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EFT Commercial Infrastructures and Implications for EBT

TECHNICAL REPORT #1: POS EQUIPMENT AND CAPABILITIES

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TECHNICAL REPORT #1: POS EQUIPMENT AND CAPABILITIES

September 1994

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ACKNOWLEDGEMENTS

The Price Waterhouse project team wishes to thank the many individuals who contributed to this analysis of the national on-line debit infrastructure and its implications for food stamp EBT. Special gratitude is due to staff of the Food and Nutrition Service, particularly Ken Offerman of the Office of Analysis and Evaluation who served as Project Officer and Erin McBride of the Program Development Division. Both provided critical guidance and support throughout the study. In addition, while the study has benefitted from the review and input of many individuals at FNS, special thanks are due to Steve Carlson, Theodore Macaluso, and Carol Olander for their attention and commitment to its completion.

The analysis of the EFT commercial infrastructure is the product of the cooperation of literally hundreds of food retailers, EFT processors, financial institutions, shared regional networks, and equipment manufacturers and vendors. They provided not only essential information on the systems maintained and services offered by their companies but valuable insight on the current and future operation of the on-line debit infrastructure regionally and nationwide. Their willingness to participate in this study underscores the importance of these stakeholders to current and future EBT systems and their commitment to the success of EBT nationwide. While space limitations do not allow us to recognize the many private sector participants in this study, a list of significant contacts is provided as an appendix to this report.

Special recognition is owed to the staff of Benton International and Geosocial Resources, Inc. (GRI) which served as subcontractors to Price Waterhouse under this study. At Benton International, project efforts were directed by Maria Arminio who was assisted by Michael Lloyd and several support staff. Ms. Arminio and her staff brought to this project an understanding of electronic payment systems and the EFT commercial infrastructure that greatly enriched these reports. At GRI, Dr. James Welsh employed highly innovative geographic information systems (GIS) technology to spatially analyze and present data on the on-line debit capabilities of FNS authorized food retailers across the country. Dr. Welsh was assisted by Lixin Yu, who tirelessly compiled, analyzed, and mapped the study data. Both firms added dimensions to this study that could not have been achieved by Price Waterhouse staff alone, making this truly a collaborative effort.

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GLOSSARY

Access Device -- See Payment Card.

ACH Debit -- A proprietary off-line debit system established by a retailer. Cards are issued to approved customers and may be used exclusively at that retailer's locations. Settlement is performed through the ACH network.

Automated Clearing House (ACH) Network -- A network run by the Federal Reserve to electronically process funds transfers between member financial institutions. Typically used in a food stamp EBT system to transfer credits from the concentrator bank to financial institutions holding retailer accounts.

Acquiring Bank Processing and Support -- The bank which settles funds between the merchant, merchant acquirer, and the front-end processor each business day. This entity also provides risk management services which detects fraudulent merchant activity.

ATM Deployers -- Depository financial institutions (e.g., banks, thrifts, credit unions) that support proprietary or shared automated teller machines.

Automated Teller Machine (ATM) -- Unattended terminal from which one or more banking transactions can be performed, including balance inquiries, cash deposits, cash withdrawals, transfers between accounts, and payments on loans and credit cards. Requires card access.

Back-End Processing -- Funds settlement and reconciliation functions that follow the transaction authorization process.

Card Issuer -- The organization, typically a financial institution, that maintains the consumer relationship and depository account on behalf of the customer and issues the magnetic stripe card. The latter function is provided by the financial institution itself or a third-party on the financial institution's behalf.

Check Authorization -- The process by which a retailer verifies the authenticity of a check and/or its presenter. Check authorization systems vary in sophistication; four general constructs are presented below.

- Paper "hot" lists which identify all customers who have previously written bad checks in the store. There is no electronic capability in this option.
- In-store negative files tied to the existing scanning systems. The transaction is authorized against a negative file resident at the store controller.
- On-line check authorization against a headquarters central negative or positive file.
- Check authorization databases supported by outside service providers. Check verification is a service which verifies only that there is no record of bad check-writing behavior by the customer. It does not verify that sufficient balance exists to cover purchases or withdrawals.

Controller -- Also referred to as an in-store processor (ISP) or store controller. A computer, usually a PC, that controls the payments system in the store. In an integrated payments system, the controller also routes on-line debit transactions to the transaction acquirer.

Data Encryption Standard (DES) -- Standard for encrypting data to allow secure transmission of data between two points. In the EBT context, the DES employs a 56 bit key to encrypt the PIN using a Data Encryption Algorithm.

Debit Transaction -- Approval by the cardholder of the debit to his or her account. At the same time, it provides a claim of funds made by the

acquirer (or card acceptor) against the card issuer.

Dial-Up -- A telecommunications configuration whereby a POS terminal connects to a host computer on an as-needed (per transaction) basis. See also Leased Line.

Electronic Benefits Transfer -- An electronic payments system that uses electronic funds transfer, automated teller machines, and point of sale technology for the delivery and control of public assistance benefits.

Electronic Funds Transfer -- Any transfer of funds, other than a transaction originated by check, draft, or similar paper instrument, which is initiated through an electronic terminal, telephonic instrument, or computer or magnetic tape so as to order, instruct, or authorize a financial institution to debit or credit an account.

Electronic Funds Transfer System -- System designed to facilitate the exchange of monetary value via electronic means. Objectives include expansion of time and location availability of basic financial services, and reduction of the present growth of paper volume (i.e., cash and checks).

Electronic Cash Register (ECR) -- An electronic device used at the lane level to record a retailer's sales. An ECR may be either connected with other ECRs in the store to a central processing computer, or stand alone.

Food Stamp Authorized Retailer -- Individual stores and/or corporate headquarters authorized by the food stamp program to accept food stamp benefits toward eligible food purchases.

Front-End Processor -- The entity that manages the telecommunications and terminal management infrastructure which routes electronic transactions from the merchant location to another point, usually the transaction router, for the purpose of transaction authorization.

Front-End Switch -- The entity in the EFT infrastructure that relays transaction information between the merchant acquirer and the customer's financial institution.

Gateway Service Provider -- The entity that allows on-line debit transactions to be supported between and among a network switch, third party processor, EBT processor, or large food retailer. The most common gateway service providers are shared regional networks themselves and the national on-line debit networks (Interlink and Maestro).

Host -- A computer, usually a mainframe, that receives on-line debit transactions from the store level. Transactions are relayed by the host to the network switch, which routes them to the card-issuing bank for authorization.

In-Sourcing -- Developing the capability or purchasing services to perform a function "in-house" rather than contracting with another party.

Independent Sales Organization (ISO) -- An organization, usually contracted by a financial institution, that markets electronic payment services offered by the financial institution.

Integrated Configuration -- An electronic payments system in which the POS terminal, either directly or indirectly, sends to and receives information from the ECR. Two main types of integrated configurations exist:

- Interfaced: POS terminals are connected to a controller by means of a local area network. The controller may also support the ECR system, or is interfaced with the ECR controller. This provides an indirect exchange of information between the ECR and POS terminal in a particular lane.
- Fully Integrated: POS terminals are connected to ECRs in the lane, allowing for the direct exchange of transaction information.

Interchange Fee -- A fee paid by a card issuing bank to a transaction acquirer for an on-line debit or ATM transaction.

Leased Line -- A telecommunications configuration whereby a POS terminal possesses a dedicated connection to a host computer. See also Dial-Up.

Magnetic Stripe Reader (MSR) -- The component of the POS terminal that reads the magnetic stripe card. Occasionally referred to as a "card swipe".

Magnetic Stripe Card -- Benefit access card that contains encoded information on a magnetic strip. The strip may contain three information tracks. Track 2 is used for payments and benefits.

Merchant Acquirer -- The entity that drives or maintains (maintenance may be subcontracted) retailer POS terminals and routes electronically captured transactions to the correct card issuer, third party processor or network switch. Merchant acquirers include:

- POS Merchant Banks -- Financial institutions that act as merchant acquirers.
- POS Retailer Programs -- Retailers that act as merchant acquirers.
- EFT Processors -- Third party processors that act as merchant acquirers. A more comprehensive operational entity than the others, providing both back-end and front-end processing capabilities.

Merchant Bank of Deposit -- The bank that maintains the day-to-day cash management and cash, coin, and currency relationships with a merchant. This entity receives funds from the acquiring bank processor for electronic card activity. This bank may or may not be the acquiring bank depending on whether it supplies acquiring bank EFT services.

Network -- The entity that routes an EFT transaction from the front-end processor to the card issuing bank. Networks either perform the physical switching of the transaction themselves or outsource the function to another party. Networks are also responsible for the settlement of funds between entities in the EFT infrastructure. See also Switch.

Off-Line Debit -- A payments system in which a magnetic stripe card is used to draw upon a designated depository transaction account. Off-line debit differs from on-line debit in that transaction authorization usually consists of the manual verification of the customer's signature; and from credit in that settlement occurs through the automated clearing house (ACH) network.

On-Line Debit -- Also referred to as POS debit. On-line debit involves the use of a magnetic stripe card at a point of sale terminal to initiate a debit from a customer's demand deposit (checking) account and corresponding credit to the retailer's deposit account.
On-line debit contrasts with off-line debit and credit in that transaction authorization consists of the matching of a customer-entered PIN against a central database, and differs from credit in that settlement occurs through the automated clearing house (ACH) network.

Out-Sourcing -- Contracting out the performance of functions or services rather than performing them in-house.

Payment Card -- The vehicle by which the consumer accesses the EFT infrastructure. Predominantly, the cards have been magnetic stripe-based, and contain information on both the cardholder and type of account. The type of card and the business relationship between the merchant acquirer and the retailer determine the conditions and the timing of reimbursement to the retailer.

Personal Identification Number (PIN) -- An alphanumeric string, typically four characters or longer, used to verify the identity of a cardholder when performing an on-line debit transaction.

Piggybacking or Leveraging -- In the context of EBT, piggybacking refers to the use of the existing on-line debit infrastructure for the initiation, processing, and settlement of EBT transactions.

Point of Sale (POS) Terminal or POS Device -- An electronic device used to support the authorization function in a merchant location. At a minimum, the device includes a card-reading mechanism and dial-up telecommunications capability to operate in the payments system infrastructure. More sophisticated POS terminals can be integrated with an electronic cash register (ECR) or personal computer (PC) based system.

Primary Account Number (PAN) -- Number used to identify a customer's bank account. This number is transmitted, along with the PIN and purchase amount, to the card-issuing bank for authorization of the transaction.

Reconciliation -- A message that is generated by the acquirer (e.g., EBT processor) that advises the receiver of settlement information regarding transaction processing between the sending and receiving locations.

Retrofitting -- The modification of existing payments systems to support the EBT application.

Settlement -- The transfer of funds among entities in the EFT environment based on the transactions processed, up to a specified time.

Stand Alone Configuration -- An electronic payments system in which the POS terminal(s) can initiate transaction authorization requests and receive responses from a central database without need for connection or support from a controller or ECR.

Stakeholder -- Any entity (e.g., retailer, merchant acquirer, front-end processor, merchant bank of deposit, or acquiring bank) that plays a role in the initiation or processing of an EFT transaction.

Switch -- The entity that routes transactions for authorization from the point of acquisition to the card issuer. See also Transaction Router.

Third Party Processor -- A organization that drives and maintains retailer POS terminals, authorizes and processes transactions, and settles retailer accounts.

Transaction Acquirer -- An entity that drives terminals and terminal systems for the purpose of electronic capture and routing of transactions.

Transaction Authorization -- The process by which approval is given to permit a card or account to be used in a transaction on behalf of the card issuer. An authorization begins as a request that flows through the payment system between the retailer and card issuer, who approves or denies the request. An authorization approval from an issuer represents a promise to pay the retailer, contingent upon compliance with the operating rules and procedures for the transaction.

Transaction Router -- The entity that directs transactions from acquirers to card issuers. It receives transactions from a front-end processor and routes them to appropriate card issuers and other regional and national networks for authorization. The transaction router is responsible for single-point net settlement services (i.e., one net settlement total which includes both debit and credit transactions) for each entity to which it is connected. See also Switch.

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I. OVERVIEW OF THE STUDY AND METHODOLOGY

Introduction

The Food and Nutrition Service (FNS), through previous analysis, demonstration, and evaluation, has identified the deployment and operation of direct debit point of sale (POS) terminals to be a key determinant in the cost of developing and operating state-level electronic benefit transfer (EBT) systems. As a result, the issue of building upon (i.e., "piggybacking") the existing commercial on-line debit infrastructure to support Food Stamp EBT has received considerable attention among the EBT stakeholders including; government agencies, the food retailer community, and especially the EFT industry.

This study, entitled *"EFT Commercial Infrastructures and Implications for EBT"*, reflects an initiative by the agency to comprehensively address major issues shaping this discussion. Reflecting the broad nature of its title, the study includes a discussion of the numerous consumer payment systems supported by the EFT commercial infrastructures. The discussion further presents the rationale for building Food Stamp EBT upon one payment system in particular -- on-line debit at the point-of-sale (POS debit). With this basis, our analysis and conclusions focus on the current infrastructures supporting POS debit and their implications for Food Stamp EBT.

Objectives of the Study

The research objectives of this study were as follows:

(1) Identify the location of existing and/or proposed POS/ATM infrastructures,

(2) Determine the levels of terminal deployment in terms of check-out lane coverage,

(3) Determine the capability of these POS/ATM systems to meet FSP functionality, program and performance standards,

(4) Examine the feasibility of retrofitting existing electronic cash registers (ECRs) to meet FSP needs and standards,

(5) Correlate the service areas of these systems with FSP authorized food retailer locations, and,

(6) Use computer mapping technology to present data and publish findings in a final report as well as provide mapping software in a user friendly format for use in decision making.

Overview of the Study Methodology

To fully address the study objectives listed above, and numerous clarifications made during initial discussions with FNS, a comprehensive guide to the data collection, analysis, and reporting activities under this study was developed.

The primary research method employed was an extensive collection of data from respondent groups within and peripheral to the EFT commercial infrastructure. Respondents included numerous individuals from the following areas:[1]

- Regional EFT network/switch operators
- Vendors of access devices and software developers
- Food industry organizations
- Banking industry organizations
- Major third party processors
- Federal, State and local program officials who administer and enforce food assistance programs

The very nature of the EFT commercial infrastructures posed a significant challenge to the data collection effort. That is, great variability exists in the roles and functions of these organizations,

[1] A comprehensive list of individuals and organizations contacted under this study is included as Appendix B in TECHNICAL REPORT #2.

and of individuals within them, reflecting the somewhat incongruous development of POS debit nationwide. With the objective of painting a complete and fair picture of the EFT commercial infrastructure, our data collection often hinged on locating whomever could provide the accurate and comprehensive data, regardless of organization.

At the outset of the study, we proposed that a convenient framework in which to view our analytical approach is as separate, but linked, "micro" and "macro" analyses.

