIDING RECIPIENTS WITH ACCESS DEVICES							
a. Raw Card Stock							
Card needs							
* Total annual applications		4862	119257	366945	4862	119257	366945
* Annual approval rate		0.79	0.79	0.79	0.79	0.79	0.79
Annual number of new FS households		3824	93799	288612	3824	93799	288612
* Annual number of damaged cards		32	780	2400	64	1560	4800
* Proportion lost/stolen cards per month		0.01	0.01	0.01	0.01	0.01	0.01
Annual number of lost/stolen cards		852	20904	64320	852	20904	64320
Annual number of cards needed		4708	115483	355332	4740	116263	357732
Monthly number of cards needed		392	9624	29611	395	9689	29811
Monthly number of disposable cards needed		N/A	N/A	N/A	N/A	N/A	N/A
Card costs							
* Price per blank card		\$0.40	\$0.30	\$0.12	\$12.00	\$7.75	\$6.25
* Price per blank disposable card		N/A	N/A	N/A	N/A	N/A	N/A
Total cost per case month		\$0.03	\$0.02	\$0.01	\$0.89	\$0.58	\$0.47
b. Equipment for Card Fabrication/Encoding							
Amortized capital costs							
* Number of machines required		1	1	1	1	20	100
* Purchase price		\$8,845.00	\$31,955.00	\$41,530.00	\$1,200.00	\$1,200.00	\$1,200.00
* Expected lifetime (months)		60	60	60	60	60	60
Monthly amortized capital costs/machine		\$166.92	\$603.03	\$783.72	\$22.65	\$22.65	\$22.65
Maintenance costs							
* Monthly maintenance cost/machine		\$70.02	\$252.98	\$328.78	\$9.50	\$9.50	\$9.50
Total monthly cost		\$236.94	\$856.01	\$1,112.50	\$32.15	\$642.91	\$3,214.55
Total cost per case month		\$0.04	\$0.01	\$0.00	\$0.01	\$0.00	\$0.01

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**Exhibit E-4
(continued)**

	POS/ACD STANDARD MAG STRIPE	POS/ACD STANDARD MAG STRIPE	POS/ACD STANDARD MAG STRIPE	POS/ACD CHIP CARD	POS/ACD CHIP CARD	POS/ACD CHIP CARD
c. Communications/Postage Costs for Initialization						
Communications costs						
* Average cost per connect	\$0.07	\$0.07	\$0.11	\$0.07	\$0.07	\$0.11
Monthly number of initializations	392	9624	N/A	395	9689	29811
* Monthly proportion of caseload making queries	0.12	0.12	0.12	0.12	0.12	0.12
Number of queries per month	632	15496	47680	632	15496	47680
Communications cost per month	\$71.69	\$1,758.37	\$6,198.40	\$71.87	\$1,762.92	\$10,073.83
Postage cost						
* Monthly card mailing cost	\$0.00	\$0.00	\$2,358.40	\$0.00	\$0.00	\$0.00
Total cost per case month	\$0.01	\$0.01	\$0.02	\$0.01	\$0.01	\$0.03
d. Labor for Fabrication, Initialization, Training, etc.						
* Labor cost per case month	\$0.45	\$0.45	\$0.45	\$0.45	\$0.45	\$0.45
e. Indirect Costs						
* Indirect labor cost ratio	0.08	0.08	0.06	0.08	0.08	0.06
Indirect labor cost per case month	\$0.04	\$0.04	\$0.03	\$0.04	\$0.04	\$0.03
* Indirect non-labor cost ratio	0.08	0.08	0.06	0.08	0.08	0.06
Indirect non-labor cost per case month	\$0.01	\$0.00	\$0.00	\$0.07	\$0.05	\$0.03
Total cost per case month	\$0.04	\$0.04	\$0.03	\$0.11	\$0.08	\$0.06

**Exhibit E-4
(continued)**

	POS/ACD STANDARD MAG STRIPE	POS/ACD STANDARD MAG STRIPE	POS/ACD STANDARD MAG STRIPE	POS/ACD CHIP CARD	POS/ACD CHIP CARD	POS/ACD CHIP CARD
2. BENEFIT AUTHORIZATION						
a. Issuance Machines						
Equipment requirements						
* Number of machines	27	62	1587	27	62	1587
Amortized capital costs						
* Purchase price/machine	\$27,000.00	\$22,500.00	\$18,000.00	\$28,000.00	\$23,500.00	\$19,000.00
* Installation cost/machine	\$1,500.00	\$1,500.00	\$1,500.00	\$1,500.00	\$1,500.00	\$1,500.00
* Expected lifetime (months)	60	60	60	60	60	60
Monthly amortized capital cost/machine	\$537.83	\$452.91	\$367.99	\$556.70	\$471.78	\$386.86
Maintenance costs						
* Monthly maintenance cost/machine	\$225.00	\$187.50	\$150.00	\$233.33	\$195.83	\$158.33
Stocking costs						
* Monthly stocking cost/machine	\$25.00	\$25.00	\$25.00	\$25.00	\$25.00	\$25.00
Supply costs						
* Monthly supply cost/machine	\$2.50	\$2.50	\$2.50	\$2.50	\$2.50	\$2.50
Environment costs						
* Monthly space rental cost/machine	\$300.00	\$300.00	\$300.00	\$300.00	\$300.00	\$300.00
* Monthly utilities cost/machine	\$50.00	\$50.00	\$50.00	\$50.00	\$50.00	\$50.00
Monthly environment cost/machine	\$350.00	\$350.00	\$350.00	\$350.00	\$350.00	\$350.00
Total cost per case month	\$5.81	\$0.49	\$3.55	\$5.95	\$0.50	\$3.66
b. Issuance File Creation						
Regular issuance file creation costs						
* Cost per regular issuance	\$214.99	\$1,054.69	\$3,245.19	\$214.99	\$1,054.69	\$3,245.19
* Number of regular issuances/month	2	10	10	2	10	10
Monthly regular issuance cost	\$429.99	\$10,546.88	\$32,451.94	\$429.99	\$10,546.88	\$12,451.94
Non-recurring issuance file creation costs						
* Cost per non-recurring issuance	\$2.11	\$51.67	\$158.99	\$2.11	\$51.67	\$158.99
* Number of non-recurring issuances/month	22	22	22	22	22	22
Monthly non-recurring issuance cost	\$46.35	\$1,136.81	\$3,497.88	\$46.35	\$1,136.81	\$1,497.88
Issuance tape daily delivery fee						
* Number of deliveries	\$5.00	\$5.00	\$5.00	\$5.00	\$5.00	\$5.00
Monthly tape delivery cost	22	22	22	22	22	22
Total cost per case month	\$110.00	\$110.00	\$110.00	\$110.00	\$110.00	\$110.00
Total cost per case month	\$0.11	\$0.09	\$0.09	\$0.11	\$0.09	\$0.09

Exhibit E-4
(continued)

	POS/ACD STANDARD MAG STRIPE	POS/ACD STANDARD MAG STRIPE	POS/ACD STANDARD MAG STRIPE	POS/ACD CHIP CARD	POS/ACD CHIP CARD	POS/ACD CHIP CARD
c. Issuance Posting						
Transmission run costs						
* Average daily transmission run cost	\$78.29	\$142.08	\$201.35	\$78.29	\$142.08	\$201.35
Number of transmissions runs/month	22	22	22	22	22	22
Monthly transmission run cost	\$1,722.35	\$3,125.86	\$4,429.73	\$1,722.35	\$3,125.86	\$4,429.73
Communication costs						
* Communication cost per transmission	\$0.81	\$1.86	\$194.90	\$0.81	\$1.86	\$194.90
Number of transmissions/month	22	22	22	22	22	22
Monthly communication cost	\$17.82	\$40.92	\$4,287.76	\$17.82	\$40.92	\$4,287.76
Total cost per case month	\$0.33	\$0.02	\$0.02	\$0.33	\$0.02	\$0.02
d. Coupons (where applicable)						
* Total cost per case month	\$0.06	\$0.06	\$0.06	\$0.06	\$0.06	\$0.06
e. Recipient Access						
Transaction costs						
* Proportion of caseload - regular issuance	1.00	1.00	1.00	1.00	1.00	1.00
* Proportion of caseload - non-recurring issuance	0.06	0.06	0.06	0.06	0.06	0.06
* Proportion of issuances not picked up	0.09	0.09	0.09	0.09	0.09	0.09
Number of monthly issuance transactions	5155	126451	189080	5155	126451	189080
* Proportion of caseload making balance inquiries	2.63	2.63	2.63	2.63	2.63	2.63
Number of monthly transactions	0.25	0.25	0.25	0.25	0.25	0.25
* Proportion of caseload trying unauthorized access	15225	373451	1149080	15225	373451	1149080
Number of other monthly transactions	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
* Cost per transaction	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Total monthly transaction costs	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Total cost per case month						