The "macro" components of the study include:

- an overview of the EFT infrastructures' historical evolution, current characteristics, and outlook for the future
- a discussion of the payment systems supported by the infrastructure, focusing on the functions comprising on-line debit as performed by the various "stakeholder" businesses
- detailed explanation of the business and physical relationships that shape the way payments services are delivered today
- analysis of the most common "generic" equipment configurations that support electronic payments applications, particularly in the food retail industry
- analysis of the major technical and cost issues surrounding the retrofitting of existing payments systems to support food stamp EBT

The "macro" data collection elements, identified as necessary to address the components, are listed below, as are the approaches for collecting each:

Services Supported -- Identify the array of electronic payment transactions supported in the retail environment, e.g., direct debit, ACH debit, credit card, check verification, EBT, etc.

POS Device Supported -- Identify the array of point-of-sale terminals available with receipt print capability that support electronic payment system transactions by vendor, model, and type.

POS Device Functionality -- Determine the range of features and functionality supported -- vis-a-vis FSP functional requirements (e.g., receipt print capability, balance on receipt, balance only inquiry, etc.) -- by terminal type. In addition, discern any planned technical modifications. This data will be used to develop a taxonomy of terminal devices, their capabilities, and support the area-by-area assessment of the extent to which the capabilities are being used.

POS Technical/Cost Data -- Identify the potential technical and cost considerations in retrofitting POS devices to perform fully within the functional and performance requirements of FSP EBT.

Distribution of POS Devices -- Segment the total number of POS debit terminals deployed in the U.S. market by retailer classification.

Historical/Current POS Transaction Volumes -- Track the growth of total POS debit transaction volumes (performed in retail locations and at ATMs) over the past five years, and provide estimates of future projections, where available.

Transaction Acquiring -- Identify the primary organizations in the twelve selected geographic areas that drive terminals and terminal systems for the purpose of electronic capture and routing of transactions.

Switching Capabilities -- Identify the primary organizations in the twelve selected geographic areas providing back-end switching -- that is, the routing of transactions between and among participants in the payment system infrastructure (i.e., network).

Transaction Authorization -- Identify the primary organizations in the twelve selected geographic areas that support the request to permit a card or account to be used in a transaction on behalf of the card issuer.

POS Configuration Options -- Develop schematic diagrams of the *most common business configuration alternatives (i.e., service* models) used in the payment system infrastructure.

Requirements for Food Stamp Program EBT Capability -- Identify the requirements specified in the EBT Regulations that impact the functionality of POS devices to be used in FSP EBT. Examples include: receipt print capability, balance-only inquiry, balance-on-receipt capability.

Structure and Range of Fees Charged -- Identify the range of fees charged, including surcharges, rebates, and volume discounts, for payment-related transactions -- between various entities.

Sparse POS Debit Areas: What other infrastructure exists? -- On a case-by-case basis, provide descriptive data on the existence of other EFT infrastructures that might serve as a precursor to POS.

Structural Changes Planned for Near Future -- Describe the trends and other environmental factors that might influence the growth and development of POS programs in the future, and assess the importance to the evolution of EBT (i.e., advance of cellular *technology, microwave, other telecommunication infrastructure).*

By contrast, the "micro" components of the study included:

- development of comprehensive analyses of twelve geographic areas selected by FNS with respect to current and planned on-line debit capability at FNS-authorized food retailer locations

- employing geographic information systems (GIS) technology as a dynamic tool to illustrate and further analyze the on-line debit coverage of each study area (***the methodology for these activities is described in greater detail in TECHNICAL REPORT #2***)

- diagramming the major store system configurations encountered in each area supporting retailer's electronic payment services, and relating these to the generic "service models" developed in the "macro" analysis

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II. INTRODUCTION TO THE EFT COMMERCIAL INFRASTRUCTURE

A. DEFINITIONS OF PAYMENT SYSTEMS ALTERNATIVES

Overview

The EFT commercial infrastructures provide the underlying foundation supporting all functions associated with the authorization and settlement processes for electronic payment services. In the broadest sense, the infrastructures include the technologies, operations, telecommunications, security, operating rules, and processes required to support a payment transaction. There is general agreement that the key to establishing cost-effective, and convenient electronic benefit transfer (EBT) systems lies in building upon the infrastructures already in use. Maximum efficiency is obtained by using existing equipment and communications lines to the greatest degree possible.

Each of the electronic payment options supported by the EFT commercial infrastructure, has its own unique features and functional capabilities. As a result, the components of the infrastructures often vary to satisfy particular product requirements.

This section describes the basic payment flows, processes, supporting technologies, and standards in the EFT commercial infrastructure; provides a sense of the similarities and differences of each payment alternative; and examines the suitability of the various existing infrastructures for piggybacking EBT.

Basic Payment Flows

Figure II.A.1, entitled *"Basic Payment Flows"*, depicts the principal players in the EFT commercial infrastructure.

The payment card is the vehicle by which the consumer accesses the EFT infrastructure. These cards identify the customer and account. Predominantly, the cards have been magnetic stripe-based, and contain information on both the cardholder and type of account. The type of card and the business relationship between the merchant acquirer and the retailer determine the

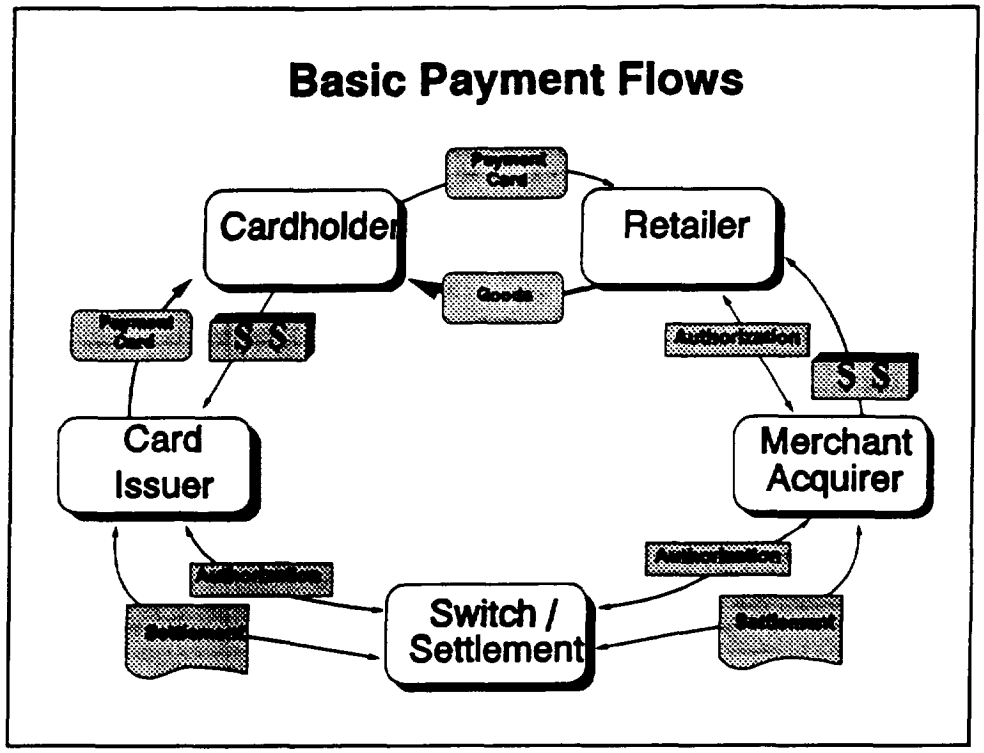

Figure II.A.1

conditions and the speed of reimbursement to the retailer.

The retailer accepts the customer's payment card for the purchase of goods or services upon obtaining authorization (promise to pay) from the card issuer.

The authorization request is an electronic transaction that flows through the payment system between the retailer and card issuer, who approves or denies the request. An authorization approval from an issuer represents a promise to pay the retailer, contingent upon compliance with the operating rules and procedures for the transaction.

The merchant acquirer introduces the transactions into the payment system and accepts settlement on behalf of the retailer. Here, the merchant acquirer generically represents several functions supporting the retailer, which will be addressed in greater detail later in the report.

The switching and settlement entail two specific functions--transaction processing, i.e., routing of the transaction through the payment system, and the transfer of funds based on the transactions processed.

The card issuer maintains the relationship with the cardholders and automatically debits their transaction account for all approved EFT transactions. The issuer provides the cardholder with the payment card and handles consumer problems regarding card usage.

Payment System Processes

Often, the analysis of payment services tends to focus on the different features and operating structures associated with the individual payment services, while ignoring the general structure common to *all* payment services. This approach is misleading because each service is evaluated from a cost/benefit perspective as individual offerings in isolation from each other, rather than as a part of an integrated set of products with a "program" objective. A structured view of the underlying fundamentals of payment services can be a very useful tool to assist in further discussions of this subject, as well as evaluating the applicability of piggybacking EBT on the existing EFT commercial infrastructure. The framework for these discussions is provided below.

First, the location of the consumer funds for each service varies by payment type. Depending upon the type of payment vehicle, the actual funds for the payment vehicle may reside at the consumer's demand deposit account at a financial institution, or in the form of a line-of-credit with a financial service company or retailer. The location of these funds has different implications for consumers, retailers, and financial institutions --causing trade-offs in convenience, buying power, liability, and cost of accessing processing and settlement.

The customer validation and identification process in the retailer environment is performed at the point-of-sale. In its simplest form, this may be done by having the customer present a valid driver's license or other picture identification card. In the payment system, it is more likely the case that validation will be done in a

paper-based environment via customer signature or, in electronic payment, using a PIN.

The authorization process is the most important process component for payment services. This function is performed to control the risk associated with the transaction which, along with processing costs, drives the pricing for the service.

In some instances, the risk is managed by requiring transactions over a certain floor limit to be authorized by/against a file with account information. When this occurs, authorizations are supported:

- On-line, against current active demand deposit account files held by the processor.
- Off-line, against a customer information file that holds no active demand deposit account information. For example, a negative file or positive file resident as internal retailer databases or as external databases at a third-party processor.

The settlement process may be paper-based or electronic. In the retailer environment, the latter is facilitated through electronic terminals which submit transactions for settlement, eliminating the paper trail altogether.

The time frame designated for the settlement process can be real time, i.e., at the time the transaction is approved, or batch, after the fact. Delays in the transfer of funds to cover the transaction are referred to as float. Funds that were available at the time the purchase was made may not necessarily be available at the time of settlement of the transaction. If the funds are not available, a collection effort is initiated.

Managing the risk associated with the delays between the time of transaction and the reimbursement of the retailer for goods purchased requires rules with regard to liability for the transaction. Liability presents a formidable issue in the EFT commercial infrastructure.

Supporting Technology

The dominant card technology underlying today's plastic-based payment services is magnetic stripe. Cards are embossed and encoded in accordance with ISO standards (International Organization for Standardization). In the food retailer environment, check-cashing cards are also quite common. These cards may be either plastic or paper-based, with scannable UPC encoding.

The POS terminal is a device designed to support the authorization function in a merchant location. At minimum, the device requires a card-reading mechanism and dial-up telecommunications capabilities to operate in the payments system infrastructure. More sophisticated generations of terminals can support data capture, have increased memory capacity (hence enhanced functionality to support multiple payment applications), are software programmable, have multiple ports to support different interface capabilities, and can be integrated to an electronic cash register or personal computer (PC) based system.

Telecommunications capabilities can be dial-up or leased line. With dial-up, there are no ongoing physical linkages among entities in the system. In contrast, leased lines provide a proprietary, open communication line between parties.

Dial-up communication is generally slower due to the call setup time, i.e., the elapsed time that occurs between dialing and receiving a connection. Leased lines offer more rapid response times, but are more expensive. In the EFT commercial infrastructure, the type of telecommunication lines used is determined by matching the volume of data passed through the lines to line type, and by considering response time requirements.

High-speed leased lines form the backbone of the telecommunications networks in the commercial infrastructure. Store connections or local legs may be dial-up (for smaller stores) or leased-line (for supermarket chains and multi-lane environments).

Payment System Options

There are several electronic payment system models in existence today, supporting a variety of payment alternatives. The most prominent models in the food retailer environment support credit card, debit card, and check authorization.

National Credit Cards

A credit card is a plastic card that empowers the cardholders to buy or borrow against a credit line established by the card issuer. Funds so spent are charged to the cardholder's account. The cardholder is then billed for any outstanding balance.

The EFT commercial infrastructure supporting credit card transactions is supported by MasterCard and Visa, on behalf of their member financial institution acquirers (merchant banks) and card issuers, and third-party processors. Credit card transactions require two discrete steps. The authorization process is facilitated through an acquirer that provides gateway connections to MasterCard, Visa, and other regional or local credit authorization centers. MasterCard and Visa also perform daily processing and routing of financial transactions between the associations and their member financial institutions. These clearing and settlement systems support overall system settlement, network/switch balancing, and report generation, enabling the process of funds settlement between institutions.

National Debit Cards (Off-line Debit)

The basic purpose of a national debit card or off-line debit program is to allow financial institutions to provide "credit-worthy" customers with a unique debit card that draws down a designated depository transaction account (e.g., checking, savings, etc.) when purchases are made. From the merchant's perspective, the card looks and operates like a credit card, and must be accepted by retailers who presently accept bank credit cards. Visa Debit and MasterDebit cards have been available in the market for over a decade. Visa Debit (recently renamed Visa Check Card) has been aggressively marketed, while MasterDebit is a niche product with limited issuance.

Off-line debit rides on the coattails of the credit card infrastructure. This product uses the same procedures and infrastructure as credit, and requires no personal identification numbers (PINs), special terminals, or merchant training. As such, off-line programs are extremely profitable because the merchant (unable to distinguish between the debit and credit card) pays the credit card discount, which is more costly than an on-line debit transaction. Philosophically, retailers have major problems paying credit card rates for off-line debit transactions because the fees are almost four times as expensive as the on-line debit alternative. Moreover, off-line debit typically displaces less expensive payment alternatives--cash and checks--rather than credit for the retailer.

On-line Debit

A debit card is a plastic card issued by a financial institution to its customers, that, by usage, debits a customer's designated depository transaction account. Initially issued as an ATM access card and/or check guarantee card, on-line debit is now largely positioned by issuing financial institutions as an access device at the point-of-sale.

From the consumer's perspective, an on-line debit transaction is similar to an ATM transaction. The transaction is authorized against the customer's designated account, which is debited immediately for the amount of purchase. The on-line debit infrastructure is supported primarily by local and regional networks, whose membership consists of financial institution acquirers and card issuers. Regional networks facilitate financial interchange between and among financial institutions, and support the authorization and settlement functions on behalf of their constituency. Although originally formed to support ATM switching, most regional networks now have expanded their service offering to include POS debit because of the similarities in the transactions supported. Through gateway interfaces, the regional networks can support on-line debit transactions between and among other regional networks.

At first blush, the infrastructures to support debit seem identical to credit. However, the technical requirements to support debit are far more stringent than those for credit. The primary difference deals with the security required to support a debit

transaction throughout the system. Initially, these requirements posed an economic and operational burden to merchants. Only recently have these burdens become surmountable, as merchants rethink their payment system strategies.

The growth in on-line debit has been spawned largely by interest from merchants (particularly gasoline retailers and supermarkets) who were able to make a strong business case for on-line debit, based on potential savings in processing costs and bank service charges. Larger supermarket retailers, in particular, are realizing that the implementation of an electronic payment system has a discernible and quantifiable impact in gaining market share from competitors. These competitive pressures have fostered the growth of debit during the past three years.

ACH Debit

A few retailers have opted to support ACH debit, often referred to as electronic check or proprietary debit. An ACH debit program is a proprietary debit program (as opposed to a national debit program), implemented by the retailer (as opposed to a financial institution.) Customers complete an application identifying the depository transaction account from which funds are to be withdrawn and, upon approval by the retailer, are issued an ACH debit card. When used to purchase goods at the retailer's store, the ACH debit card functions like an electronic check, as funds are withdrawn from the customer's depository transaction account.

Check Authorization

Check authorization is the process of determining whether a customer's account balance is sufficient to cover a purchase or withdrawal of funds. Check authorization systems have been employed in food retail locations for decades, and are specifically designed to assist the retailer by verifying the authenticity of the check and/or its presenter.

Check authorization systems vary in sophistication, and, as such, provide varying degrees of insurance to the retailers against bad check losses. Four general constructs are presented below.

- Paper "hot" lists used by retailers with unsophisticated systems capabilities. These lists identify all customers who have previously written bad checks in the store, thereby providing the retail clerk a warning notification that the customer has previously written a bad check. There is no electronic capability in this option.

- In-store negative files tied to the existing scanning systems. These are most prevalent in the food retailer environment, if the retailer has not yet migrated to support electronic payments systems. Check cashing plastic or paper cards (typically UPC encoded) are used and some other form of personal identification may be required to identify the customer. The transaction is authorized against a negative file resident at the store controller. The file identifies customers who have outstanding bad checks only from that particular store. Retailers typically determine the parameters for approval.

- On-line check authorization against a headquarters central negative or positive file. Newer implementations are based on dual cards (e.g., UPC-scannable cards and magnetic stripe cards issued by the retailer). Data exchange between stores and headquarters is usually done on a leased-line basis. These files provide information on the check-writing history of customers for the entire grocery chain, and are accessed for authorization approval.

- Check authorization databases supported by outside service providers. Although not commonly used by food retailers because of the burdensome pricing, check authorization (verification) service companies provide retailers with a more extensive negative file, perhaps covering an entire geographic region and/or multiple retail industry sectors, to support the authorization process. Check verification is a service which verifies only that there is no record of bad check-writing behavior by the customer. It does not verify that sufficient balance exists to cover purchases or withdrawals. If an item (check) is returned, the retailer assumes the responsibility for collection, unless that has been outsourced to a third-party.

Among the large grocers, a definite trend exists toward the establishment of proprietary check authorization programs (e.g., in-store or chain-wide) linked to a principle of self-insurance, where the company funds the losses.

The clearing process for checks resides with the check clearing houses. The retailer batches the checks and sends them to its bank of first deposit for clearance. The bank processes all on-us checks internally, and sends all not-on-us items for clearance through the clearing house.

B. HISTORICAL GROWTH AND CURRENT STATISTICS

EFT NETWORKS: TRENDS AND PERSPECTIVES

The Foundation

Traditionally, consumers have viewed the payment system as consisting of two primary mediums of exchange: cash and checks. Until the 1960s, the vast majority of consumer payment transactions were effected either via cash or check.

The Rise of Credit: VISA and MasterCard

Beginning in the 1960s however, the widespread introduction of the credit card radically changed the face of the consumer payments. Competition has fostered various alternative payment mechanisms, and the proponents and service providers /stakeholders behind each of them. Individual retailers, long-time credit issuers on a "mom-and-pop" basis, began to think of themselves as being in the consumer financing as well as the merchandising business. Proprietary retailer credit cards achieved wide-scale acceptance. Specialty credit cards, most notably those referred to as T&E (travel and entertainment) cards, such as American Express and Diners Club, also achieved widespread acceptance and prominence in the marketplace. For the first time, the banks had serious competition with respect to control over the consumer payment system.

The most important development, however, was the emergence of the general purpose credit card, originally strictly the province

of the banking system. By the early to mid-1970s, the general purpose credit card market had essentially stabilized into two competing card associations (VISA and MasterCard), each of which was (and is) owned by a cluster of banks. Over time, virtually every domestic depository financial institution became a participant in either one or both of these associations, both of which operate on a national (and indeed international) level.

The Advent of On-line Debit: ATMs and Regional Networks

Technology also changed the face of consumer payments with the advent of the ATM (and, more recently, both on-line and off-line debit at the point of sale). By the mid-1970s, ATM pioneers such as Citibank had already deployed hundreds of ATM terminals. By the early 1980s, virtually all depository financial institutions of any size had deployed proprietary ATM networks throughout their branch systems.

Originally, ATMs were thought of as a means of reducing teller staff through transaction displacement, and/or as a means of attracting incremental customers through the increased convenience afforded by around-the-clock, self-service banking. Large institutions began to tout their (branch) system-wide proprietary networks as enabling their customers to "get cash anywhere, anytime," thus placing smaller institutions who could ill afford to deploy more than a few terminals at an extreme disadvantage.

To compete, smaller institutions began to join forces by entering into reciprocal ATM sharing arrangements, whereby one institution's customer could access funds from the ATM of another institution. In order to do this, rules had to be established, and a switching infrastructure had to be built. The result, starting in the last few years of the 1970s, was the formation of local and regional ATM networks, often in competition with one another in a given geographic area, throughout the country.

By 1985, there were some two hundred local or regional network associations. Increasingly, larger institutions found that they had to join one or more shared network in order to provide a comparable level of service convenience. In fact, by the end of

the decade, virtually all large financial institutions (with the notable exception of Citibank) had become members of at least one regional network.

On-line POS Debit

Further advances in technology lead to the emergence of a second major on-line debit product: on-line debit at the point-of-sale. Originally brought to market by some of the major oil retailers such as Exxon and Mobil, the banking infrastructure was also involved in the pioneering efforts of on-line POS debit. POS debit transactions were performed as early as 1977 in Wisconsin, with similar accomplishments in Iowa and South Florida in the early 1980's. In the mid-1980's the "big four" California banks formed a stand-alone shared network, dubbed Interlink, which was dedicated to on-line POS debit. Interlink proceeded to capture as a participant Lucky, a major West Coast supermarket, and as transaction volume grew, the "experiment" proved to be successful. Into the fray came the regional networks, led by STAR, Honor, and some others, who already had much of the

In the early 1990s, more and more interest was shown by additional retailer segments, notably the supermarkets, convenience stores, and the oil retailers. Consequently, more and more of the regional networks began to develop on-line POS debit programs. As of mid-1993, most of the major regional networks either had in place were planning on-line POS debit programs.

current practice, these national ATM networks serve as the "network of last resort." In other words, only transactions which exceed the geographic reach of the regional networks are processed by the nationals.

Similarly, in response to the more recent rapid growth of the on-line POS debit market and the perceived need for a national capability (a customer of a nationwide retail chain may wish to make out-of-market purchases using on-line POS), the last few years have witnessed the formation of national on-line POS debit networks (e.g., MasterCard's Maestro and VISA's Interlink).

Competitive Developments

Spurred on by numerous factors, including the emergence of new technologies, deregulation which eased the barriers to entry, and the vision of significant revenue potential associated with the explosion of electronic payment systems transaction volume, the competition for control over the consumer payment system has intensified.

Credit

In the credit card world, "non-bank" banks sought and obtained the right to issue VISA and MasterCard branded credit cards. Some of these, such as Associates National Bank, became large rivals to the major bank issuers. Third-party processors, such as First Data Resources, offered a variety of operational services to card issuers, in effect competing with internal bank credit card processing departments. More recently, Sears successfully launched its own general purpose credit card program (divested in June 1993), known as DISCOVER Card, in direct competition with VISA and MasterCard. In a separate event, Sears and VISA have also been involved in protracted litigation over Sears' attempt to become a card-issuing member of VISA.

The capstone to the trend toward increased non-bank ownership of the credit card payment system, however, was evidenced by the successful entry by AT&T (soon followed by General Motors, General Electric, and others) into the ranks of the bank association card issuers. When companies the likes of AT&T and General

Motors are issuing MasterCards, the bank's traditional domination of the (credit) payment system franchise is clearly at risk.

On-line Debit

The credit card side of consumer payments is not alone in terms of competition from sources outside the banking industry. On-line POS debit has a potentially large impact on participating retailers. The banks and retailers have often not seen eye-to-eye with respect to how to develop, update, and price on-line POS debit programs. Consequently, some of the more aggressive retailers, such as ARCO in California, have developed their own on-line POS debit programs, inclusive of back room and data processing operations. In fact, Wegman's, an upstate New York supermarket chain that deploys its own ATMs, provides its own data processing support, and has even gone so far as to establish a consulting service to advise other supermarkets. In short, retailers are also competing head-to-head with the banks for control of selected payment system functions.

Third-party processors have also claimed a stake in on-line debit. Many of the regional ATM networks, including some of the larger ones such as STAR, rely on third-party processors such as Deluxe Data Systems (DDS) to provide their switching and other data processing capabilities for both their ATM and POS products.

Within the fraternity of regional debit networks, there has also been significant competition. Primarily as a result of consolidations within a given geographic area, the number of regional networks has diminished from some 150 in the 1984-1985 time frame, to an estimated 75 by mid-1993.

Beyond the competition between banks and non-banks for control of consumer payment systems, there is significant competition between the regional and national networks. It might seem illogical that the regionals and nationals are in competition with one another. After all, both are owned by various combinations of banks, and in many cases a given bank is a stakeholder (owner, member, or participant) in both types of networks.

During the second half of the 1980s, many regional ATM networks formed gateway relationships with one another which

effectively allow members' cardholders to use an out-of-region ATM without the need to route the transaction through the national networks (PLUS or CIRRUS). PLUS, however, is now wholly owned by VISA, and CIRRUS wholly owned by MasterCard (PLUS/VISA and CIRRUS/MasterCard have had affiliations for many years, but were not wholly owned until quite recently). Any transaction routed through a gateway relationship between the regionals is clearly one less transaction for the nationals. Publicly, both CIRRUS and PLUS continue to proclaim that they are merely seeking to serve as the switch of last resort.

The competition in the rapidly burgeoning on-line POS debit arena has been somewhat less muted. In response to the success of regional programs such as STAR's Explore, VISA purchased Interlink, a previously independently owned regional POS network, with the intention of taking it national. MasterCard has launched Maestro, a competing national on-line POS brand. Nominally, as is the case for CIRRUS and PLUS, these programs will only process transactions that exceed the geographic boundaries of the regional networks. Importantly, the regionals have established gateway relationships for their on-line POS debit programs. As is the case in the ATM environment, the national networks have pledged to honor all regional gateways relative to on-line POS debit.

Current Trends

Consumer payment system transaction volume continues to increase, and is projected to continue to do so throughout the remainder of the 1990s. Continued growth is forecast for all forms of electronic payments: credit card, ACH, ATM, and, most dramatically, POS debit.

The roll-out of POS programs, including both the on-line and off-line national programs marketed by VISA and MasterCard, is still in its infancy. In addition, natural product extensions, such as health care and, of course, EBT, are beginning to take root as well.[1]

[1] VISA and MasterCard do not yet appear eager to play a significant role in EBT, other than to express concerns about costs, standards, and the like. It would appear that their controlling members have simply not yet shown much interest in EBT. This could be due to

The Super-Regionals

One of the more significant and potentially meaningful trends currently underway is the formation of super-regional networks. Among the approximately 75 regional networks in existence, perhaps 15-20 or so are by far and away the most important, in terms of providing service to geographic areas in which the bulk of the nation's population live and work, and in terms of total transaction volume. Yet it is largely within this group (but not necessarily exclusively) that we are beginning to see what appears to be a concerted effort toward the formation of super-regional networks.

The reasons advanced for the development of the super-regional networks include:

- ✓ Increased processing efficiency: Transaction processing is a classic fixed-cost driven business. As transaction volume increases, the cost per transaction diminishes. Many in the industry believe that the regionals, however large, are still not of sufficient size to completely capture the benefits available from economies of scale. There are some voices, however, who dispute this notion. These individuals believe that there are no more economies to be had from combining the larger of the existing regional networks, i.e., "bigger is not necessarily better" is the argument advanced here.

- ✓ Reduced processing and membership fees: The corollary to the increased processing efficiency argument is that the benefits of increased processing efficiency can be passed on to all network members in the form of lower prices.

- ✓ Interstate bank mergers: The recent wave of bank mergers across state lines has resulted in new bank entities which have equity positions in multiple contiguous regional networks. As a means of simplification and cost reduction, these banks have a strong incentive to back the formation of super-regionals.

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the priority of other current major activities (e.g., off-line and on-line POS debit roll-outs).

✓ Sufficient interest to raise the capital necessary for the development of new products and services: In addition to ATM sharing, on-line POS debit, EBT, and health claims processing, network owners wish to explore products and services such as credit card processing and authorizations, ATM and POS terminal driving, electronic bill payment services, home banking, home shopping, merchant acquirer processing, check verification, and so on. Network owners (i.e., the banks) have finally come to the realization that the proliferation of products and services offered by the non-bank players in the electronic payment system market represents a serious threat to their exclusive ownership of the consumer payment system franchise. Whereas until recently, networks were often quite willing to out-source processing and support activities to third parties, the industry has begun to reverse this trend out of the realization that value and control (not to mention profit opportunities) may have been "given away."

Upon further analysis, it's clear that most of the reasons cited above have to do with competitive positioning, and ultimately profitability. Regional networks link together, thus forming super-regionals, in an attempt to increase process efficiency and reduce costs so as to better be able to guard against encroachment from the nationals. In addition, owner banks see the super-regional as a means of effectively competing with the process efficiency of the large third-party processors, so as to regain some control over the payment system which had previously been ceded to the non-banks.

Market Specifics

There have been a number of recent developments in the EFT arena:

- The Southeast region saw the formation of what was perceived by many to be the first super-regional network, when Honor, Relay, and Avail joined forces to form the Southeast Switch a few years ago.

- In the Pennsylvania/Ohio region, Corestates, owner of the MAC network and a major player in parts of the Northeast, has joined forces with Banc One, Society Corp (Green Machine network),

and PNC Bank (Owl network) to form EPS (Electronic Payment Services), a super-regional which operates in 16 states, predominantly in parts of the Northeast and Mid-west.

- There are also other active merger discussions, not yet publicly disclosed, which are developing in other parts of the country.

In addition to, but not necessarily unrelated to the emergence of the super-regional, there is also a definitive trend toward "in-sourcing" network processing capabilities. Historically, a few of the regional networks, such as Accel-Exchange in the Pacific Northwest, had opted to build and maintain an internal data processing and operations capability. Many networks, however, had chosen to outsource their processing requirements to third-party processors. A primary example of the current trend is the action taken by NYCE (one of the largest of the regional networks, based in New York/New Jersey), which recently terminated its relationship with DDS in favor of establishing an in-house processing capacity.