**Exhibit E-4
(continued)**

	POS/ACD STANDARD MAG STRIPE	POS/ACD STANDARD MAG STRIPE	POS/ACD STANDARD MAG STRIPE	POS/ACD CHIP CARD	POS/ACD CHIP CARD	POS/ACD CHIP CARD
f. Issuance Reconciliation						
Transmission run costs						
* Average daily transmission cost	\$104.94	\$190.45	\$269.89	\$104.94	\$190.45	\$269.89
Number of transmissions/month	22	22	22	22	22	22
Total monthly transmission run costs	\$2,308.68	\$4,189.96	\$5,937.69	\$2,308.68	\$4,189.96	\$5,937.69
Communication costs						
* Communication cost per transmission	\$0.00	\$0.00	\$186.80	\$0.00	\$0.00	\$186.80
Number of transmissions/month	22	22	22	22	22	22
Total monthly communication cost	\$0.00	\$0.00	\$4,109.70	\$0.00	\$0.00	\$4,109.70
Archiving and Summary runs (applicable in coupon scenarios only)						
* Monthly archiving and summary run cost	\$116.70	\$211.80	\$300.15	\$194.51	\$353.01	\$500.25
Report reconciliation costs (where applicable)						
* Monthly manual reconciliation cost	\$37.68	\$68.38	\$96.90	\$62.79	\$113.96	\$161.49
Reconciliation run costs						
* Monthly reconciliation run cost	\$668.39	\$994.70	\$1,155.88	\$668.39	\$994.70	\$1,155.88
Total cost per case month	\$0.59	\$0.04	\$0.03	\$0.61	\$0.04	\$0.03
g. Indirect Costs						
Indirect cost ratios						
* Indirect cost ratio (computer center functions)	0.08	0.08	0.08	0.08	0.08	0.08
* Indirect cost ratio (state functions)	0.06	0.06	0.06	0.06	0.06	0.06
Monthly indirect cost	\$2,889.37	\$6,474.11	\$117,563.24	\$2,956.37	\$6,623.99	\$121,038.31
Total cost per case month	\$0.55	\$0.05	\$0.29	\$0.56	\$0.05	\$0.30

**Exhibit E-4
(continued)**

3. RECIPIENTS USE OF BENEFITS	POS/ACD	POS/ACD	POS/ACD	POS/ACD	POS/ACD	POS/ACD	
	STANDARD MAG STRIPE	STANDARD MAG STRIPE	STANDARD MAG STRIPE	CHIP CARD	CHIP CARD	CHIP CARD	
a. Store Equipment							
Equipment requirements							
* Number of one-terminal stores		143	2976	6529	143	2976	6529
* Number of multi-terminal stores		30	402	1623	30	402	1623
* Average number of terminals		6.05	4.14	6.36	6.05	4.14	6.36
Number of POS terminals		324	4640	16851	324	4640	16851
* Number of balance inquiry terminals		12	343	1330	12	343	1330
Number of manual transaction recorders		143	2976	6529	143	2976	6529
POS terminals							
* Purchase price/terminal		\$678.00	\$565.00	\$427.00	\$748.00	\$635.00	\$497.00
* Installation cost/terminal		\$50.00	\$50.00	\$50.00	\$50.00	\$50.00	\$50.00
* Expected lifetime (months)		36	36	36	36	36	36
Monthly amortized capital cost/terminal		\$21.82	\$18.43	\$14.30	\$23.92	\$20.53	\$16.39
POS terminal maintenance costs							
* Monthly maintenance cost/terminal		\$5.65	\$4.71	\$3.56	\$6.23	\$5.29	\$4.14
Balance inquiry terminals							
* Purchase price/terminal		\$220.00	\$150.00	\$135.00	\$300.00	\$200.00	\$165.00
* Expected lifetime		60	60	60	60	60	60
Monthly amortized cost per terminal		\$4.15	\$2.83	\$2.55	\$5.66	\$3.77	\$3.11
Balance inquiry terminal maintenance costs							
* Monthly maintenance cost/machine		\$1.83	\$1.25	\$1.13	\$2.50	\$1.67	\$1.38
Manual transaction recorder							
* Purchase Price		\$330.00	\$317.00	\$191.00	\$430.00	\$417.00	\$291.00
* Expected lifetime		60	60	60	60	60	60
Monthly amortized cost/recorder		\$6.23	\$5.98	\$3.60	\$8.11	\$7.87	\$5.49
Supply costs							
* Monthly supply costs (overall)		\$199.01	\$5,714.29	\$20,752.46	\$199.01	\$5,714.29	\$20,752.46
Number of POS purchases							
* Ave. number POS purchases by non-FS/month		N/A	N/A	N/A	N/A	N/A	N/A
* Ave. number POS purchases by FS-only/month		8.05	8.05	8.05	8.05	8.05	8.05
Total cost per case month							
		\$1.94	\$1.02	\$0.88	\$2.16	\$1.16	\$1.02

**Exhibit E-4
(continued)**

	POS/ACD STANDARD MAG STRIPE	POS/ACD STANDARD MAG STRIPE	POS/ACD STANDARD MAG STRIPE	POS/ACD CHIP CARD	POS/ACD CHIP CARD	POS/ACD CHIP CARD
b. Other Terminals (assume no cost implications for the Food Stamp Program)						
c. Transaction Costs						
Electronic transaction costs						
* Cost per electronic transaction	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
* Number of purchase transactions/household	8.05	8.05	8.05	8.05	8.05	8.05
* Number of credit transactions/household	0.04	0.04	0.04	0.04	0.04	0.04
* Number of balance inquiries/household	2.63	2.63	2.63	2.63	2.63	2.63
* Number of rejections/household (bad PIN, insufficient balance, etc.)	0.25	0.25	0.25	0.25	0.25	0.25
Number of monthly transactions/household	10.97	10.97	10.97	10.97	10.97	10.97
Monthly electronic transaction cost	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Manual transaction costs						
* Cost per manual transaction	\$0.63	\$0.63	\$0.63	\$0.63	\$0.63	\$0.63
* Failure rate	0.00195	0.00195	0.00195	0.00195	0.00195	0.00195
* Number of purchase transactions	34985	858130	2640400	34985	858130	2640400
Number of manual transactions	68	1673	5149	68	1673	5149
Monthly manual transaction cost	\$42.90	\$1,052.20	\$3,237.55	\$42.90	\$1,052.20	\$3,237.55
Total cost per case month	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01
d. Settlement Cost						
Coupon settlement costs (where applicable)						
* Total monthly coupon settlement costs	\$130.17	\$3,192.75	\$9,823.86	\$130.17	\$3,192.75	\$9,823.86
POS settlement costs						
* Cost per polling run	\$7.41	\$13.44	\$19.05	\$7.41	\$13.44	\$19.05
* Communication cost per polling run	\$13.33	\$190.24	\$1,576.61	\$13.33	\$190.24	\$1,576.61
Total monthly polling run cost	\$621.96	\$6,110.49	\$47,869.92	\$621.96	\$6,110.49	\$47,869.92
* Cost per file preparation run	\$7.41	\$13.44	\$19.05	\$7.41	\$13.44	\$19.05
Total monthly file preparation run	\$222.21	\$403.29	\$571.51	\$222.21	\$403.29	\$571.51
* Cost per transmission	\$26.32	\$47.76	\$67.68	\$26.32	\$47.76	\$67.68
Total monthly transmission cost	\$578.93	\$1,050.69	\$1,488.95	\$578.93	\$1,050.69	\$1,488.95
* ACH and wire transfer fees per run	\$39.10	\$763.50	\$1,842.53	\$39.10	\$763.50	\$1,842.53
Total monthly settlement fees	\$860.24	\$16,797.04	\$40,535.66	\$860.24	\$16,797.04	\$40,535.66
Total monthly POS settlement costs	\$2,283.35	\$24,361.51	\$90,466.04	\$2,283.35	\$24,361.51	\$90,466.04
Total cost per case month	\$0.46	\$0.21	\$0.25	\$0.46	\$0.21	\$0.25

**Exhibit E-4
(continued)**

	POS/ACD STANDARD MAG STRIPE	POS/ACD STANDARD MAG STRIPE	POS/ACD STANDARD MAG STRIPE	POS/ACD CHIP CARD	POS/ACD CHIP CARD	POS/ACD CHIP CARD
e. Settlement Reconciliation Cost						
Reconciliation costs						
* Cost per reconciliation run	\$34.05	\$61.80	\$87.58	\$34.05	\$61.80	\$87.58
Total reconciliation run cost per month	\$749.17	\$1,359.66	\$1,926.80	\$749.17	\$1,359.66	\$1,926.80
Total cost per case month	\$0.12	\$0.01	\$0.00	\$0.12	\$0.01	\$0.00
f. Archiving and Report Generation Costs						
* Cost per run	\$6.32	\$11.48	\$16.26	\$6.32	\$11.48	\$16.26
Total monthly archiving/report run cost	\$189.72	\$344.32	\$487.94	\$189.72	\$344.32	\$487.94
Total cost per case month	\$0.04	\$0.00	\$0.00	\$0.04	\$0.00	\$0.00
g. Handling Recipient Balance Problems						
* Labor cost	\$272.74	\$6,689.75	\$20,583.85	\$272.74	\$6,689.75	\$20,583.85
* Equipment cost	\$5.82	\$116.33	\$357.95	\$5.82	\$116.33	\$357.95
Total cost per case month	\$0.05	\$0.05	\$0.05	\$0.05	\$0.05	\$0.05
h. Handling Grocer Problems						
* Labor cost	\$2,824.21	\$5,648.42	\$11,631.11	\$2,824.21	\$5,648.42	\$11,631.11
* Equipment cost	\$60.23	\$1,204.65	\$3,706.62	\$60.23	\$1,204.65	\$3,706.62
Total cost per case month	\$0.54	\$0.05	\$0.04	\$0.54	\$0.05	\$0.04
i. Indirect Cost						
Indirect cost rates						
* Indirect cost rate (computer center)	0.08	0.08	0.08	0.08	0.08	0.08
* Indirect cost rate (state/local)	0.08	0.08	0.06	0.08	0.08	0.06
Total monthly indirect cost	\$1,396.78	\$14,823.06	\$40,858.99	\$1,495.31	\$16,390.18	\$45,815.62
Total cost per case month	\$0.26	\$0.11	\$0.10	\$0.28	\$0.13	\$0.11