Finally, once again independent of but also in harmony with the development of the phenomenon of the super-regional, there is a market trend toward converting not-for-profit networks to profit-seeking organizations. Historically, the market had been more or less equally divided between non-profit and for-profit regional networks. The principal impetus for the movement toward for-profit status is the desire to raise capital to develop new products and services, which many feel is difficult in the absence of the profit motive as an incentive to contribute capital.

The Future

The EFT industry has grown tremendously, although not always predictably since its beginnings some 20 years ago. In the opinion of many in the industry, there are a number of "givens" in the foreseeable future:

1. Technology development will continue to fuel the development of new EFT products and services (such as EBT).

2. Total consumer electronic payment systems transaction volume will continue to show demonstrable growth.

3. The banks and non-banks (retailers, third-party processors, telephone companies, others) will continue to compete for control of the payment system franchise and profit capture.

4. Internal to the industry, the competition between the regionals and the nationals, sometimes tacitly and perhaps sometimes more overtly, will continue.

5. The number of regional networks will continue to shrink, with perhaps something like 10-20 survivors by the end of the 1990s.

6. Surviving regionals and super-regionals, having in the main adopted a for-profit status, will increasingly venture into new products and services, such as terminal driving, home banking, health claims processing, and, of course, EBT.

7. There will be a perceptible movement toward the integration of debit and credit at the point-of-sale.

Whether the regionals will "win" or the nationals will "win" is a matter of open conjecture. The regionals may be able to provide more customized support services, especially in terms of informal "hand-holding," which is particularly important to smaller financial institutions. At least in theory, however, the nationals may benefit from a lower cost structure. The super-regional, which can be thought of as a hybrid of the two, may ultimately prove to be the best of both worlds. In all likelihood, however, at least for the foreseeable future, both regional organizations, fortified by combining into super-regionals, and national organizations will co-exist.

Similarly, we believe that the era of complete bank domination over the consumer payment system has ended. The banks are, of course, learning to fight back, but non-bank competition in one form or another is here to stay.

POS DEBIT TERMINAL DEPLOYMENT BY INDUSTRY SEGMENT

Figure II.B.1 graphically displays the distribution of debit terminals across different industry segments from 1988 through *June* 1993.

The grocery industry segment is by far the largest segment with over 75,000 terminals deployed. It is growing at a fast rate, 42% between 1991 and 1992 and an astonishing 67% between 1992 and 1993. Meanwhile, the oil industry segment, which until recently was the largest industry segment for POS debit terminal deployment, grew 22% in 1992 to just over 26,000 terminals, and then by **91%** in 1993 to over 50,000 terminals deployed. The convenience store market segment grew roughly 130% from 1991 to 1992, had a flat year in 1993, and still accounts for only approximately 7,200 terminals. All other segments (e.g., fast food chains, pharmacies, movie theaters, etc.) combined currently account for just over 22,000 terminals. **Figure II.B.2** graphically depicts the annual growth rates in terminal deployments by industry sector over the last six years.

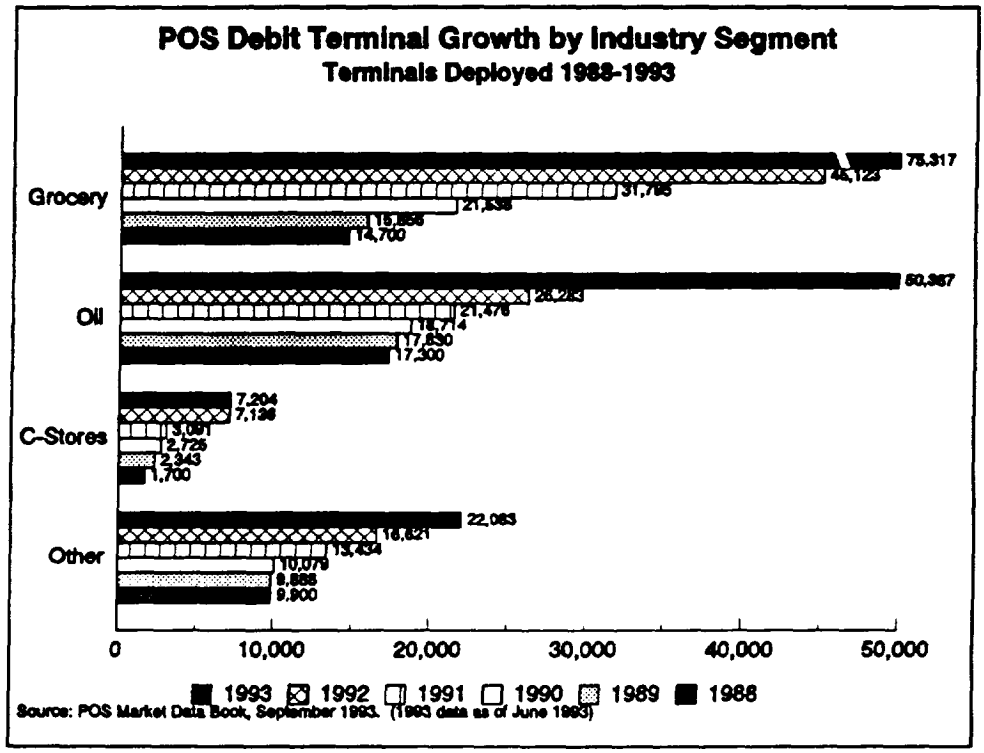

Figure II.B.1

As of June 1993, there were roughly 155,000 POS debit terminals deployed in the United States. The total count has grown from 40,439 in 1988 to 69,796 in 1991 to 95,163 in 1992, before reaching its current peak of 154,991. This equates to an annualized growth rate over the past six years of 29.0%.

Using this rate as a basis for projecting terminal deployments through 1994 and 1995 yields projections of 200,000 and 258,000 terminals, respectively. This annualized rate provides a moderate estimate. A less conservative approach might use the most recent year's growth rate of 63% and project 253,000 and 413,000 terminals by 1994 and 1995 respectively.

With respect to the grocery and convenience store market segments, POS deployments have grown since 1988 at an annualized rate of 38.6% and 33.5% respectively. Using these growth factors, projections for POS deployments for 1994 and 1995 are as follows:

Market Segment	Current 1993	Projected 1994	Projected 1995
Grocery	75,317	104,427	144,788
Convenience Stores	7,204	9,617	12,839
Total	82,521	114,044	157,627

The annualized growth rates used in these projections reflect the relatively high growth in deployments over the past two years. The projections, therefore, should be considered in the broader context of *where* these deployments have occurred. In general, the larger food retailer chain stores have lead POS deployment growth over the smaller independent and "mom & pop" stores.[2] While the food retailer POS market is far from saturated, it is likely that on-line debit will continue to grow in those areas offering the highest transaction volume potential (e.g., fast food chains, etc.). Given these considerations, the above projections should be tempered accordingly.

[2] This is consistent with data collected in twelve locations nationwide as part of this study. With the exception of the Houston area, in which significant convenience store deployments exist, POS deployments were found to be *almost exclusively* in supermarket chain stores.

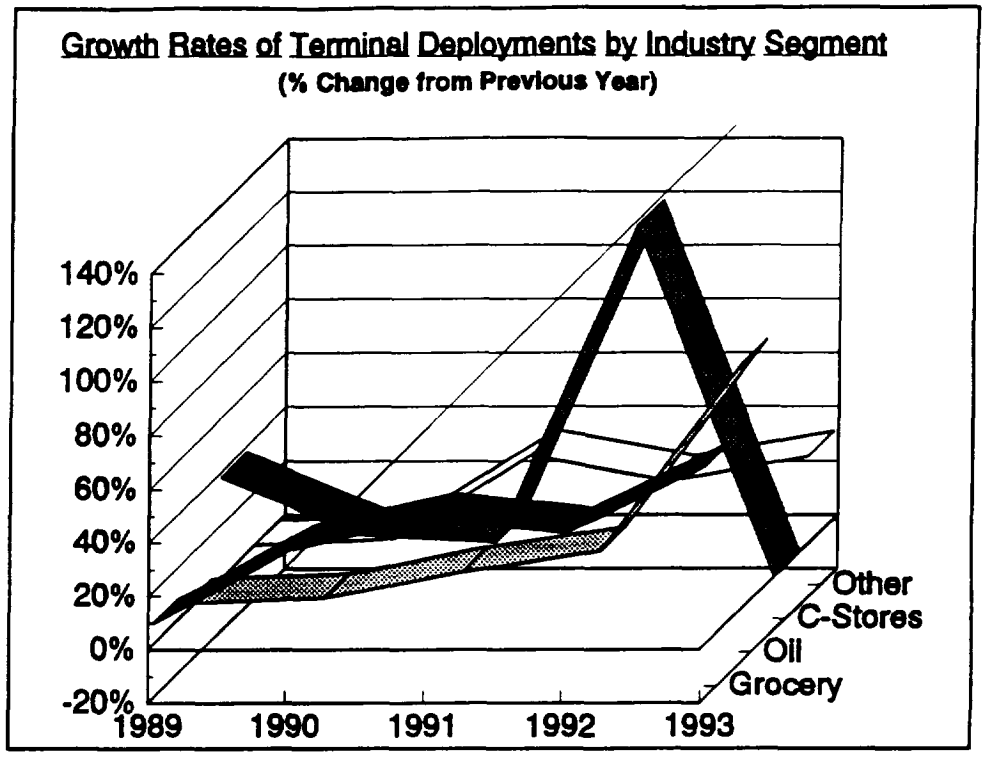

Figure II.B.2

POS Debit Transaction Volume Growth

Figure II.B.3 graphically depicts monthly POS debit transaction volumes for 1988 through 1993. Total volumes have grown from roughly 6 million monthly transactions in 1988 to 14.3 million monthly transactions in 1991 to 27.0 million in by June of this year. This reflects a five year annualized growth rate of roughly 40% over the period, and a one year growth rate of nearly 40% from 1992 to 1993. These figures suggest that 1994 volumes will increase to approach 37 million transactions per month.

Overview of U.S. Current and Planned POS Network Coverage

Presently, the number of shared regional EFT networks is approximately 75, down from roughly 150 ten years ago, with 80% of the market share concentrated among the top ten. **Figure II.B.4** shows the top 25 shared regional EFT networks with volumes, membership, and ATM and POS terminals (which accept POS debit). **Figure II.B.5** looks at POS switch fees and other fee

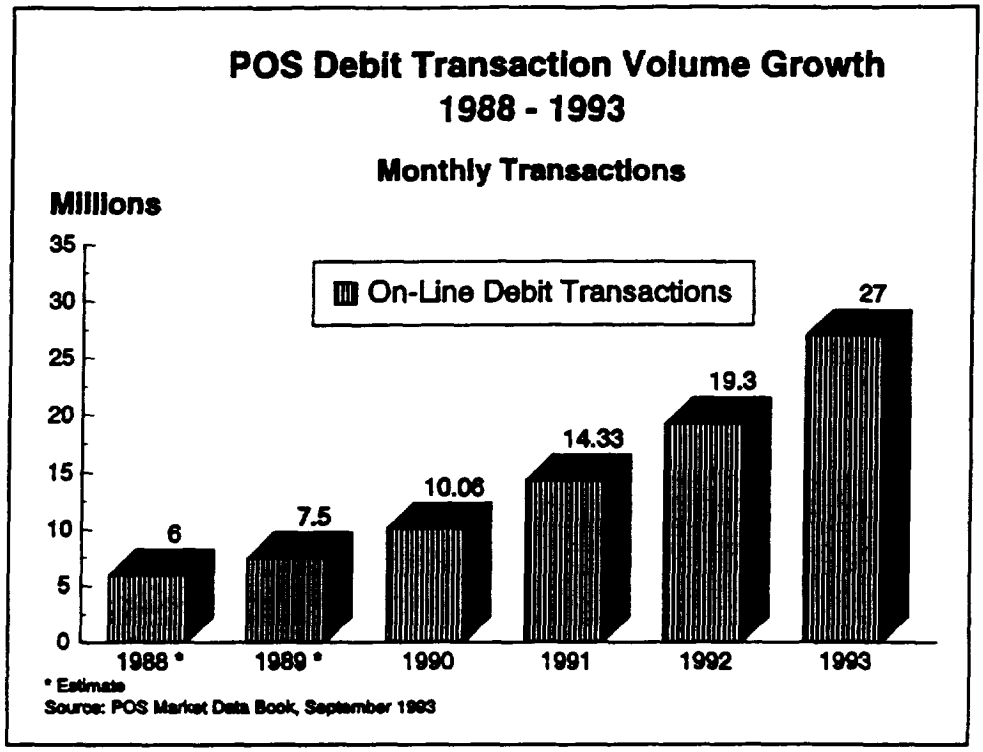

Figure II.B.3

elements. **Figure II.B.6** examines ATM switch fees from the standpoint of acquirer and issuer institutions.

Note: The following figures present descriptive statistics on POS and ATM fees. The components of these fees, and their differences, are discussed in detail in ***Section III. E. "Structure and Range of Fees"*** *of this report.*

In the coming years, the environment will likely involve ten to fifteen large super-regional networks spread across these regions similar to the current system of Federal Reserve Banks.