**Exhibit E-4
(continued)**

	POS/ACD STANDARD MAG STRIPE	POS/ACD STANDARD MAG STRIPE	POS/ACD STANDARD MAG STRIPE	POS/ACD CHIP CARD	POS/ACD CHIP CARD	POS/ACD CHIP CARD
4. HOUSEKEEPING OPERATIONS AT THE COMPUTER CENTER						
a. Hardware Costs						
* Purchase price	\$529,635.00	\$586,770.00	\$596,770.00	\$529,635.00	\$586,770.00	\$596,770.00
* Expected lifetime (months)	60	60	60	60	60	60
Total monthly amortized hardware costs	\$9,994.87	\$11,073.07	\$11,261.79	\$9,994.87	\$11,073.07	\$11,261.79
b. Software Costs						
* Monthly maintenance fee	\$2,000.00	\$2,000.00	\$2,000.00	\$2,000.00	\$2,000.00	\$2,000.00
c. Fixed Communications Costs						
* Monthly line costs	\$219.10	\$1,439.80	\$7,696.10	\$219.10	\$1,439.80	\$7,696.10
* Hardware purchase and installation of communications equipmen	\$24,400.00	\$73,200.00	\$146,600.00	\$24,400.00	\$73,200.00	\$146,600.00
* Expected lifetime (months)	36	36	36	36	36	36
Total monthly cost	\$950.39	\$3,633.67	\$12,089.83	\$950.39	\$3,633.67	\$12,089.83
d. Labor Costs						
* Total monthly labor cost	\$17,645.83	\$32,025.00	\$45,383.33	\$17,645.83	\$32,025.00	\$45,383.33
* Total monthly unassignable labor cost	\$10,829.78	\$19,873.06	\$28,416.27	\$10,726.86	\$19,686.27	\$28,151.57
e. Environment Costs						
* Rent	\$5,666.00	\$5,666.00	\$5,666.00	\$5,666.00	\$5,666.00	\$5,666.00
* Preparation	\$1,698.41	\$1,698.41	\$1,698.41	\$1,698.41	\$1,698.41	\$1,698.41
* Utilities	\$3,000.00	\$3,000.00	\$3,000.00	\$3,000.00	\$3,000.00	\$3,000.00
* Maintenance (UPS, A/C)	\$425.00	\$425.00	\$425.00	\$425.00	\$425.00	\$425.00
* Total monthly environment cost	\$10,789.41	\$10,789.41	\$10,789.41	\$10,789.41	\$10,789.41	\$10,789.41
Total direct cost per case month	\$6.52	\$0.36	\$0.16	\$6.50	\$0.36	\$0.16
f. Indirect Costs						
Indirect cost						
* Indirect cost rate	0.08	0.08	0.08	0.08	0.08	0.08
Monthly indirect cost	\$2,765.16	\$3,789.54	\$5,164.58	\$2,756.92	\$3,774.59	\$5,143.41
Total indirect cost per case month	\$0.52	\$0.03	\$0.01	\$0.52	\$0.03	\$0.01
5. Other Food Stamp Program Costs						
a. Retailer Management						
Training cost						
* Total monthly cost	\$182.85	\$4,485.00	\$13,800.00	\$182.85	\$4,485.00	\$13,800.00
General management cost						
* Total monthly cost	\$1,421.46	\$34,866.00	\$107,280.00	\$1,421.46	\$34,866.00	\$107,280.00
Total cost per case month	\$0.30	\$0.30	\$0.30	\$0.30	\$0.30	\$0.30

**Exhibit E-4
(continued)**

	POS/ACD STANDARD MAG STRIPE	POS/ACD STANDARD MAG STRIPE	POS/ACD STANDARD MAG STRIPE	POS/ACD CHIP CARD	POS/ACD CHIP CARD	POS/ACD CHIP CARD
b. Redemption Monitoring						
* Total monthly cost	\$850.12	\$20,852.00	\$64,160.00	\$850.12	\$20,852.00	\$64,160.00
Total cost per case month	\$0.16	\$0.16	\$0.16	\$0.16	\$0.16	\$0.16
c. Indirect Costs						
Indirect labor costs						
* Indirect cost rate (Compliance Branch)	0.12	0.12	0.12	0.12	0.12	0.12
* Indirect cost rate (Administrative Review Office)	0.01	0.01	0.01	0.01	0.01	0.01
* Indirect cost rate (Minneapolis Data Center)	0.01	0.01	0.01	0.01	0.01	0.01
* Indirect cost rate (FNS)	0.27	0.27	0.27	0.27	0.27	0.27
* Indirect cost rate (PDPW/OIS)	0.06	0.06	0.06	0.06	0.06	0.06
Monthly indirect non-labor cost	\$28.09	\$689.00	\$2,120.00	\$28.09	\$689.00	\$2,120.00
Total cost per case month	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01
TOTAL SYSTEM OPERATING COST PER CASE MONTH	=====	=====	=====	=====	=====	=====
	\$18.95	\$1.62	\$6.54	\$20.23	\$4.38	\$7.33

Exhibit E-5

DETAILED BREAKDOWN OF OPERATING COSTS *
MULTIPROGRAM POS SYSTEMS
WITH
STANDARD MAGNETIC STRIPE CARD AND CHIP CARD ACCESS DEVICES

SYSTEM PARAMETERS	SYSTEM: CARD TYPE:	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS CHIP CARD	MULTI- PROGRAM POS CHIP CARD	MULTI- PROGRAM POS CHIP CARD
Food stamp caseload		5300	130000	400000	5300	130000	400000
Proportion of FS only cases in scenario caseload (incl. Medicaid)		0.03	0.03	0.03	0.03	0.03	0.03
Proportion of FS only cases in scenario caseload (excl. Medicaid)		0.05	0.05	0.05	0.05	0.05	0.05
Prprtn of FS + other cases in scenario caseload (incl. Medicaid)		0.33	0.33	0.33	0.33	0.33	0.33
Prprtn of FS + other cases in scenario caseload (excl. Medicaid)		0.64	0.64	0.64	0.64	0.64	0.64
* Average number of applicable programs in which food stamp households participate (incl. Medicaid)		2.19	2.19	2.19	2.19	2.19	2.19
* Average number of applicable programs in which food stamp households participate (excl. Medicaid)		1.65	1.65	1.65	1.65	1.65	1.65
* Interest rate		0.05	0.05	0.05	0.05	0.05	0.05
1. PROVIDING RECIPIENTS WITH ACCESS DEVICES							
a. Raw Card Stock							
Card needs							
* Total annual applications		4862	119257	366945	4862	119257	366945
* Annual approval rate		0.79	0.79	0.79	0.79	0.79	0.79
* Annual number of new FS households		3824	93799	288612	3824	93799	288612
* Annual number of damaged cards		32	780	2400	64	1560	4800
* Proportion lost/stolen cards per month		0.01	0.01	0.01	0.01	0.01	0.01
Annual number of lost/stolen cards		852	20904	64320	852	20904	64320
Annual number of cards needed		4708	115483	355332	4740	116263	357732
Monthly number of cards needed		392	9624	29611	395	9689	29811
Monthly number of disposable cards needed		N/A	N/A	N/A	N/A	N/A	N/A
Card costs							
* Price per blank card		\$0.40	\$0.30	\$0.12	\$12.00	\$7.75	\$6.25
* Price per blank disposable card		N/A	N/A	N/A	N/A	N/A	N/A
Total cost per case month		\$0.02	\$0.01	\$0.00	\$0.51	\$0.33	\$0.27
b. Equipment for Card Fabrication/Encoding							
Amortized capital costs							
* Number of machines required		1	1	1	1	20	100
* Purchase price		\$8,845.00	\$11,955.00	\$41,530.00	\$1,200.00	\$1,200.00	\$1,200.00
* Expected lifetime (months)		60	60	60	60	60	60
Monthly amortized capital costs/machine		\$166.92	\$603.03	\$783.72	\$22.65	\$22.65	\$22.65
Maintenance costs							
* Monthly maintenance cost/machine		\$70.02	\$252.98	\$328.78	\$9.50	\$9.50	\$9.50
Total monthly cost		\$236.94	\$856.01	\$1,112.50	\$32.15	\$642.91	\$3,214.55
Total cost per case month		\$0.02	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

Exhibit E-5
(continued)

	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS CHIP CARD	MULTI- PROGRAM POS CHIP CARD	MULTI- PROGRAM POS CHIP CARD
c. Communications/Postage Costs for Initialization						
Communications costs						
* Average cost per connect	\$0.07	\$0.07	\$0.13	\$0.07	\$0.07	\$0.13
Monthly number of initializations	392	9624	N/A	395	9689	29811
* Monthly proportion of caseload making queries	0.12	0.12	0.12	0.12	0.12	0.12
Number of queries per month	632	15496	47680	632	15496	47680
Communications cost per month	\$71.69	\$1,758.37	\$6,198.40	\$71.87	\$1,762.92	\$10,073.81
Postage cost						
* Monthly card mailing cost	\$0.00	\$0.00	\$2,358.40	\$0.00	\$0.00	\$0.00
Total cost per case month	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01
d. Labor for Fabrication, Initialization, Training, etc.						
* Labor cost per case month	\$0.16	\$0.16	\$0.16	\$0.16	\$0.16	\$0.16
e. Indirect Costs						
* Indirect labor cost ratio	0.08	0.08	0.06	0.08	0.08	0.06
Indirect labor cost per case month	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01
* Indirect non-labor cost ratio	0.08	0.08	0.06	0.08	0.08	0.06
Indirect non-labor cost per case month	\$0.00	\$0.00	\$0.00	\$0.04	\$0.03	\$0.02
Total cost per case month	\$0.02	\$0.01	\$0.01	\$0.05	\$0.04	\$0.03

Exhibit E-5
(continued)

	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS CHIP CARD	MULTI- PROGRAM POS CHIP CARD	MULTI- PROGRAM POS CHIP CARD
2. BENEFIT AUTHORIZATION						
a. Issuance Machines						
Equipment requirements						
* Number of machines	27	62	1587	27	62	1587
Amortized capital costs						
* Purchase price/machine	\$8,000.00	\$7,600.00	\$6,700.00	\$9,000.00	\$8,600.00	\$7,700.00
* Installation cost/machine	\$1,500.00	\$1,500.00	\$1,500.00	\$1,500.00	\$1,500.00	\$1,500.00
* Expected lifetime (months)	60	60	60	60	60	60
Monthly amortized capital cost/machine	\$179.28	\$171.73	\$154.74	\$198.15	\$190.60	\$173.62
Maintenance costs						
* Monthly maintenance cost/machine	\$66.67	\$63.33	\$55.83	\$75.00	\$71.67	\$64.17
Stocking costs						
* Monthly stocking cost/machine	N/A	N/A	N/A	N/A	N/A	N/A
Supply costs						
* Monthly supply cost/machine	\$2.50	\$2.50	\$2.50	\$2.50	\$2.50	\$2.50
Environment costs						
* Monthly space rental cost/machine	\$300.00	\$300.00	\$300.00	\$300.00	\$300.00	\$300.00
* Monthly utilities cost/machine	\$50.00	\$50.00	\$50.00	\$50.00	\$50.00	\$50.00
Monthly environment cost/machine	\$350.00	\$350.00	\$350.00	\$350.00	\$350.00	\$350.00
Total cost per case month	\$1.09	\$0.10	\$0.80	\$1.14	\$0.10	\$0.84
b. Issuance File Creation						
Regular issuance file creation costs						
* Cost per regular issuance	\$214.99	\$1,054.69	\$3,245.19	\$214.99	\$1,054.69	\$3,245.19
* Number of regular issuances/month	2	10	10	2	10	10
Monthly regular issuance cost	\$429.99	\$10,546.88	\$32,451.94	\$429.99	\$10,546.88	\$32,451.94
Non-recurring issuance file creation costs						
* Cost per non-recurring issuance	\$2.11	\$51.67	\$158.99	\$2.11	\$51.67	\$158.99
* Number of non-recurring issuances/month	22	22	22	22	22	22
Monthly non-recurring issuance cost	\$46.35	\$1,136.81	\$3,497.88	\$46.35	\$1,136.81	\$3,497.88
Issuance tape daily delivery fee						
* Number of deliveries	\$5.00	\$5.00	\$5.00	\$5.00	\$5.00	\$5.00
Monthly tape delivery cost	22	22	22	22	22	22
Total cost per case month	\$110.00	\$110.00	\$110.00	\$110.00	\$110.00	\$110.00
	\$0.06	\$0.05	\$0.05	\$0.06	\$0.05	\$0.05

Exhibit E-5
(continued)

	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS CHIP CARD	MULTI- PROGRAM POS CHIP CARD	MULTI- PROGRAM POS CHIP CARD
c. Issuance Posting						
Transmission run costs						
* Average daily transmission run cost	\$78.29	\$142.08	\$201.35	\$78.29	\$142.08	\$201.35
Number of transmissions runs/month	22	22	22	22	22	22
Monthly transmission run cost	\$1,722.35	\$3,125.86	\$4,429.73	\$1,722.35	\$3,125.86	\$4,429.73
Communication costs						
* Communication cost per transmission	\$0.81	\$1.86	\$194.90	\$0.81	\$1.86	\$194.90
Number of transmissions/month	22	22	22	22	22	22
Monthly communication cost	\$17.82	\$40.92	\$4,287.76	\$17.82	\$40.92	\$4,287.76
Total cost per case month	\$0.19	\$0.01	\$0.01	\$0.19	\$0.01	\$0.01
d. Coupons (where applicable)						
* Total cost per case month	N/A	N/A	N/A	N/A	N/A	N/A
e. Recipient Access						
Transaction costs						
* Proportion of caseload - regular issuance	1.00	1.00	1.00	1.00	1.00	1.00
* Proportion of caseload - non-recurring issuance	0.06	0.06	0.06	0.06	0.06	0.06
* Proportion of issuances not picked up	0.09	0.09	0.09	0.09	0.09	0.09
Number of monthly issuance transactions	5155	126451	389080	5155	126451	389080
* Proportion of caseload making balance inquiries	2.63	2.63	2.63	2.63	2.63	2.63
* Proportion of caseload trying unauthorized access	0.25	0.25	0.25	0.25	0.25	0.25
Number of other monthly transactions	15225	373451	1149080	15225	373451	1149080
* Cost per transaction	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Total monthly transaction costs	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Total cost per case month	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

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Exhibit E-5
(continued)

	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS CHIP CARD	MULTI- PROGRAM POS CHIP CARD	MULTI- PROGRAM POS CHIP CARD
f. Issuance Reconciliation						
Transmission run costs						
* Average daily transmission cost	\$104.94	\$190.45	\$269.89	\$104.94	\$190.45	\$269.89
Number of transmissions/month	22	22	22	22	22	22
Total monthly transmission run costs	\$2,308.68	\$4,189.96	\$5,937.69	\$2,308.68	\$4,189.96	\$5,937.69
Communication costs						
* Communication cost per transmission	\$0.00	\$0.00	\$186.80	\$0.00	\$0.00	\$186.80
Number of transmissions/month	22	22	22	22	22	22
Total monthly communication cost	\$0.00	\$0.00	\$4,109.70	\$0.00	\$0.00	\$4,109.70
Archiving and Summary runs (applicable in coupon scenarios only)						
* Monthly archiving and summary run cost	N/A	N/A	N/A	N/A	N/A	N/A
Report reconciliation costs (where applicable)						
* Monthly manual reconciliation cost	N/A	N/A	N/A	N/A	N/A	N/A
Reconciliation run costs						
* Monthly reconciliation run cost	\$815.11	\$1,479.32	\$2,096.38	\$815.11	\$1,479.32	\$2,096.38
Total cost per case month	\$0.59	\$0.04	\$0.03	\$0.59	\$0.04	\$0.03
g. Indirect Costs						
Indirect cost ratios						
* Indirect cost ratio (computer center functions)	0.08	0.08	0.08	0.08	0.08	0.08
* Indirect cost ratio (state functions)	0.06	0.06	0.06	0.06	0.06	0.06
Monthly indirect cost	\$812.97	\$2,060.80	\$28,244.51	\$834.01	\$2,109.10	\$29,481.00
Total cost per case month	\$0.15	\$0.02	\$0.07	\$0.16	\$0.02	\$0.07

Exhibit E-5
(continued)

	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS CHIP CARD	MULTI- PROGRAM POS CHIP CARD	MULTI- PROGRAM POS CHIP CARD
3. RECIPIENTS USE OF BENEFITS						
a. Store Equipment						
Equipment requirements						
* Number of one-terminal stores	143	2976	6529	143	2976	6529
* Number of multi-terminal stores	30	402	1623	30	402	1623
* Average number of terminals	6.05	4.14	6.36	6.05	4.14	6.36
Number of POS terminals	324	4640	16851	324	4640	16851
* Number of balance inquiry terminals	12	343	1330	12	343	1330
Number of manual transaction recorders	143	2976	6529	143	2976	6529
POS terminals						
* Purchase price/terminal	\$678.00	\$565.00	\$427.00	\$748.00	\$635.00	\$497.00
* Installation cost/terminal	\$50.00	\$50.00	\$50.00	\$50.00	\$50.00	\$50.00
* Expected lifetime (months)	36	36	36	36	36	36
Monthly amortized capital cost/terminal	\$21.82	\$18.43	\$14.30	\$23.92	\$20.53	\$16.39
POS terminal maintenance costs						
* Monthly maintenance cost/terminal	\$5.65	\$4.71	\$3.56	\$6.23	\$5.29	\$4.14
Balance inquiry terminals						
* Purchase price/terminal	\$220.00	\$150.00	\$135.00	\$300.00	\$200.00	\$165.00
* Expected lifetime	60	60	60	60	60	60
Monthly amortized cost per terminal	\$4.15	\$2.83	\$2.55	\$5.66	\$3.77	\$3.11
Balance inquiry terminal maintenance costs						
* Monthly maintenance cost/machine	\$1.83	\$1.25	\$1.13	\$2.50	\$1.67	\$1.38
Manual transaction recorder						
* Purchase Price	\$330.00	\$317.00	\$191.00	\$430.00	\$417.00	\$291.00
* Expected lifetime	60	60	60	60	60	60
Monthly amortized cost/recorder	\$6.23	\$5.98	\$3.60	\$8.11	\$7.87	\$5.49
Supply costs						
* Monthly supply costs (overall)	\$399.01	\$5,714.29	\$20,752.46	\$399.01	\$5,714.29	\$20,752.46
Number of POS purchases						
* Ave. number POS purchases by non-FS/month	0.40	0.40	0.40	0.40	0.40	0.40
* Ave. number POS purchases by FS-only/month	8.05	8.05	8.05	8.05	8.05	8.05
Total cost per case month	\$1.83	\$0.96	\$0.83	\$2.04	\$1.10	\$0.97