Network Volumes, Terminals, and Membership

	Network	ATM[i] Transactions	POS[i] Transactions	Switch[ii]	ATMs	POS	Card Base	Financial Institution Members
1.	STAR	98,171,680	4,474,799	20,616,862	14,852	59,070	27,343,826	744
2.	MAC	89,859,302	2,381,168	64,194,587	13,152	57,000	27,546,276	1,455
3.	NYCE	76,443,537	NA	17,816,700	11,401	26,766	21,263,216	725
4.	HONOR	69,674,861	1,688,812	17,202,654	8,938	11,252	21,500,000	1,042
5.	MOST	52,494,647	2,604,372	12,407,875	5,180	14,023	8,500,000	450
6.	PULSE	47,182,336	1,185,955	9,523,891	5,682	9,740	10,200,000	1,489
7.	Money Station	27,795,809	625,264	5,830,470	4,493	3,650	11,177,401	607
8.	Accel/Exchange	21,500,000	1,500,000	9,400,000	3,845	7,800	5,500,000	246
9.	Yankee 24	22,155,000	345,000	3,662,000	3,854	15,900	5,200,000	628
10.	Magic Line	20,214,355	237,249	4,294,837	3,723	4,783	4,200,000	452
11.	Network One	15,120,000	0	5,110,163	2,369	0	4,490,135	495
12.	BankMate	12,631,053	230,689	2,630,589	2,407	2,886	4,000,000	597
13.	XPress24	10,673,250	265,000	11,728,030	1,275	4,980	1,451,875	92
14.	Jeanie	8,858,000	1,550,000	5,960,000	1,120	5,225	3,120,000	195
15.	Cash Station	8,725,673	329,947	6,895,540	2,278	8,186	3,700,000	462
16.	Shazam	8,621,491	357,659	5,793,025	1,494	1,269	1,500,000	706
17.	GulfNet	8,946,000	0	1,226,300	2,185	0	5,100,000	225
18.	MPACT	7,400,000	175,000	7,176,000	989	2,600	2,400,000	427

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TOP REGIONAL NETWORKS
Figure II.B.5

Network	Switch Fees POS (cents)	Membership Fee ATM / POS network	Monthly Fee ATM / POS network	ATM Monthly Driving Fee	State
Star	5	$1,500 - $2,500	$1,000 - $2,250 annual	NA	CA
NYCE	4	$0 - $20,000	0	$125	NY
Honor	6	$2,000 - $25,000	$2,000 - $12,5000 annual	NA	FL
MAC	4.5-10	$5,000 - $75,000	0	$125 - $175	PA
Most	4	$600 - $100,000	0	$75 - $90	VA
Pulse	5-6	$200	0	NA	TX
Money Station	5	$7,500	$2,000	NA	OH
Exchange/Accel	5-6**	$6,000	$500	0	WA
Yankee 24	4	$10 + $50 per ATM	0	0	CT
Magic Line	5	0	0	0	MI
XPress 24	NA	not available	not available	not available	MA
Jeanie	10	not available	not available	not available	OH
Cash Station	6	0	0	NA	IL
Shazam	5	NA	0	$150 - $250	IA
BankMate	6	$100	0	$50	MO
GulfNet	NA	0	$420 - $5,000 annual	NA	LA
MPact	6	not available	not available	not available	TX
Presto	5	not available	not available	not available	FL
Tyme	6-8	*	0	0	WI
SCS	7.5-10	not available	not available	not available	OK
Networks	3	$500 - $40,000	0	$175 - $250	NE
Instant Cash	NA	not available	not available	not available	MN
Moneymaker	5	0	0	$.08 / transaction	TX
Quest	6	$1,000 - $2,000	0	NA	KY
Rocky Mtn BankCard	NA	$2,000	$150	$150	CO
Alert	8	*	*	NA	AL
CO-OP	7	0 - $5,000	NA	$100 - $200	CA
TX	15	$1,500	$500 / year + $100	NA	MA
MAX	10.5	NA	NA	$200	FL
Alaska Option	5.5	$1 per card or account	$100 - $600	0	AK
Universal Money Center	8	$1,000	$250	$50 ($150 / 1st ATM)	
Average	6.32				

* Tyme's fee is $80 per million in retained deposits, and Alert's is $30 per million in deposits.
** Exchange/Accel POS switch fees are split evenly between the issuer and acquirer.
Surcharging varies from bank to bank.

Source: Bank Network News, April 12, 1993

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TOP REGIONAL NETWORKS
Figure II.B.6

Network	Switch Fees ATM (cents)	Acquirer Receives				Issuer Pays				State
		WithDrw	Deposit	Transfer	Inquiry	WithDrw	Deposit	Transfer	Inquiry	
Star	3.5-8	50	NA	22	22	53.5-58	NA	25.5-30	25.5-30	CA
NYCE	6-13	38	70	20	20	44-51	76-83	26-33	26-33	NY
Honor	2-10	40	NA	20	20	42-50	NA	22-30	22-30	FL
MAC	5-25	30	80	15	15	35-55	85-105	20-40	20-40	PA
Most	3.5-14	41	NA	26	26	44.5-55	NA	29.5-40	29.5-40	VA
Pulse	6	50	NA	25	25	56	NA	31	31	TX
Money Station	4.5-15	35	55	35	35	39.5-50	59.5-70	39.5-50	39.5-50	OH
Exchange/Accel	3-10	45	83	25	25	48-55	86-93	28-35	28-35	WA
Yankee 24	12	38	69	25	25	50	81	37	37	CT
Magic Line	12	55	100	25	25	67	112	37	37	MI
XPress 24	15	50	50	50	20	65	65	65	35	MA
Jeanie	10	10	40	10	0	20	50	20	10	OH
Cash Station	6.5-8.8	44	109	35	35	50.5-52.8	115.5-117.8	41.5-43.8	41.5-43.8	IL
Shazam	5-9	21	85	16	16	26-30	90-94	21-25	21-25	IA
BankMate	10	55	NA	35	25	65	NA	45	35	MO
GulfNet	15	50	NA	25	25	65	NA	40	40	LA
MPACT	6	40	125	20	15	46	131	26	21	TX
Presto	NA	45	60	20	20	NA	NA	NA	NA	FL
Tyme	7	43	67	20	20	50	74	27	27	WI
SCS	7.5-10	40	40	20	20	47.5-50	47.5-50	27.5-30	27.5-30	OK
Networks	6	60	75	30	30	66	81	36	36	NE
Instant Cash	8-17	43	68	43	13	51-60	76-85	51-60	21-30	MN
Moneymaker	5	50	NA	30	30	55	NA	35	35	TX
Quest	9-13	40	NA	20	15	49-53	NA	29-33	24-28	KY
Rocky Mtn BankCard	20	50	75	15	15	70	95	35	35	CO
Alert	8	40	NA	15	15	48	NA	23	23	AL
CO-OP	7-10	55	80	15	15	62-65	87-90	22-25	22-25	CA
TX	6-18	31	81	26	26	37-49	87-99	32-44	32-44	MA
MAX	10.5	50	95	15	15	60.5	105.5	25.5	25.5	FL
Alaska Option	8-19	46	75	25	25	54-65	83-94	33-44	33-44	AK
Universal Money Center	10	50	NA	50	25	60	NA	60	35	
Average	**9.82**	**43.06**	**75.33**	**24.94**	**21.23**	**52.89**	**85.16**	**34.76**	**31.05**	

Source Bank Network News, April 12, 1993

C. RATIONALE FOR MODELLING FOOD STAMP EBT ON THE POS ON-LINE DEBIT INFRASTRUCTURE

EBT Requirements for Piggybacking the EFT Infrastructure

We have identified four fundamental issues which need to be addressed in evaluating the ability of the EFT commercial infrastructures to support the EBT requirements:

- Authorization processing
- Security
- Card and terminal technology
- Message formats

Authorization Processing

Authorizations for EBT transactions are performed by accessing balance information from an active household account database. The impact of funds withdrawal from these types of account is immediate. Supporting on-line, real-time transactions requires linkages from the retailer to external databases to complete the authorization function. Retailers requiring authorization from an external database have either built interfaces to the authorization center or use a third-party processor to provide these interfaces on their behalf.

Security

The security requirements mandated for EBT and on-line debit to protect the identity of the cardholder and the integrity of the transaction message are probably the single most important issue that distinguishes EBT product requirements from other payment alternatives supported in the EFT commercial infrastructure. While other payment alternatives have no security requirements, EBT and on-line debit systems must support:

- PIN encryption at the PIN pad
- Encrypted PIN files

- Key translation and management processes (including automated key changes which are required for inter-processor linkages to protect the integrity of the system).

Security requirements in the EBT environment go beyond the hardware element at the terminal and controller levels. PIN-based security used in EBT involves a system-wide capability from the terminal, through intervening nodes, into the authorization system and extending into the operating center. The implications of this are fewer for the POS terminal device than for other zones in the payment system, as many terminal devices deployed today already use DES encryption from the point of PIN entry.

Card and Terminal Technology

Simply stated, the terminal requirements for an EBT system entail three basic components:

- Magnetic stripe reader
- PIN pad (and port to support the addition of the peripheral)
- Printer (and port)

The printer is required to provide the recipient with a receipt including account balance information. In more sophisticated store systems, the electronic cash register (ECR) printer may be used to satisfy this requirement in lieu of the POS terminal printer.

Message Formats

The technical standards governing the content and format of a transaction message are called message formats. These standards specify in detail the message structure, format, content, data elements, and values for the data elements. Today, there are two message formats which are internationally accepted and widely followed:

- International Organization for Standardization (ISO) 8583
- American National Standards Institute (ANSI) X9.2 (1988 version)

The message length (i.e., the amount of information transmitted for authorization) of an on-line debit transaction is about 100 characters; providing information on transaction type, terminal location, date of transaction, the full card number, PIN and

expiration, etc., to support transaction authorization and processing. This structure makes additional allowances for security algorithms for the transaction itself and for the definition of the account from which the funds are being withdrawn (e.g., checking, savings, money market, etc.)

Food Stamp regulations governing on-line EBT provide guidance on message formats by stating that FNS "expects..EBT systems to meet currently prevailing [industry] standards"(where applicable). Various EFT processors in the market today employ their own proprietary message formats for EFT transactions. The capability of each potential vendor to process EBT transactions, therefore, hinges on whether the proprietary format in use fully meets the industry standards. By mandating compliance with industry standards for message format, the potential for inter-processor food stamp EBT is furthered. *The issue of message formats and standards is further addressed in the main, or "issues" report.*

Rationale for Modeling EBT on the On-line Debit Infrastructure

Figure II.C.1, entitled *"Payment Services Topology"*, maps the variety of payments that exist in the EFT commercial infrastructure by general processing structure.

Payment Services Topology

Function	Check	National Credit	Debit			EBT
			Off-Line	ACH	On-Line	
Customer Identification/ Validation	Varied	Signature	Signature	PIN	PIN	PIN
Terminal	None or Scan or MSR	MSR	MSR	MSR and PIN Pad	MSR and PIN Pad	MSR and PIN Pad
Message Format	Proprietary	ISO or ANSI	ISO or ANSI	ISO or ANSI	ISO or ANSI	ISO or ANSI
Authorization						
• Mode	Negative or Positive File	On-line or Floor Limit	On-line or off-line	Negative file (usually) or Positive File	On-line	On-line
• Database	Internal or External	External	External	Internal	External	External
• Liability	Retailer	DFI or FSC	DFI	Retailer	DFI	EBT Processor

Figure II.C.1

Legend
TPP = *Third-party processor*
MSR = Magnetic stripe reader
DFI = Depository Financial Institution
FSC = Financial Service Company

This chart provides the basis for evaluating each of the various payment infrastructures that could support EBT, and *clearly shows that the commercial systems capabilities required for EBT are best based on the existing debit infrastructure.*

An EBT transaction most closely resembles an on-line debit transaction. Both transactions are performed on a magnetic stripe terminal with a PIN pad. Both require the use of a PIN to validate the consumer's identification, and DES encryption (the Federal standard for the algorithm used in encrypting messages) at the terminal level -- to initiate transactions at a terminal for purchases, PIN selection, or entry into the system.

Authorizations for on-line debit and EBT are performed on-line, accessing active files resident at a processor database external to the retailer's store. Liability for the transaction lies with the party

that authorizes the transaction. Controls are already in place to track and monitor positive authorizations and to reduce the risk of loss from lost/stolen cards or fraud. The similarities between on-line debit and EBT transactions are not coincidental. In fact, in the payment systems environment, an EBT transaction is considered a debit transaction--only differing in the location of the consumer's funds.

The question remains whether the EFT commercial infrastructures supporting other payment types can also be used to support EBT systems. The short answer is no -- the amount of retrofitting an organization might be willing to expend to accommodate the needs of EBT far supersedes total replacement costs, even if the system were technologically sophisticated enough to accommodate EBT requirements. The underlying rationale follows.

Authorization Requirements

Any payment service that requires authorizations from an external database needs to build or procure an external interface to support EBT transactions. Retailers that operate ACH debit or proprietary check authorization programs have not needed to develop this capability to date. Those supporting debit or credit transactions already have interfaces to support these transaction types. Issues regarding the ability to retrofit these interfaces to support EBT are discussed in Section III of this report.

Security Requirements

The security functions mandated by EBT and on-line debit (see preceding "Security" discussion) are unused by credit and check authorization processors, because the customer validation process for credit cards and national debit cards (off-line debit) are signature-based. Requirements for electronic verification of the customer have not yet been mandated for credit card or national bank card transactions, although there is a strong movement among supermarkets to require PINs for both to mitigate the fraud incidence that these retailers have been experiencing. The investment cost and design complexity for security systems are formidable for those EFT commercial infrastructures that are not already supporting these requirements.

Card/Terminal Requirements

Most POS terminals that process credit card transactions are sophisticated enough to add PIN pads for on-line debit. In fact, nearly one million draft capture terminals are technically capable of taking debit cards with only minor adjustments and the addition of PIN pads. However, the vast majority of electronic data capture terminals *cannot* support the stringent security and Regulation E requirements[3] needed by debit.

Low-end, credit card terminals are commonly single-function devices with a magnetic stripe reader, but without a printer. At most, these devices may also support check authorizations. Typically, these pure credit card terminals cannot support multiple services and multiple card types, and thus cannot meet the requirements to support EBT.

More importantly, the use of credit card in the grocery environment has only become a phenomenon within the last two or three years. Thus, the credit card infrastructure is not as readily available in grocery stores as in other retail sectors. Most of the terminals that have been installed are dial-up, potentially straining volume throughput and processing capabilities as other applications are added to the terminal.

The ability of a check authorization terminal at the store level of a food retailer to support on-line debit depends upon the existing store system. This may range from a sophisticated scanning system and electronic cash register system to a simple stand-beside POS terminal. The former typically lacks the magnetic stripe reader capability. If the electronic cash register is a recent generation, then a combination magnetic stripe reader and PIN pad can be added and application software can be added at the controller to support debit. If the system is stand-beside, then its ability to support debit depends on the generation of POS terminal and enhancement capability. In all cases, some software modification is required.

[3] Regulation E requires both a transaction date and settlement date, and a description of the location where the transaction occurred. It must also include a transaction code that can be translated into a transaction description.

Message Formats

The message length and structure length for EBT closely parallels an on-line debit transaction. Comparatively, a credit message is shorter (only 40 characters in length), and the message structure is much simpler because there is no Regulation E requirement, security provision, and only one account type (line of credit) can be accessed. Check authorization messages may even be shorter, requiring limited formatting and limited information. Most operate against a customer identification number or checking account routing and transit number.

The message length has obvious implications to systems processing speed and telecommunications requirements--the more information that needs to be transmitted, the greater the processing time required to complete the transaction. For debit environments, this factor has virtually mandated the use of leased-line telecommunications, except in low traffic volume areas.

Although ISO and ANSI are the prevailing message format standards, most long-established networks in the U.S. today operate under some proprietary variants of these standards. One of the earliest of these, Deluxe Format 8, is widely used by networks for historical reasons, particularly for debit card transactions.

Note on Communication Protocols

Different protocols exist to support communications:

(1) Between the terminal and host computer: There are several communications protocols available in the market today to support POS debit terminals. The most common are asynchronous, bisynchronous, and SDLC (synchronous). These are defined in Section III of this report.

(2) From host computer to host computer: For communications from host to host, the most common protocol supported today is 2780/3780 contention bisynchronous point-to-point. Large processors (e.g., financial institutions) communicate in SNA, a packet switching, bit synchronous protocol commonly used to

support IBM host computers. Another alternative becoming more widespread in use in X.25, an ISO controlled standard for packet switching, which is a more standardized alternative to SNA.

The issue of supporting cross-border debit transactions, whether POS debit, ATM, or EBT, is not technologically constrained, but rather is a function of the third party processor's overall service offering. The large, more established third party processors supporting POS debit terminals can support either of these communications protocols on behalf of their retailer base.

More relevant to the discussion on communication requirements for EBT are the functions and capabilities of the state systems, and/or their EBT processors, to communicate to third party processors on an application to application basis.

Summary

The most prominent payment system models in the EFT commercial infrastructures support credit, debit, and check authorization. The infrastructure requirements to support EBT are best culled from the existing debit infrastructure, because the requirements for security, card and terminal technology, message formats, and linkages for access to external authorization databases are already in place. For example, in some cases it may be more cost-effective to the EBT vendor to receive transactions through a network switch than to develop telecommunications linkages from scratch. This too makes it easier for retailers to maintain existing business and physical relationships, particularly when third party processors are involved. The modifications required by other payment infrastructures pose undue technological and cost-justification challenges to be the foundation for a viable solution.

D. FUNCTIONAL COMPONENTS OF THE POS DEBIT INFRASTRUCTURE

Traditional Market Segmentation

In EFT/POS vernacular, there are common terms for the organization, processing, routing, and authorization of transactions. These terms are described within major business categories as follows: (1) Merchant Acquiring; (2) Card Issuing; and, (3) Transaction Routing. Each of these three categories are described below.

Merchant Acquiring

Merchant acquiring encompasses all of the companies and services which assist in signing up merchants, deploying terminals, routing transactions to an end-point (such as a regional or national network) that has access to the proper financial institution for authorization, and settling EFT/POS transactions with the merchant.

Merchants either own their processing infrastructure for point-of-sale or they lease/buy services from another company. Different parts of the nation have preferred methods of implementation for the merchant acquiring side of the business. On the West Coast, the large grocery chains typically purchase and operate their own technology platforms. On the East Coast, large grocery chains tend to experiment with one or more pilot installations and usually buy services from a third-party processor. Two charts which directly follow this discussion describe the preferred methods of point-of-sale implementation generally found nationally.

Figure II.D.1, entitled *"Current Environment - Option 1"*, describes a rather large grocery chain that purchases its own processing infrastructure. The merchant provides its own software and hardware development in support of the electronic payments program and deploys its own terminals. Usually in this environment, a third-party processor and/or a financial institution provides front-end processing and acquiring bank processing and support, and handles all switching to a regional and national network.

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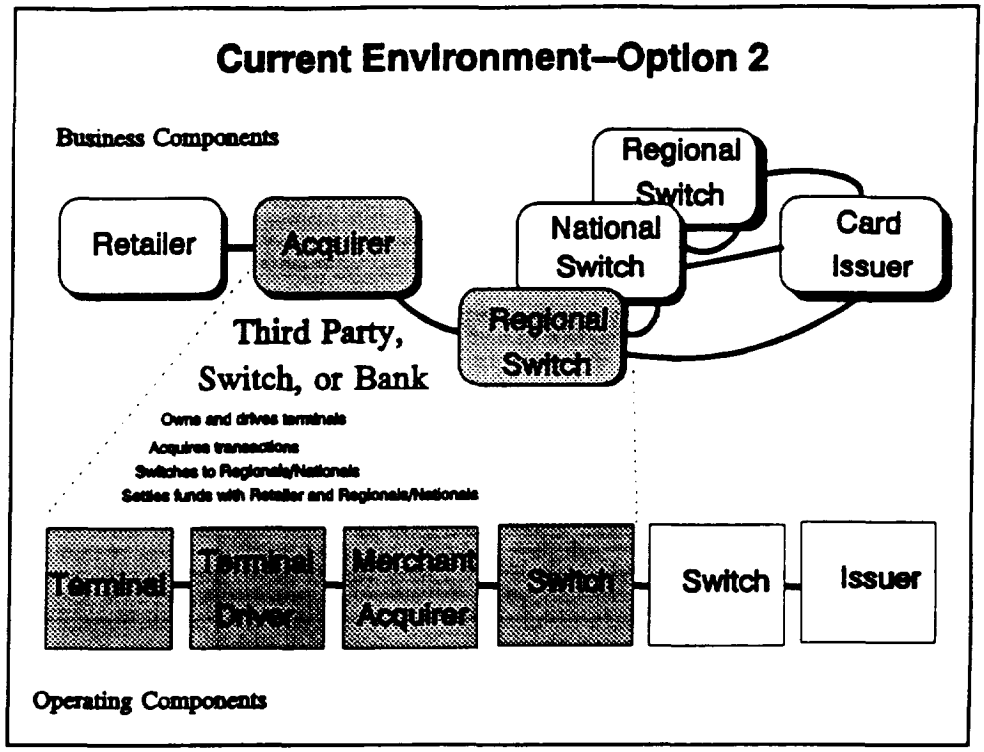

Figure II.D.2

- ✓ front-end processor,
- ✓ merchant acquirer, and
- ✓ merchant

All of these types of firms are described in more depth in the next section, entitled ***"The Value Chain"***. The main reason why there are so many different kinds of companies servicing this business is that it is highly specialized, competitive, price sensitive, and relies upon economies of scale. Each type of business is able to concentrate its resources on one or more particular core services that provide competitive advantage over others in the market. No one company provides the best all-around service in the merchant acquiring business. Moreover, due to bank regulatory issues, the non-bank firms are precluded from providing settlement of funds services.

Under EBT, when the EBT processor manages and deploys its own terminals directly with retailers, it will be performing all of the merchant acquiring functions analogous to the on-line debit world; from merchant contract negotiation, to terminal deployment,

terminal processing and transaction routing, and settlement services.

When the EBT processor receives transactions from a third-party, a merchant, a regional network, or a financial institution, literally all of the merchant acquiring functions will be performed by the other business entities. The EBT processor will simply act as a card issuing/authorizing service, thus reducing many of the front-end costs associated with signing and maintaining a merchant terminal network. In this situation, the EBT processor will not be responsible for settlement at the merchant terminal level. Rather, the EBT processor will only settle funds with third-parties, the regional network, merchant central sites, or financial institution end-points.

Card Issuing

Card issuing is a service/product offering performed by financial institutions which provides plastic cards, either proprietary or national debit and credit, to consumers for use as a point-of-sale product access device. The card issuer is responsible for authorizing transactions associated with the cards it has issued. Most often financial institutions maintain card bases and authorization access to checking and savings account balances. However, more and more institutions are beginning to outsource card-based applications to third-party processors for cost reduction purposes.

Card issuing in the EBT environment will likely be performed by the EBT processor on behalf of the State.

Transaction Routing

Transaction routers are companies such as regional and national networks which pass transactions between the merchant acquiring side of the business and the card issuance/authorization side of the business. Sometimes merchants directly connect their technology platforms to the transaction router (the regional network). Alternatively, transactions from merchants enter the regional switch through a front-end processor owned by a bank or third-party. To better support members that are unable to offer merchant services, some regional networks deploy the merchant terminals and connect them directly to the switch.

For debit transactions, national networks are connected to regional networks to facilitate inter-region transactions. Merchants and financial institutions do not connect to the national EFT debit networks -- Interlink and Maestro. This contrasts with the national credit networks which directly connect with financial institutions and third-party processors, thus cutting out the need for regional networks in the credit card environment.

Under EBT, when building upon the existing infrastructure, transaction routers will deliver EBT transactions directly to the EBT processor.

E. STAKEHOLDERS AND THEIR ROLES: "THE VALUE CHAIN"

The Value Chain

Each stakeholder and activity in the point-of-sale business system and value chain adds perceived value to the EFT service. These so-called "players" in the chain perform vital activities for the other stakeholders, both up- and downstream. Each of the activities performed by a stakeholder helps establish its own unique perspective on the acceptance/processing of point-of-sale debit and credit.

The stakeholder perspectives are critical to understanding each of the varied business and financial strategies. Each stakeholder is compensated for its value contribution. **Figure II.E.1** depicts the *"Value Chain of Consumer Debit Payments at the Point-of-Sale"*. Directly following that is **Figure II.E.2**, entitled *"Types of Companies Operating Within the Value Chain"*. This figure shows the various types of firms that offer some or all of point-of-sale processing services. Each stakeholder and the types of firms within the categorizations of the value chain are described in the next discussion.

Value Chain Definitions

Merchant. The retail grocery company establishment, either a large chain or a small to medium-sized operation, that maintains the point-of-sale contact with the EBT client.

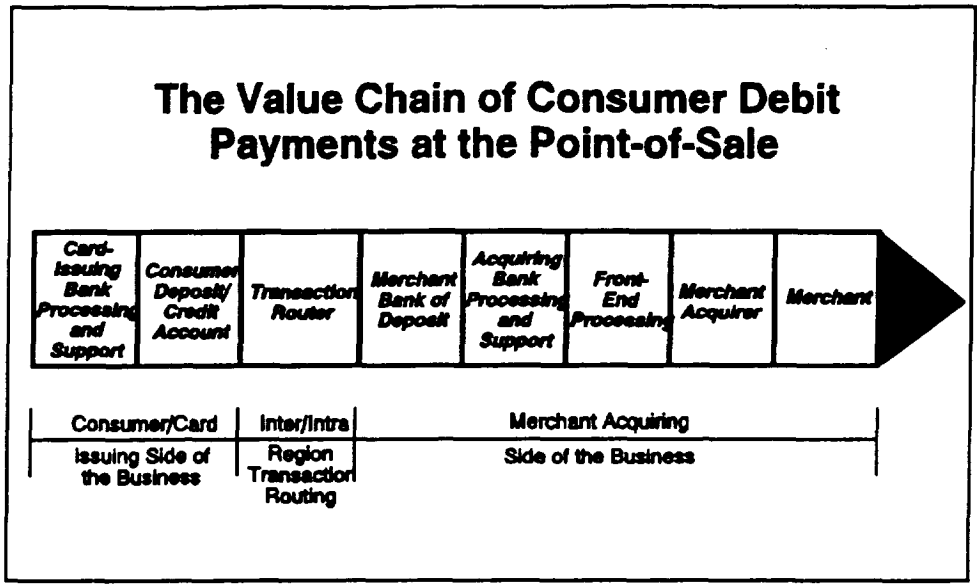

Figure II.E.1

Merchant Acquirer. The firm that sells electronic payment services to the merchant, deploys terminals, and maintains the payment and liability contracts on behalf of the acquiring bank. Companies that sell these services are banks, Independent Sales Organizations (ISOs), and third-party processors.

Front-end Processor. The firm that manages the telecommunications and terminal management infrastructure which routes electronic transactions from the merchant location to another point, usually the transaction router, for the purposes of transaction authorization. Companies that sell these services are banks and third-party processors.

Acquiring Bank Processing and Support. The bank which settles funds between the merchant and the merchant acquirer and the front-end processor each business day. This entity also provides risk management services which detects fraudulent merchant activity.

Merchant Bank of Deposit. The bank which maintains the day-to-day cash management and cash, coin, and currency relationships with a merchant. This entity receives funds from the acquiring bank processor for electronic card activity. This bank may or may not be the acquiring bank depending on whether it supplies

Types of Companies Operating Within the Value Chain

Value Chain	SERVICE PROVIDERS					
	Retail Establishment	Banks	Third Parties	ISOs	Regional Networks	Consumers
Merchant	✓					
Merchant Acquirer		✓	✓	✓	✓	
Front-End Processor	✓	✓	✓		✓	
Acquiring Bank Processing & Support		✓			✓	
Merchant Bank of Deposit		✓				
Transaction Router		✓	✓		✓	
Consumer Deposit Account		✓				✓
Card-Issuing Bank Processing & Support		✓	✓		✓	

Figure II.E.2

acquiring bank EFT services or not.

Transaction Router. This firm is also called a transaction processor and routes transactions from acquirers to issuers. It receives transactions from a front-end processor and routes them to appropriate card issuers and other regional and national networks for authorization. It is often a regional network or switch operated by a large financial institution that provides these services. The transaction router is responsible for single-point net settlement services (i.e., one net settlement total which includes both debit and credit transactions) for each entity that is connected to the switch.

Consumer Deposit Account. The consumer account from which electronic activity is debited or credited as a result of a transaction initiated by the consumer using a card at the point-of-sale. This account is similar to the EBT recipient account.

Card Issuing Bank Processing and Support. The bank which maintains the consumer relationship and depository account on behalf of the customer. Usually this support is provided by the bank itself or a third-party on the bank's behalf.

Merchant

Sometimes merchants, acting as their own front-end processor, own and operate their own debit and credit ready terminals, which constitutes a significant capital investment. Others contract out for the provision of equipment, which entails an ongoing monthly rental or lease expense. In all cases, transactions are captured on the terminal and sent to financial institutions or other third-party processors for transaction authorization and settlement of funds.

Grocery merchants generally want to minimize overhead costs and will accept point-of-sale debit transactions so long as the transactions are guaranteed and are priced at the lowest possible fee level. Most merchants are not loyal to any one financial institution or third-party and will shop around on an annual basis for the best price and service quality available in the market area (they usually look for the best combined pricing of both debit and credit card transactions).

Merchants are interested in consumer convenience, and in services which are attractive to consumers and which may help move market share into its stores. Merchants are loath to add administrative overhead to support electronic services or to increase the amount of time required for customer checkout. Therefore, it's possible they'll favor:

(1) one terminal that provides a full range of service capability (e.g. debit, credit, check authorization, EBT, etc.);

(2) some other party to handle the administrative and settlement side of the business (resulting in greater retailer efficiencies);

(3) the guaranteed payment/consumer convenience features of the service.

Retailers have been able to prove that customers using a debit card will spend more per visit than a cash or check sale and often

will buy higher margin goods. All of these elements provide hard benefits in favor of the debit service.

The introduction of electronic benefits transfer in the grocery environment is expected to complement the existing EFT platforms available to grocery merchants since the use of the technology is effectively identical from the merchant's perspective. Merchants are generally unwilling to support two separate terminal platforms, one for debit and credit cards and one for EBT cards, due to space limitations in the customer checkout area, cost, and other internal support and training requirements.

Merchant Acquirer

Firms providing merchant acquisition services are responsible for building a sales force that solicits merchants for terminal driving services. Often these entities are independent sales organizations, a bank, a third-party processor, or a combination of these players. If the entity is not a bank, it must offer services through a bank sponsor which we call the acquiring bank processing and support entity. Bank sponsors are required so that settlement money clears through a Federal Reserve Bank.

During the 1980s, many financial institutions exited the merchant acquiring business. As a result, third-party processors and ISOs grew in increasing importance as an alternative service delivery vehicle. Their roles remain increasingly important in today's market.

Merchant acquirers are interested in acquiring and retaining the highest caliber of merchant in the sales territory. They carefully screen merchants for integrity and profitability to minimize the possibility of fraud losses and collections which occur as a result of bankruptcies. Usually these firms are responsible for deploying terminals: the sale and leasing of equipment, the installation, and the maintenance of terminals. The terminal deployment business is dependent on a steady and strong stream of cash flow to fund the ongoing capital requirements for the purchase of equipment.