**Exhibit E-5
(continued)**

	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS CHIP CARD	MULTI- PROGRAM POS CHIP CARD	MULTI- PROGRAM POS CHIP CARD
b. Other Terminals (assume no cost implications for the Food Stamp Program)						
c. Transaction Costs						
Electronic transaction costs						
• Cost per electronic transaction	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
• Number of purchase transactions/household	8.05	8.05	8.05	8.05	8.05	8.05
• Number of credit transactions/household	0.04	0.04	0.04	0.04	0.04	0.04
• Number of balance inquiries/household	2.63	2.63	2.63	2.63	2.63	2.63
• Number of rejections/household (bad PIN, insufficient balance, etc.)	0.25	0.25	0.25	0.25	0.25	0.25
Number of monthly transactions/household	10.97	10.97	10.97	10.97	10.97	10.97
Monthly electronic transaction cost	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Manual transaction costs						
• Cost per manual transaction	\$0.63	\$0.63	\$0.63	\$0.63	\$0.63	\$0.63
• Failure rate	0.00195	0.00195	0.00195	0.00195	0.00195	0.00195
• Number of purchase transactions	42665	1046500	3220000	42665	1046500	3220000
Number of manual transactions	83	2041	6279	83	2041	6279
Monthly manual transaction cost	\$52.31	\$1,283.18	\$3,948.24	\$52.31	\$1,283.18	\$3,948.24
Total cost per case month	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01
d. Settlement Cost						
Coupon settlement costs (where applicable)						
• Total monthly coupon settlement costs	N/A	N/A	N/A	N/A	N/A	N/A
POS settlement costs						
• Cost per polling run	\$9.03	\$16.39	\$23.23	\$9.03	\$16.39	\$23.23
• Communication cost per polling run	\$16.25	\$232.00	\$1,922.70	\$16.25	\$232.00	\$1,922.70
Total monthly polling run cost	\$758.49	\$7,451.82	\$58,377.95	\$758.49	\$7,451.82	\$58,377.95
• Cost per file preparation run	\$9.03	\$16.39	\$23.23	\$9.03	\$16.39	\$23.23
Total monthly file preparation run	\$270.99	\$491.82	\$696.97	\$270.99	\$491.82	\$696.97
• Cost per transmission	\$32.09	\$58.24	\$82.54	\$32.09	\$58.24	\$82.54
Total monthly transmission cost	\$706.01	\$1,281.33	\$1,815.80	\$706.01	\$1,281.33	\$1,815.80
• ACH and wire transfer fees per run	\$47.69	\$931.10	\$2,246.99	\$47.69	\$931.10	\$2,246.99
Total monthly settlement fees	\$1,049.07	\$20,484.19	\$49,433.73	\$1,049.07	\$20,484.19	\$49,433.73
Total monthly POS settlement costs	\$2,784.57	\$29,709.15	\$110,324.44	\$2,784.57	\$29,709.15	\$110,324.44
Total cost per case month	\$0.50	\$0.22	\$0.26	\$0.50	\$0.22	\$0.26

**Exhibit E-5
(continued)**

	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS CHIP CARD	MULTI- PROGRAM POS CHIP CARD	MULTI- PROGRAM POS CHIP CARD
e. Settlement Reconciliation Cost						
Reconciliation costs						
* Cost per reconciliation run	\$41.51	\$75.37	\$106.81	\$41.51	\$75.37	\$106.81
Total reconciliation run cost per month	\$913.63	\$1,658.12	\$2,349.76	\$913.63	\$1,658.12	\$2,349.76
 Total cost per case month	 \$0.16	 \$0.01	 \$0.01	 \$0.16	 \$0.01	 \$0.01
f. Archiving and Report Generation Costs						
* Cost per run	\$7.71	\$14.00	\$19.83	\$7.71	\$14.00	\$19.83
Total monthly archiving/report run cost	\$231.37	\$419.90	\$595.05	\$231.37	\$419.90	\$595.05
 Total cost per case month	 \$0.04	 \$0.00	 \$0.00	 \$0.04	 \$0.00	 \$0.00
g. Handling Recipient Balance Problems						
* Labor cost	\$272.74	\$6,689.75	\$20,583.85	\$272.74	\$6,689.75	\$20,583.85
* Equipment cost	\$5.82	\$116.33	\$357.95	\$5.82	\$116.33	\$357.95
 Total cost per case month	 \$0.03	 \$0.03	 \$0.03	 \$0.03	 \$0.03	 \$0.03
h. Handling Grocer Problems						
* Labor cost	\$2,824.21	\$5,648.42	\$13,631.11	\$2,824.21	\$5,648.42	\$13,631.11
* Equipment cost	\$60.23	\$1,204.65	\$3,706.62	\$60.23	\$1,204.65	\$3,706.62
 Total cost per case month	 \$0.52	 \$0.05	 \$0.04	 \$0.52	 \$0.05	 \$0.04
i. Indirect Cost						
Indirect cost rates						
* Indirect cost rate (computer center)	0.08	0.08	0.08	0.08	0.08	0.08
* Indirect cost rate (state/local)	0.08	0.08	0.06	0.08	0.08	0.06
Total monthly indirect cost	\$1,372.54	\$14,079.74	\$39,137.33	\$1,465.87	\$15,564.01	\$43,831.95
 Total cost per case month	 \$0.26	 \$0.11	 \$0.10	 \$0.28	 \$0.12	 \$0.11

Exhibit E-5
(continued)

	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS CHIP CARD	MULTI- PROGRAM POS CHIP CARD	MULTI- PROGRAM POS CHIP CARD
4. HOUSEKEEPING OPERATIONS AT THE COMPUTER CENTER						
a. Hardware Costs						
* Purchase price	\$529,635.00	\$586,770.00	\$596,770.00	\$529,635.00	\$586,770.00	\$596,770.00
* Expected lifetime (months)	60	60	60	60	60	60
Total monthly amortized hardware costs	\$9,994.87	\$11,073.07	\$11,261.79	\$9,994.87	\$11,073.07	\$11,261.79
b. Software Costs						
* Monthly maintenance fee	\$2,000.00	\$2,000.00	\$2,000.00	\$2,000.00	\$2,000.00	\$2,000.00
c. Fixed Communications Costs						
* Monthly line costs	\$219.10	\$1,439.80	\$7,696.10	\$219.10	\$1,439.80	\$7,696.10
* Hardware purchase and installation of communications equipmen	\$24,400.00	\$73,200.00	\$146,600.00	\$24,400.00	\$73,200.00	\$146,600.00
* Expected lifetime (months)	36	36	36	36	36	36
Total monthly cost	\$950.39	\$3,633.67	\$12,089.83	\$950.39	\$3,633.67	\$12,089.83
d. Labor Costs						
* Total monthly labor cost	\$17,645.83	\$32,025.00	\$45,383.33	\$17,645.83	\$32,025.00	\$45,383.33
* Total monthly unassignable labor cost	\$10,406.70	\$18,886.87	\$26,765.00	\$10,406.70	\$18,886.87	\$26,765.00
e. Environment Costs						
* Rent	\$5,666.00	\$5,666.00	\$5,666.00	\$5,666.00	\$5,666.00	\$5,666.00
* Preparation	\$1,698.41	\$1,698.41	\$1,698.41	\$1,698.41	\$1,698.41	\$1,698.41
* Utilities	\$3,000.00	\$3,000.00	\$3,000.00	\$3,000.00	\$3,000.00	\$3,000.00
* Maintenance (UPS, A/C)	\$425.00	\$425.00	\$425.00	\$425.00	\$425.00	\$425.00
* Total monthly environment cost	\$10,789.41	\$10,789.41	\$10,789.41	\$10,789.41	\$10,789.41	\$10,789.41
Total direct cost per case month	\$2.32	\$0.13	\$0.06	\$2.32	\$0.13	\$0.06
f. Indirect Costs						
Indirect cost						
* Indirect cost rate	0.08	0.08	0.08	0.08	0.08	0.08
Monthly indirect cost	\$983.27	\$1,335.83	\$1,811.69	\$983.27	\$1,335.83	\$1,811.69
Total indirect cost per case month	\$0.19	\$0.01	\$0.00	\$0.19	\$0.01	\$0.00
5. Other Food Stamp Program Costs						
a. Retailer Management						
Training cost						
* Total monthly cost	\$173.18	\$4,247.92	\$13,070.53	\$173.18	\$4,247.92	\$13,070.53
General management cost						
* Total monthly cost	\$1,421.46	\$34,866.00	\$107,280.00	\$1,421.46	\$34,866.00	\$107,280.00
Total cost per case month	\$0.30	\$0.30	\$0.30	\$0.30	\$0.30	\$0.30

Exhibit E-5
(continued)