Moreover, merchant acquirers are often responsible for obtaining the merchant bank card contract which permits the acceptance of credit and debit cards at the point-of-sale and constitutes the terms and conditions of service. Debit card contracts are usually

handled by an addendum to the credit card contract or by separate contract. Both contracts must make provision for the capture of the sum total of all fees due throughout the entire value chain. *In other words, the merchant is usually charged one total fee which covers all of the sub-fees owed to not only this entity, but also the front-end processor, the acquiring bank, the interchange infrastructure, and the consumer bank.*

Since the EBT services will be provided on the same EFT platform as the debit and credit infrastructure, the merchant acquirer may want to ensure that EBT is supported by its platform to increase transaction volume and, potentially, revenues from additional merchant sales activity. Opting not to support EBT may make the merchant acquirer non-competitive in the marketplace. Conversely, the merchant acquirer can assist in the EBT sale/terminal deployment effort since the sales force is already well established in the merchant community.

Front-End Processor

This stakeholder provides the processing and operations which integrate the merchant point-of-sale terminal into a sophisticated telecommunications management network for authorization by the card issuer and/or the interchange infrastructure of a regional and/or national network switch. It also provides routine management, problem resolution, and Help Desk services.

Often front-end processors are entities other than banks since many banks have chosen not to be in this business. Of the banks that do provide front-end processor services, they generally provide both debit and credit card services and have tremendous economies of scale, often representing some of the largest processors in the business, such as Bank of America, Wells Fargo Bank, CoreStates, etc. The viability of the front-end processor is heavily dependent on the ongoing investments in hardware and software technology, which continues to change rapidly in electronic payment services, to meet or exceed the competition.

The front-end processor sends transactions to the card issuer only when the card issuer is directly connected to the front-end processor. Often this is the case when a bank or third-party operates on both the card issuing and merchant acquiring sides of

the business. Otherwise, the transaction is routed through the primary, local regional network and then, if necessary, through a national network such as Maestro or Interlink for access to a secondary regional network. Super-regionals can also provide national access through their gateway connections.

Front-end processors are responsible for providing access to voice authorization, sales draft capture, and deposit processing support for the merchant. These processors will be responsible for programming the EBT capability into the existing merchant terminals and for acquiring the transactions through the telecommunications infrastructure and routing them for authorization.

Acquiring Bank Processing & Support

The acquiring bank sponsors the merchant into the electronic payment system infrastructure. These banks are generally members of the regional networks and Visa and MasterCard. All electronic transaction settlement clears through this entity each business day. It provides:

- Risk management services which specially process transactions to detect and reduce fraudulent merchant activities and to protect cardholders and other financial institutions from transaction-related liabilities.

- Settlement and reconciliation which summarizes the daily merchant activity and prepares the activity for funds movement. This entity is responsible for settling funds directly between the merchant and the merchant bank. Settlement and reporting occurs at the terminal, store, and chain level. Funds are usually cleared through the ACH daily, five days a week.

- ACH data entry which moves funds due to/from the issuer, acquirer, and merchant banks of deposit.

- Reporting and billing which constitutes the calculation of processor and interchange fees, generation of statements,

summary reports, collection of fees for the banks, processors, and merchants.

- Exception item processing which encompasses the adjustment and chargeback processing, media requests, and statistical reporting requirements.

The acquiring bank processor is not usually the merchant bank of deposit, the bank which normally supplies cash, coin, currency, and cash management services. The acquiring bank is typically used only for debit and credit card relationships and point-of-sale settlement functions.

The acquiring bank relationship is established specifically for monitoring and clearing electronic funds initiated by a card. This stakeholder is usually responsible for the risk and liability of electronic transactions, such as fraudulent activity, and the daily balancing, reconciliation, and settlement functions associated with electronic transactions.

Merchant Bank of Deposit

The merchant bank of deposit is not usually the same bank which sponsors electronic payments at the point-of-sale, which we defined above as the acquiring bank processing and support. The merchant bank, the retailers bank, usually maintains the ongoing cash, coin, and currency and cash management relationship with the merchant and is interested in maintaining the overall merchant depository relationship. Often times this bank is not in the card-related merchant services business at all.

In the debit value chain, the merchant bank of deposit does not collect debit fees from the merchant. It only receives funds from the acquiring bank on behalf of the merchant for the amount of the daily sales volume (the dollar amount of goods and services purchased at a retailer) less transaction fees each business day, as calculated by the acquiring bank. The merchant bank of deposit, however, collects other types of normal account fees from the merchant which are outside the scope of the electronic payment process.

Each retailer's merchant bank of deposit relationship is not expected to change in the EBT environment, as all EBT transactions will be settled electronically with the merchant bank in the same manner as debit and credit activity today.

Transaction Router

The transaction router, the interchange infrastructure, supports the routing of transactions among member banks, the core function of regional and national network associations. This infrastructure performs the bulk of research and development on new payment products and provides member education and joint advertising and marketing for consumer usage to boost transaction volumes and card usage rates.

Regional networks, legal entities with By-laws and Operating Rules, are established through memberships of financial institutions in a geographic area: Northeast, Pacific Northwest, South, etc. When established, the Board of Directors selects either a for-profit or not-for-profit status. Usually this status determines the directional positioning of the regional network. Not-for-profit entities are interested in setting member fee levels to cover the costs of the supporting infrastructure. Fees are established, and as volume grows, funds are rebated back to the member institutions or fee prices are lowered as excess funds are generated. The main objective of these networks is to keep electronic payment costs as low as possible for the member banks. New development is typically foregone in lieu of lower fees. Thus, the margins between the cost of the service and the fee charged to its membership are nominal.

For-profit entities, on the other hand, use excess funds from volume growth to support new development activities which will generate more profits for the owner banks. For-profit entities are not interested in merely covering infrastructure costs. Members prefer viewing the regional network as a profit center for each owning bank. Fees tend to be slightly higher in for-profit entities. Since the for-profit entities are financially stronger than their not-for-profit cousins, many not-for-profit entities are turning toward for-profit status or are being acquired as part of the financial industry consolidation and competitive posturing for long-term survival.

In transaction routing, the terms on-us and off-us are used quite often. On-us transactions are those that are initiated by cardholders with accounts that are domiciled and belong to member institutions within a regional network which is currently processing a transaction. Off-us transactions are those that are initiated by cardholders with accounts that are domiciled and belong to an external, non-member institution, such as another regional or national network.

On a technical level, and as depicted in **Figure II.E.3** on the following page, the front-end processor is connected to either an acquiring bank processor or a regional switch, or both, through telecommunications. If the cardholder who initiates the debit transaction does not maintain an account with the acquiring bank processor (an off-us transaction), the processor sends the transaction to its regional switch which determines if the card is owned by another locally operated institution. If the cardholder maintains a deposit account at a locally owned institution (on-us), the transaction stays and is settled within the regional switch network.

National networks are employed if and when a customer is traveling across the country and uses a card. As expected, since national networks are only utilized when transactions are authorized out-of-region, the volumes are typically much lower than a regional network even though infrastructure costs are fairly similar. National networks are typically considered the switch of last resort.

Cardholder transactions which are processed and owned by the acquiring bank processor (the cardholder has a depository relationship with the acquiring bank processor and on-us) are the least expensive to process. Transactions which pass through a national network (off-us) are the most expensive since multiple networks, on both the regional and national level, are accessed. When transactions are processed through a national network, fees are collected by all parties which receive and process them. Regional network transactions, on a cost basis, fall somewhere in the middle.

In EBT, the transaction router will provide the same transaction delivery and single net settlement service for the EBT processor

as for other authorization centers. This means that the EBT processor only needs to settle with one point -- the regional network -- for all terminals, merchants, merchant acquirers, front-end processors, acquiring bank processors, and merchant banks of deposit that are supported behind it.

Consumer Deposit Account

This is the consumer's account from which funds are debited and credited to pay for goods and services purchased using a card at a merchant location. Often consumers are surcharged by the merchants or banks for the usage of debit cards at the point-of-sale. Some charges are considered implicit, that is, they are charged by the consumer's bank as part of normal checking account service charges. Other charges are explicit whereby merchants tack on a transaction fee on top of the purchase amount which is displayed on the customer's receipt at the retail location. These explicit charges are over and above the implicit bank charges.

Ultimately it is the consumer that determines the utility of a debit point-of-sale program and whether or not he or she will participate in it by using the card. The service must be convenient, easy to use, widely available, and reliable for customers to have an incentive to use it.

Card Issuing Bank Processing and Support

The card issuing bank maintains the card and the depository accounts of the consumer. It is responsible for resolving customer inquiries and disputes in a timely manner. The bank must also take on the responsibilities for lost and stolen cards, chargebacks, claims, and fraud which result in substantial monetary losses to the bank. Card issuing banks are typically paid interchange, a percentage of each sale, to cover the expected amount of overall program losses. Often times, a third-party processor will process and support a card-issuing bank rather than the bank itself. However, all of the liability and risk remains with the bank. The third-party processor provides strictly outsourcing services for the bank only.

F. COMMON "SERVICE MODELS" IN SUPPORT OF POS DEBIT AUTHORIZATION

Introduction

In describing the most common business configurations (i.e., "service models") currently supporting on-line debit authorizations, we make a distinction between the business relationships (e.g., contractual agreements) established between the retailer and the network switch, and the physical connections between the retailer and the network switch supporting the debit function. The following section describes these relationships in greater detail.

Business Relationships

All retailers access general payment services, such as credit and debit, through some form of business sponsorship. The traditional credit card model, for example, requires the retailer to establish a relationship with a financial institution, which is accredited for this purpose by Visa or MasterCard.

In the on-line debit model, the retailer is sponsored by the network switch in one of three types of business relationships, as diagrammed below in Figure II.F.1, *"Common Service Models: Business Relationships"*. The retailer's contract for services may be made through a merchant acquirer bank, through a third-party processor, or it can be made directly with the network switch.

Retailers Business Relationships With Acquirer Banks

The most traditional business relationship model is the retailer contracting services from a merchant acquirer bank to accept debit cards and/or credit cards. In this situation, the acquirer bank actually solicits merchant participation for on-line debit services using its own internal sales force or by sub-contracting the sales function to another organization (e.g., an independent sales organization (ISO) or a third-party processor who provides that sales function as part of a total package of services). Under either circumstance, the acquirer is responsible for the actions of those other parties to the network, and as such establishes acquirer rules and sponsorship rules in support of its contractual

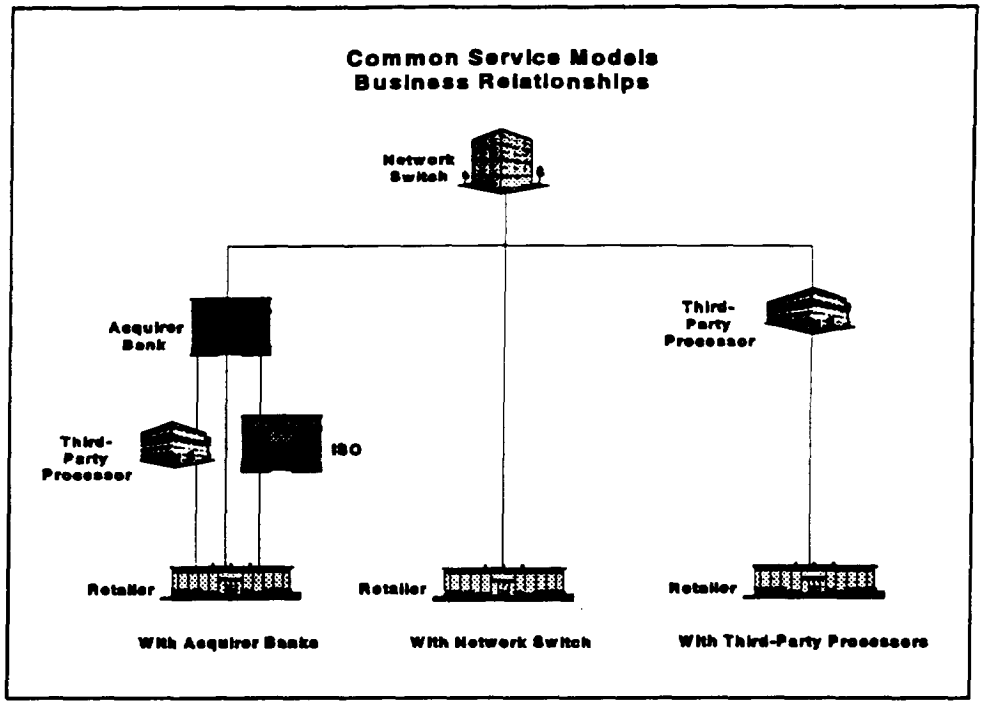

Figure II.F.1

arrangements.

In the early days of debit, the network switch programs required retailers to have a sponsoring bank (the merchant acquirer bank) to gain access to shared ATM cards at the point-of-sale. This arrangement was established because member banks perceived that the network switch ought to facilitate its members' businesses, since merchant acquiring was essentially a function performed within the financial institution domain.

There were a number of problems with this construct. First, the pricing and service relationships between the retailer and the merchant acquirer were outside the purview of the national or regional bank card programs. So, despite the fact that there was a common set of service standards to be maintained, pricing and other non-specified services (e.g., acceptance or denial of transactions) were left open to an acquiring bank, theoretically allowing acquirers to differentiate themselves from each other and compete in the market.

Second, not all banks were well attuned to the debit service. Many had been exiting the merchant services business on the credit card side over the past 7-8 years, and thus lacked an understanding of the economics, liability and risk issues involved in the payment services business in general. Therefore, financial institutions did not take a particularly aggressive marketing stance with retailers for the implementation of on-line debit. In fact, most banks were either inactive, or gave retailers confused and inaccurate messages about the service and pricing expectations; thus slowing the development of on-line debit.

Retailer Business Relationship With the Regional Network

As on-line debit programs continued to unfold, the banks began to perceive debit as a new cardholder service and looked to the regional networks to help them penetrate this market. As such, a new concept emerged in which the regional network contracted directly with the retailer for the acceptance of debit cards. In most instances, the direct contract is based upon standard pricing for the industry. The regional network provided a consistent set of services and a consistent set of messages about timing and promotion of these services. In this business relationship, the retailer must use an accredited bank as the settlement bank. In some instances, retailers were required to use the member bank of the network as the settlement bank, but this requirement has been dropped over time.

Those regional networks that have allowed direct contracts with the retailers have experienced rapid implementation of on-line debit in their regions--most notably Cash Station in the Chicago metropolitan area, and Yankee 24 in the Northeast. For example, by the end of 1994, almost all of the top 20 supermarket chains in New England will accept POS debit.

While in direct conflict with their current position, there is some indication that the national networks will be moving to support direct contractual relationships with retailers. The formal position is that Visa and MasterCard are moving in this direction. The informal position is that these national networks have started to institute enhanced capabilities for serving merchant acquiring banks, and they are posturing themselves to move in that direction.

Retailer Business Relationship With the Third-Party Processor

The role of the third-party processor in establishing a business relationship between the retailer and a point-of-sale program has always been marked by a significant degree of ambiguity, as the third-party processor operates within a network environment under two sets of business relationships.

First, there is a broad certification and approval process between the third-party processor and the network switch. In this model, the network agrees that the processor is technically qualified to interface and has agreed to all standard network operating rules. This, in effect, qualifies the processor to operate within the program. This certification process allows the third-party processor to support terminal driving and gateway processing, serving in essence as an intermediary point between the retailer and the network. As a gateway service provider, the third-party processor can provide a retailer with a single interface or "external pipe" to support all network access requirements (e.g., debit credit, check authorization, etc.).