	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS MAG STRIPE	MULTI- PROGRAM POS CHIP CARD	MULTI- PROGRAM POS CHIP CARD	MULTI- PROGRAM POS CHIP CARD
b. Redemption Monitoring						
• Total monthly cost	\$850.12	\$20,852.00	\$64,160.00	\$850.12	\$20,852.00	\$64,160.00
Total cost per case month	\$0.16	\$0.16	\$0.16	\$0.16	\$0.16	\$0.16
c. Indirect Costs						
Indirect labor costs						
• Indirect cost rate (Compliance Branch)	0.12	0.12	0.12	0.12	0.12	0.12
• Indirect cost rate (Administrative Review Office)	0.01	0.01	0.01	0.01	0.01	0.01
• Indirect cost rate (Minneapolis Data Center)	0.01	0.01	0.01	0.01	0.01	0.01
• Indirect cost rate (FMS)	0.27	0.27	0.27	0.27	0.27	0.27
• Indirect cost rate (PDPW/OIS)	0.06	0.06	0.06	0.06	0.06	0.06
Monthly indirect non-labor cost	\$28.09	\$689.00	\$2,120.00	\$28.09	\$689.00	\$2,120.00
Total cost per case month	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01
TOTAL SYSTEM OPERATING COST PER CASE MONTH	\$8.63	\$2.42	\$2.96	\$9.42	\$2.92	\$1.43

Exhibit E-6

DETAILED BREAKDOWN OF OPERATING COSTS*
 MULTIPROGRAM POS SYSTEMS
 WITH
 CHIP CARD ACCESS DEVICE USING TELEPHONY ISSUANCE AND
 NON-STANDARD MAGNETIC STRIPE ACCESS DEVICE USING MAIL-OUT ISSUANCE

SYSTEM PARAMETERS	SYSTEM:	MULTIPROG	MULTIPROG	MULTIPROG	MULTIPROG	MULTIPROG	MULTIPROG
	CARD TYPE:	CHIP CARD TELEPHONY	CHIP CARD TELEPHONY	CHIP CARD TELEPHONY	NS MAG CARD MAILOUT	NS MAG CARD MAILOUT	NS MAG CARD MAILOUT
Food stamp caseload		5300	130000	400000	5300	130000	400000
Proportion of FS only cases in scenario caseload (incl. Medicaid)		0.03	0.03	0.03	0.03	0.03	0.03
Proportion of FS only cases in scenario caseload (excl. Medicaid)		0.05	0.05	0.05	0.05	0.05	0.05
Prprtn of FS + other cases in scenario caseload (incl. Medicaid)		0.33	0.33	0.33	0.33	0.33	0.33
Prprtn of FS + other cases in scenario caseload (excl. Medicaid)		0.64	0.64	0.64	0.64	0.64	0.64
* Average number of applicable programs in which food stamp households participate (incl. Medicaid)		2.19	2.19	2.19	2.19	2.19	2.19
* Average number of applicable programs in which food stamp households participate (excl. Medicaid)		1.65	1.65	1.65	1.65	1.65	1.65
* Interest rate		0.05	0.05	0.05	0.05	0.05	0.05
1. PROVIDING RECIPIENTS WITH ACCESS DEVICES							
a. Raw Card Stock							
Card needs							
* Total annual applications		4862	119257	366945	N/A	N/A	N/A
* Annual approval rate		0.79	0.79	0.79	N/A	N/A	N/A
Annual number of new FS households		3824	93799	288612	N/A	N/A	N/A
* Annual number of damaged cards		64	1560	4800	N/A	N/A	N/A
* Proportion lost/stolen cards per month		0.01	0.01	0.01	N/A	N/A	N/A
Annual number of lost/stolen cards		852	20904	64320	N/A	N/A	N/A
Annual number of cards needed		4740	116263	357732	N/A	N/A	N/A
Monthly number of cards needed		395	9689	29811	N/A	N/A	N/A
Monthly number of disposable cards needed		N/A	N/A	N/A	5618	137800	424000
Card costs							
* Price per blank card		\$12.00	\$7.75	\$6.25	N/A	N/A	N/A
* Price per blank disposable card		N/A	N/A	N/A	\$1.34	\$0.15	\$0.13
Total cost per case month		\$0.51	\$0.33	\$0.27	\$0.81	\$0.09	\$0.08
b. Equipment for Card Fabrication/Encoding							
Amortized capital costs							
* Number of machines required		1	20	100	1	1	1
* Purchase price		\$1,200.00	\$1,200.00	\$1,200.00	\$3,200.00	\$3,200.00	\$3,200.00
* Expected lifetime (months)		60	60	60	60	60	60
Monthly amortized capital costs/machine		\$22.65	\$22.65	\$22.65	\$60.39	\$60.39	\$60.39
Maintenance costs							
* Monthly maintenance cost/machine		\$9.50	\$9.50	\$9.50	\$25.33	\$25.33	\$25.33
Total monthly cost		\$32.15	\$642.91	\$3,214.55	\$85.72	\$85.72	\$85.72
Total cost per case month		\$0.00	\$0.00	\$0.00	\$0.01	\$0.00	\$0.00

* Total cost per case month data represent amount of total shared by participating programs that is allocated to the Food Stamp Program. See Appendix E for allocation formulae.

Exhibit E-6
(continued)

MULTIPROG CHIP CARD TELEPHONY	MULTIPROG CHIP CARD TELEPHONY	MULTIPROG CHIP CARD TELEPHONY	MULTIPROG NS MAG CARD MAILOUT	MULTIPROG NS MAG CARD MAILOUT	MULTIPROG NS MAG CARD MAILOUT
\$0.07	\$0.07	\$0.13	\$0.07	\$0.07	\$0.13
395	9689	29811	N/A	N/A	N/A
0.12	0.12	0.12	0.12	0.12	0.12
632	15496	47680	632	15496	47680
\$71.87	\$1,762.92	\$10,073.83	\$44.22	\$1,084.72	\$6,198.40
\$0.00	\$0.00	\$0.00	\$955.06	\$23,426.00	\$72,080.00
\$0.01	\$0.01	\$0.01	\$0.11	\$0.11	\$0.11
\$0.16	\$0.16	\$0.16	\$0.16	\$0.16	\$0.16
0.08	0.08	0.06	0.06	0.06	0.06
\$0.01	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01
0.08	0.08	0.06	0.06	0.06	0.06
\$0.04	\$0.03	\$0.02	\$0.06	\$0.01	\$0.01
\$0.05	\$0.04	\$0.03	\$0.07	\$0.02	\$0.02

c. Communications/Postage Costs for Initialization

Communications costs

- * Average cost per connect
- Monthly number of initializations
- * Monthly proportion of caseload making queries
- Number of queries per month
- Communications cost per month

Postage cost

- * Monthly card mailing cost

Total cost per case month

d. Labor for Fabrication, Initialization, Training, etc.

- * Labor cost per case month

e. Indirect Costs

- * Indirect labor cost ratio
- Indirect labor cost per case month
- * Indirect non-labor cost ratio
- Indirect non-labor cost per case month

Total cost per case month

Exhibit E-6
(continued)

	MULTIPROG CHIP CARD TELEPHONY	MULTIPROG CHIP CARD TELEPHONY	MULTIPROG CHIP CARD TELEPHONY	MULTIPROG NS MAG CARD MAILOUT	MULTIPROG NS MAG CARD MAILOUT	MULTIPROG NS MAG CARD MAILOUT
2. BENEFIT AUTHORIZATION						
a. Issuance Machines						
Equipment requirements						
* Number of machines	27	62	1587	N/A	N/A	N/A
Amortized capital costs						
* Purchase price/machine	\$2,300.00	\$2,300.00	\$1,250.00	N/A	N/A	N/A
* Installation cost/machine	\$200.00	\$200.00	\$200.00	N/A	N/A	N/A
* Expected lifetime (months)	60	60	60	N/A	N/A	N/A
Monthly amortized capital cost/machine	\$47.18	\$47.18	\$27.36	N/A	N/A	N/A
Maintenance costs						
* Monthly maintenance cost/machine	\$19.17	\$19.17	\$10.42	N/A	N/A	N/A
Stocking costs						
* Monthly stocking cost/machine	N/A	N/A	N/A	N/A	N/A	N/A
Supply costs						
* Monthly supply cost/machine	\$2.50	\$2.50	\$2.50	N/A	N/A	N/A
Environment costs						
* Monthly space rental cost/machine	\$25.00	\$25.00	\$25.00	N/A	N/A	N/A
* Monthly utilities cost/machine	\$25.00	\$25.00	\$25.00	N/A	N/A	N/A
Monthly environment cost/machine	\$50.00	\$50.00	\$50.00	N/A	N/A	N/A
Total cost per case month	\$0.22	\$0.02	\$0.13	N/A	N/A	N/A
b. Issuance File Creation						
Regular issuance file creation costs						
* Cost per regular issuance	\$143.33	\$1,054.69	\$3,245.19	\$214.99	\$1,054.69	\$3,245.19
* Number of regular issuances/month	3	10	10	2	10	10
Monthly regular issuance cost	\$429.99	\$10,546.88	\$32,451.94	\$429.99	\$10,546.88	\$32,451.94
Non-recurring issuance file creation costs						
* Cost per non-recurring issuance	\$2.00	\$51.67	\$158.99	\$2.11	\$51.67	\$158.99
* Number of non-recurring issuances/month	22	22	22	22	22	22
Monthly non-recurring issuance cost	\$44.03	\$1,136.81	\$3,497.88	\$46.35	\$1,136.81	\$3,497.88
Issuance tape daily delivery fee						
* Number of deliveries	\$5.00	\$5.00	\$5.00	N/A	N/A	N/A
Monthly tape delivery cost	22	22	22	N/A	N/A	N/A
	\$110.00	\$110.00	\$110.00	N/A	N/A	N/A
Total cost per case month	\$0.06	\$0.05	\$0.05	\$0.05	\$0.05	\$0.05

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Exhibit E-6
(continued)

	MULTIPROG CHIP CARD TELEPHONY	MULTIPROG CHIP CARD TELEPHONY	MULTIPROG CHIP CARD TELEPHONY	MULTIPROG NS MAG CARD MAILOUT	MULTIPROG NS MAG CARD MAILOUT	MULTIPROG NS MAG CARD MAILOUT
c. Issuance Posting						
Transmission run costs						
* Average daily transmission run cost	N/A	N/A	N/A	N/A	N/A	N/A
Number of transmissions runs/month	22	22	22	N/A	N/A	N/A
Monthly transmission run cost	N/A	N/A	N/A	N/A	N/A	N/A
Communication costs						
* Communication cost per transmission	\$0.10	\$0.10	\$0.10	N/A	N/A	N/A
Number of transmissions/month	5814	142612	438805	N/A	N/A	N/A
Monthly communication cost	\$581.42	\$14,261.17	\$43,880.51	N/A	N/A	N/A
Total cost per case month	\$0.06	\$0.06	\$0.06	N/A	N/A	N/A
d. Coupons (where applicable)						
* Total cost per case month	N/A	N/A	N/A	N/A	N/A	N/A
e. Recipient Access						
Transaction costs						
* Proportion of caseload - regular issuance	1.00	1.00	1.00	1.00	1.00	1.00
* Proportion of caseload - non-recurring issuance	0.06	0.06	0.06	0.06	0.06	0.06
* Proportion of issuances not picked up	0.09	0.09	0.09	0.09	0.09	0.09
Number of monthly issuance transactions	5155	126451	389080	5155	126451	389080
* Proportion of caseload making balance inquiries	2.63	2.63	2.63	2.63	2.63	2.63
* Proportion of caseload trying unauthorized access	0.25	0.25	0.25	0.25	0.25	0.25
Number of other monthly transactions	15225	373451	1149080	15225	373451	1149080
Cost per transaction	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Total monthly transaction costs	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Total cost per case month	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

Exhibit E-6
(continued)

MULTIPROG CHIP CARD TELEPHONY	MULTIPROG CHIP CARD TELEPHONY	MULTIPROG CHIP CARD TELEPHONY	MULTIPROG NS MAG CARD MAILOUT	MULTIPROG NS MAG CARD MAILOUT	MULTIPROG NS MAG CARD MAILOUT
N/A	N/A	N/A	N/A	N/A	N/A
22	22	22	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
22	22	22	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
\$815.11	\$1,479.32	\$2,096.38	\$815.11	\$1,479.32	\$2,096.38
\$0.15	\$0.01	\$0.01	\$0.15	\$0.01	\$0.01
0.08	0.08	0.08	0.08	0.08	0.08
0.06	0.06	0.06	0.06	0.06	0.06
\$204.42	\$1,399.86	\$7,556.76	\$82.15	\$533.78	\$1,445.96
\$0.04	\$0.01	\$0.02	\$0.02	\$0.00	\$0.00

f. Issuance Reconciliation

Transmission run costs

- * Average daily transmission cost
- Number of transmissions/month
- Total monthly transmission run costs

Communication costs

- * Communication cost per transmission
- Number of transmissions/month
- Total monthly communication cost

Archiving and Summary runs (applicable in coupon scenarios only)

- * Monthly archiving and summary run cost

Report reconciliation costs (where applicable)

- * Monthly manual reconciliation cost

Reconciliation run costs

- * Monthly reconciliation run cost

Total cost per case month

g. Indirect Costs

Indirect cost ratios

- * Indirect cost ratio (computer center functions)
- * Indirect cost ratio (state functions)

Monthly indirect cost

Total cost per case month

Exhibit E-6
(continued)

	MULTIPROG CHIP CARD TELEPHONY	MULTIPROG CHIP CARD TELEPHONY	MULTIPROG CHIP CARD TELEPHONY	MULTIPROG NS MAG CARD MAILOUT	MULTIPROG NS MAG CARD MAILOUT	MULTIPROG NS MAG CARD MAILOUT
3. RECIPIENTS USE OF BENEFITS						
a. Store Equipment						
Equipment requirements	143	2976	6529	143	2976	6529
* Number of one-terminal stores	30	402	1623	30	402	1623
* Number of multi-terminal stores	6.05	4.14	6.36	6.05	4.14	6.36
* Average number of terminals	324	4640	16851	324	4640	16851
Number of POS terminals	12	343	1330	12	343	1330
* Number of balance inquiry terminals	143	2976	6529	N/A	N/A	N/A
Number of manual transaction recorders						
POS terminals						
* Purchase price/terminal	\$748.00	\$635.00	\$497.00	\$678.00	\$565.00	\$427.00
* Installation cost/terminal	\$50.00	\$50.00	\$50.00	\$50.00	\$50.00	\$50.00
* Expected lifetime (months)	36	36	36	36	36	36
Monthly amortized capital cost/terminal	\$23.92	\$20.53	\$16.39	\$21.82	\$18.43	\$14.30
POS terminal maintenance costs						
* Monthly maintenance cost/terminal	\$6.23	\$5.29	\$4.14	\$5.65	\$4.71	\$3.56
Balance inquiry terminals						
* Purchase price/terminal	\$300.00	\$200.00	\$165.00	\$220.00	\$150.00	\$135.00
* Expected lifetime	60	60	60	60	60	60
Monthly amortized cost per terminal	\$5.66	\$3.77	\$3.11	\$4.15	\$2.83	\$2.55
Balance inquiry terminal maintenance costs						
* Monthly maintenance cost/machine	\$2.50	\$1.67	\$1.38	\$1.83	\$1.25	\$1.13
Manual transaction recorder						
* Purchase Price	\$430.00	\$417.00	\$291.00	N/A	N/A	N/A
* Expected lifetime	60	60	60	N/A	N/A	N/A
Monthly amortized cost/recorder	\$8.11	\$7.87	\$5.49	N/A	N/A	N/A
Supply costs						
* Monthly supply costs (overall)	\$399.01	\$5,714.29	\$20,752.46	\$399.01	\$5,714.29	\$20,752.46
Number of POS purchases						
* Ave. number POS purchases by non-FS/month	N/A	N/A	N/A	N/A	N/A	N/A
* Ave. number POS purchases by FS-only/month	8.05	8.05	8.05	8.05	8.05	8.05
Total cost per case month	\$2.04	\$1.10	\$0.97	\$1.67	\$0.83	\$0.77

**Exhibit E-6
(continued)**

	MULTIPROG CHIP CARD TELEPHONY	MULTIPROG CHIP CARD TELEPHONY	MULTIPROG CHIP CARD TELEPHONY	MULTIPROG NS MAG CARD MAILOUT	MULTIPROG NS MAG CARD MAILOUT	MULTIPROG NS MAG CARD MAILOUT
b. Other Terminals (assume no cost implications for the Food Stamp Program)						
c. Transaction Costs						
Electronic transaction costs						
* Cost per electronic transaction	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
* Number of purchase transactions/household	8.05	8.05	8.05	8.05	8.05	8.05
* Number of credit transactions/household	0.04	0.04	0.04	0.04	0.04	0.04
* Number of balance inquiries/household	2.63	2.63	2.63	2.63	2.63	2.63
* Number of rejections/household (bad PIN, insufficient balance, etc.)	0.25	0.25	0.25	0.25	0.25	0.25
Number of monthly transactions/household	10.97	10.97	10.97	10.97	10.97	10.97
Monthly electronic transaction cost	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Manual transaction costs						
* Cost per manual transaction	\$0.63	\$0.63	\$0.63	\$0.63	\$0.63	\$0.63
* Failure rate	0.00195	0.00195	0.00195	0.00195	0.00195	0.00195
* Number of purchase transactions	42665	1046500	3220000	42665	1046500	3220000
Number of manual transactions	83	2041	6279	83	2041	6279
Monthly manual transaction cost	\$52.31	\$1,283.18	\$3,948.24	\$52.31	\$1,283.18	\$3,948.24
Total cost per case month	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01
d. Settlement Cost						
Coupon settlement costs (where applicable)						
* Total monthly coupon settlement costs	N/A	N/A	N/A	N/A	N/A	N/A
POS settlement costs						
* Cost per polling run	\$9.03	\$16.39	\$23.23	\$9.03	\$16.39	\$23.23
* Communication cost per polling run	\$16.25	\$232.00	\$1,922.70	\$16.25	\$232.00	\$1,922.70
Total monthly polling run cost	\$758.49	\$7,451.82	\$58,377.95	\$758.49	\$7,451.82	\$58,377.95
* Cost per file preparation run	\$9.03	\$16.39	\$23.23	\$9.03	\$16.39	\$23.23
Total monthly file preparation run	\$270.99	\$491.82	\$696.97	\$270.99	\$491.82	\$696.97
* Cost per transmission	\$32.09	\$58.24	\$82.54	\$32.09	\$58.24	\$82.54
Total monthly transmission cost	\$706.01	\$1,281.33	\$1,815.80	\$706.01	\$1,281.33	\$1,815.80
* ACN and wire transfer fees per run	\$47.69	\$931.10	\$2,246.99	\$47.69	\$931.10	\$2,246.99
Total monthly settlement fees	\$1,049.07	\$20,484.19	\$49,433.73	\$1,049.07	\$20,484.19	\$49,433.73
Total monthly POS settlement costs	\$2,784.57	\$29,709.15	\$110,324.44	\$2,784.57	\$29,709.15	\$110,324.44
Total cost per case month	\$0.50	\$0.22	\$0.26	\$0.50	\$0.22	\$0.26

Exhibit E-6
(continued)

	MULTIPROG CHIP CARD TELEPHONY	MULTIPROG CHIP CARD TELEPHONY	MULTIPROG CHIP CARD TELEPHONY	MULTIPROG NS MAG CARD MAILOUT	MULTIPROG NS MAG CARD MAILOUT	MULTIPROG NS MAG CARD MAILOUT
e. Settlement Reconciliation Cost						
Reconciliation costs						
* Cost per reconciliation run	\$41.53	\$75.37	\$106.81	\$41.53	\$75.37	\$106.81
Total reconciliation run cost per month	\$913.63	\$1,658.12	\$2,349.76	\$913.63	\$1,658.12	\$2,349.76
Total cost per case month	\$0.16	\$0.01	\$0.01	\$0.16	\$0.01	\$0.01
f. Archiving and Report Generation Costs						
* Cost per run						
Total monthly archiving/report run cost	\$7.71	\$14.00	\$19.83	\$7.71	\$14.00	\$19.83
Total cost per case month	\$231.37	\$419.90	\$595.05	\$231.37	\$419.90	\$595.05
Total cost per case month	\$0.04	\$0.00	\$0.00	\$0.04	\$0.00	\$0.00
g. Handling Recipient Balance Problems						
* Labor cost						
* Equipment cost	\$272.74	\$6,689.75	\$20,583.85	\$272.74	\$6,689.75	\$20,583.85
Total cost per case month	\$5.82	\$116.33	\$357.95	\$5.82	\$116.33	\$357.95
Total cost per case month	\$0.03	\$0.03	\$0.03	\$0.03	\$0.03	\$0.03
h. Handling Grocer Problems						
* Labor cost						
* Equipment cost	\$2,824.21	\$5,648.42	\$13,631.11	\$2,824.21	\$5,648.42	\$13,631.11
Total cost per case month	\$60.23	\$1,204.65	\$3,706.62	\$60.23	\$1,204.65	\$3,706.62
Total cost per case month	\$0.52	\$0.05	\$0.04	\$0.52	\$0.05	\$0.04
i. Indirect Cost						
Indirect cost rates						
* Indirect cost rate (computer center)	0.08	0.08	0.08	0.08	0.08	0.08
* Indirect cost rate (state/local)	0.08	0.08	0.06	0.08	0.08	0.06
Total monthly indirect cost	\$1,465.87	\$15,564.01	\$43,831.95	\$1,301.19	\$12,653.22	\$37,251.66
Total cost per case month	\$0.28	\$0.12	\$0.11	\$0.25	\$0.10	\$0.09

**Exhibit E-6
(continued)**

	MULTIPROG CHIP CARD TELEPHONY	MULTIPROG CHIP CARD TELEPHONY	MULTIPROG CHIP CARD TELEPHONY	MULTIPROG NS MAG CARD MAILOUT	MULTIPROG NS MAG CARD MAILOUT	MULTIPROG NS MAG CARD MAILOUT
4. HOUSEKEEPING OPERATIONS AT THE COMPUTER CENTER						
a. Hardware Costs						
* Purchase price	\$562,635.00	\$689,770.00	\$699,770.00	\$529,635.00	\$586,770.00	\$596,770.00
* Expected lifetime (months)	60	60	60	60	60	60
Total monthly amortized hardware costs	\$10,617.62	\$13,016.81	\$13,205.52	\$9,994.87	\$11,073.07	\$11,261.79
b. Software Costs						
* Monthly maintenance fee	\$2,000.00	\$2,000.00	\$2,000.00	\$2,000.00	\$2,000.00	\$2,000.00
c. Fixed Communications Costs						
* Monthly line costs	\$219.10	\$1,439.80	\$7,696.10	\$219.10	\$1,439.80	\$6,906.10
* Hardware purchase and installation of communications equipmen	\$24,400.00	\$73,200.00	\$146,600.00	\$24,400.00	\$73,200.00	\$121,600.00
* Expected lifetime (months)	36	36	36	36	36	36
Total monthly cost	\$950.39	\$3,633.67	\$12,089.83	\$950.39	\$3,633.67	\$10,550.56
d. Labor Costs						
* Total monthly labor cost	\$17,645.83	\$32,025.00	\$45,383.33	\$17,645.83	\$32,025.00	\$45,383.33
* Total monthly unassignable labor cost	\$14,437.73	\$26,202.69	\$37,132.41	\$14,437.73	\$26,202.69	\$37,132.41
e. Environment Costs						
* Rent	\$5,666.00	\$5,666.00	\$5,666.00	\$5,666.00	\$5,666.00	\$5,666.00
* Preparation	\$1,698.41	\$1,698.41	\$1,698.41	\$1,698.41	\$1,698.41	\$1,698.41
* Utilities	\$3,000.00	\$3,000.00	\$3,000.00	\$3,000.00	\$3,000.00	\$3,000.00
* Maintenance (UPS, A/C)	\$425.00	\$425.00	\$425.00	\$425.00	\$425.00	\$425.00
* Total monthly environment cost	\$10,789.41	\$10,789.41	\$10,789.41	\$10,789.41	\$10,789.41	\$10,789.41
Total direct cost per case month	\$2.64	\$0.15	\$0.07	\$2.59	\$0.15	\$0.06
f. Indirect Costs						
Indirect cost						
* Indirect cost rate	0.08	0.08	0.08	0.08	0.08	0.08
Monthly indirect cost	\$1,117.30	\$1,602.51	\$2,166.25	\$1,099.37	\$1,546.53	\$2,065.94
Total indirect cost per case month	\$0.21	\$0.01	\$0.01	\$0.21	\$0.01	\$0.01
5. Other Food Stamp Program Costs						
a. Retailer Management						
Training cost						
* Total monthly cost	\$182.85	\$4,485.00	\$13,800.00	\$182.85	\$4,485.00	\$13,800.00
General management cost						
* Total monthly cost	\$1,421.46	\$34,866.00	\$107,280.00	\$1,421.46	\$34,866.00	\$107,280.00
Total cost per case month	\$0.30	\$0.30	\$0.30	\$0.30	\$0.30	\$0.30

Exhibit E-6
(continued)

	MULTIPROG CHIP CARD TELEPHONY	MULTIPROG CHIP CARD TELEPHONY	MULTIPROG CHIP CARD TELEPHONY	NS MAG CARD MAILOUT	NS MAG CARD MAILOUT	NS MAG CARD MAILOUT
b. Redemption Monitoring						
• Total monthly cost	\$850.12	\$20,852.00	\$64,160.00	\$850.12	\$20,852.00	\$64,160.00
Total cost per case month	\$0.16	\$0.16	\$0.16	\$0.16	\$0.16	\$0.16
c. Indirect Costs						
Indirect labor costs						
• Indirect cost rate (Compliance Branch)	0.12	0.12	0.12	0.12	0.12	0.12
• Indirect cost rate (Administrative Review Office)	0.01	0.01	0.01	0.01	0.01	0.01
• Indirect cost rate (Minneapolis Data Center)	0.01	0.01	0.01	0.01	0.01	0.01
• Indirect cost rate (FNS)	0.27	0.27	0.27	0.27	0.27	0.27
• Indirect cost rate (PDPW/OIS)	0.06	0.06	0.06	0.06	0.06	0.06
Monthly indirect non-labor cost	\$28.09	\$689.00	\$2,120.00	\$28.09	\$689.00	\$2,120.00
Total cost per case month	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01
TOTAL SYSTEM OPERATING COST PER CASE MONTH	\$8.16	\$2.87	\$2.71	\$7.82	\$2.33	\$2.19

Exhibit D-1

CUPON ISSUANCE AND REDEMPTION COST COMPONENTS

Component	Cost Per Case Month	Source
State Administrative Costs		SF-269 Cost Reports
Issuance Category	\$1.79	
Certification Category	\$0.38	
Fraud Control and Data Processing Categories	\$0.31	
Subtotal	\$2.48	
FNS Administrative Costs		
Coupon Printing	\$0.17	Interview, FNS Coupon Production and Supply Unit (CPSU)
Coupon Distribution	\$0.02	Interview, FNS CPSU
Management of Coupon Printing and Distribution	\$0.02	Interview, FNS CPSU and Mid-Atlantic Regional Office
Fees to Federal Reserve Banks	\$0.16	Interview, FNS Accounting Division
Management of Retailer Participation	\$0.13	Interviews with Multiple FNS Units ^a
Reconciling and Monitoring State Issuance Systems	\$0.02	Interviews with Multiple FNS Units ^a
Subtotal	<u>\$0.52</u>	
Total	\$3.00	

Notes: ^aThese estimates are based on Exhibits IIIB-7 and IIIB-9 in John A. Kirlin et al., The Impacts of the State-Operated Electronic Benefit Transfer System in Reading, Pennsylvania, Cambridge, Massachusetts: Abt Associates Inc., February 1990, pp. III-31 - III-33 and III-38 - III-40.