However, the certification process does not enable the processor to operate within the program--that is to sign up merchants for participation in an on-line debit program. In order for a processor to physically be able to route transactions from a given retailer, typically that processor needs to operate on behalf of an acquiring member or to contract with an ISO to sign up merchants.

Importantly, the price paid by the retailer for processing services depends upon the deal the retailer is able to negotiate under the three scenarios described above.

- If the network is driving its own terminals, the network establishes its own pricing for terminal driving and processing services for the retailer.

- If the retailer has a direct contract with the network switch which uses a third-party processor for terminal driving services, the network switch may establish the price for processing:

- ✓ Under a pre-arranged pricing schedule developed with third-party processing affiliates. The network benefits in this case, because it obtains a pricing discount from the third-party processor on behalf of the retailers. The retailer benefits also because typically the retailer can negotiate a shorter term contract.

- ✓ By providing the retailer with the names of qualified third-party processing affiliates, allowing the retailer to negotiate the terms and price for service. In this case, the final price would be set directly by the third-party processor.

In both cases, the debit access fee to the retailer would be controlled and defined by the network, but the third-party processors could compete on fees for other services, such as credit, check authorization, frequent shopper, and/or terminal driving.

The preceding discussion presented the three common service models supporting the *business* relationships between the retailers and the network switch in the commercial environment.

In the typical EBT model, the State agency selects an EBT processor through a competitive procurement process which, in turn, establishes business relationships with acquirer banks, network switches, and/or third party processors to support EBT transaction processing on behalf of the State. The models most likely to predominate are in essence a function of the ability of the providers (i.e., banks, networks, third party processors) to meet the certification requirements mandated for participation in the EBT program, and may vary geographically.

Physical Relationships

Numerous configuration options will support on-line debit, and vary according to the stakeholder that is controlling the terminal driving function. The following paragraphs present schematics of the most common configurations or "service models" for POS debit, and describe infrastructure requirements to support transaction processing. Three basic models are presented below.

Option 1: The Retailer Buys the Debit Services From a Network Switch

In this option, the retailer buys all terminal driving and application services from one network switch. Also referred to as store-level direct connect, this option requires that the network switch drives the terminals, e.g., supports the front-end configuration. Thus, no systems development is required by the retailer.

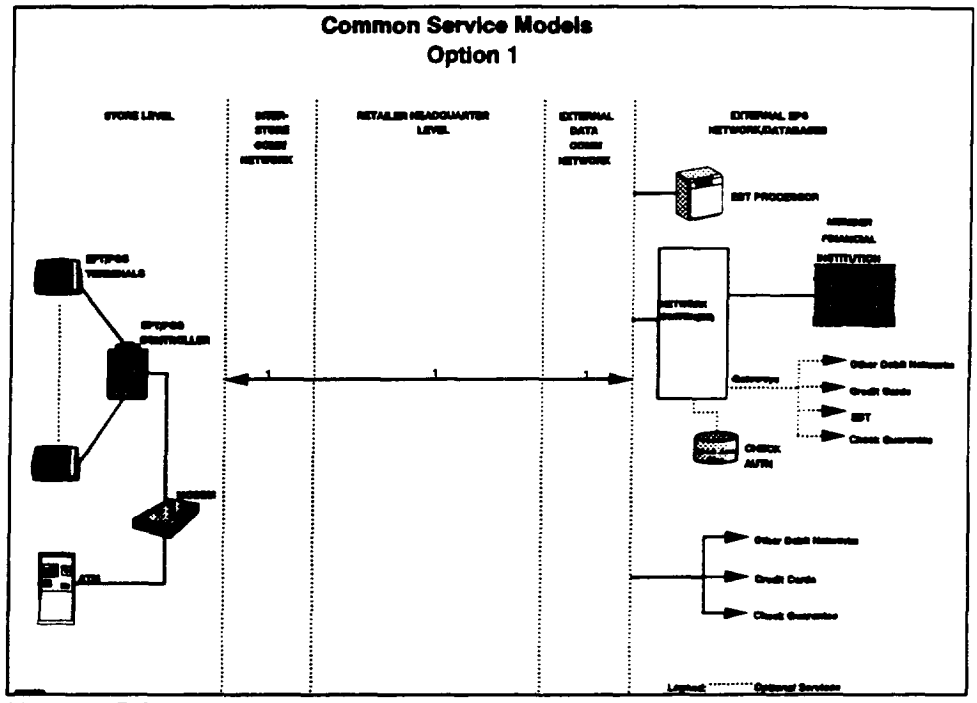

Figure II.F.2

Typically, the retailer has access to only one network unless the network provides gateway services to other shared networks. Most retailers supporting on-line debit POS have access to at least one network.

Store-level direct connect does not support check authorization or credit card functions, unless the network switch provides gateway interfaces to check authorization services and Visa/MasterCard, respectively. EBT transactions would be facilitated through the network switch, acting as a gateway to the EBT processor.

The retailer must also establish a relationship with a depository financial institution for clearance of funds.

Option 2: The Retailer Buys Debit Services From an Acquirer Bank or Third-Party Processor

Here, the retailer obtains all terminal driving services from an independent third-party processor or an acquirer bank. The retailer is wholly reliant on a third party to support on-line debit authorization functions. Such reliance is often the outcome of shared regional network by-laws prohibiting retailer direct-connect.

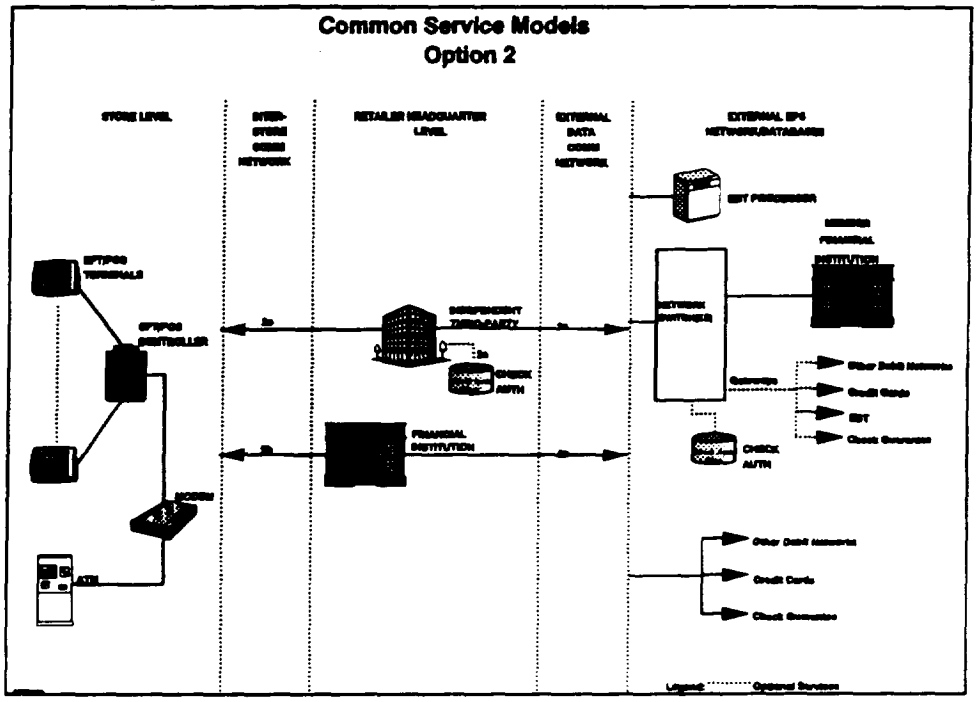

Figure II.F.3

There are two connection modes for retailers in this option:

- The acquirer bank or third-party processor connects to the retailer at the store level.
- The acquirer bank or third-party processor connects to the retailer's switch, located at the chain headquarters.

In either case, the retailer is provided access to the network switch(es) to which the acquirer/third-party belongs.

Check cashing can be supported either through gateway services to a third-party check authorization company, or to the retailer's proprietary system (depending upon the retailer's switch configuration). Credit card can be supported through gateway services provided by the acquirer/third-party. Similarly, the acquirer/third-party would provide the retailer with gateway access to EBT processor to support EBT transactions. Settlement and clearance of funds is also provided through the acquirer/third-party.

The development[4] costs for this option are dependent upon the connection mode, and influenced by the number of processor interfaces required for access to external databases.

Option 3: The Retailer Implements an In-House System

In this option, the retailer implements an in-house system which:

- Drives all POS terminals
- Supports check authorization
- Routes electronic payment system functions either directly to an external network switch or to a gateway service provider, i.e., an independent third-party processor or financial institution.

This scenario requires that the network switch permit merchant direct connect. From a business perspective, all switching to external databases is either performed through a gateway service provider, or possibly by the retailer's in-house system. In the latter, the retailer is responsible for developing multiple processor interfaces at the retailer switch (headquarters).

Check cashing can be done in real-time, against a full positive proprietary file, or through a third-party check authorization

[4] Retrofitting requirements and costs are discussed in a separate section of this report.

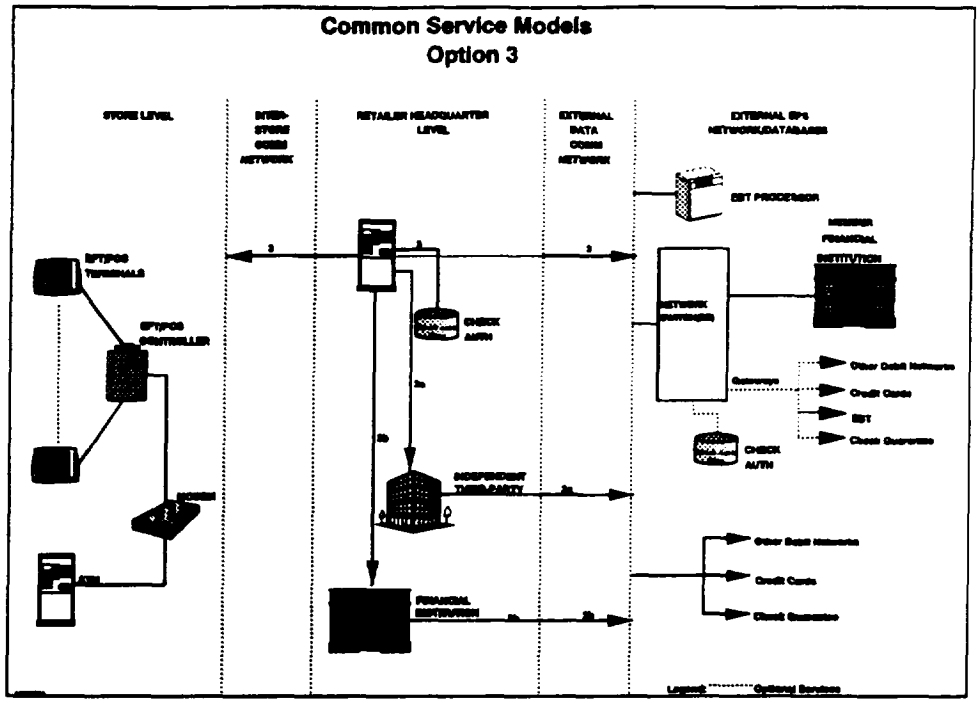

Figure II.F.4

service. Real-time authorizations for credit card transactions are performed against Visa/MasterCard databases. For EBT transactions, the retailer would need to develop a host-to-host linkage to the EBT processor, or access the EBT processor through a gateway service provider, e.g., the network switch, third-party, etc. Settlement and sponsorship requirements must be performed by a depository financial institution.

Summary

There are three types of contractual arrangements between the retailer and the network switch in support of POS debit:

- Retailer business relationship with the acquirer bank
- Retailer business relationship with the network switch
- Retailer business relationship with a third-party processor

The service models, describing the most common configurations or physical relationships between the retailer and the various stakeholders involved in supporting electronic payment services today, fall into three categories:

- Store-level direct connection, in which the retailer buys on-line debit services from a network switch.

- Connection to an acquirer/third-party, in which a retailer buys on-line debit services from an acquiring bank or third-party processor.

- Company-level direct connection to a network switch, in which the retailer develops its own front-end processing capability.

The purpose of the preceding discussion is to clarify the business and physical relationships supporting on-line debit POS in food retailer establishments; *not* to imply how EBT would be supported at the retailer level. To date, State EBT procurements have required a single vendor to service all authorized food retailers, with no use of retailers' existing payment systems. This discussion provides the context in which such development, if it is to occur in the future, should be considered.

The physical relationships described above have been illustrated in a generic form on the previous pages. Complete retailer-specific diagrams are provided in TECHNICAL REPORT #2. These diagrams illustrate how various configurations encountered reflect the three "common service models" described above. As you will see, the diagrams adopt the service model schematic and focus on how on-line debit transactions are accomplished in the retail environment.

III. BUILDING UPON THE EXISTING POS INFRASTRUCTURE TO SUPPORT EBT

Introduction

Pursuant to the Mickey Leland Memorial Domestic Hunger Relief Act of 1990, the Department issued final regulations ("EBT regulations") on April 1, 1992 implementing requirements that EBT systems must meet in order to be approved for operation. Among these requirements are several that pertain to the functional capabilities of POS terminal devices.[1]

This section begins with a discussion of the functional requirements for POS terminal devices as specified by FNS in the EBT regulations. These functional requirements provide a key "benchmark" against which current terminal devices can be measured to determine their relative EBT readiness. Importantly, the ability of a terminal device to perform the required functions, either currently or with modification, is but one component of a retailer POS system's EBT readiness. Ultimately, readiness can be judged only by examining the capabilities of each "zone" in the POS system. These zones extend well beyond the POS terminal device, and are discussed in detail in Part C of this section.

We focus, therefore, on one component of EBT readiness in Part B of this section where we present a taxonomy of current POS and electronic cash register (ECR) devices. Part B discusses separately the components, configurations, and transactions supported by POS devices and ECRs. The results of our discussions with equipment manufacturers and vendors are then summarized, and individual "fact sheets" on leading (i.e., in the food retailer segment) devices are presented. Each device's capability to perform the functions required under the EBT regulations is summarized in its fact sheet.

[1] We have focused our analysis on the functional capabilities of POS terminal devices, and where appropriate, peripheral devices including PIN pads and printers. While the EBT regulations provide guidelines for the performance of other components in an EBT system, including the processor and telecommunications, a comparison of these standards to the current EFT infrastructure lies beyond the scope of this effort.

Section III then expands the discussion of POS and ECR devices to encompass the broader payment systems environment in which they operate. Part C, entitled *"Zones of Service Provision to Support On-Line POS Debit"*, presents the generic POS system in five component zones. Each zone is discussed in terms of its physical boundaries in the system, and the functions performed therein. This section provides the foundation for the discussion of system-wide retrofitting requirements which follows.

The complex issue of retrofitting existing retailer POS systems to support Food Stamp EBT is introduced in Part D of this section. The discussion builds on the "zones of service" concept introduced in the previous part, and focuses on the specific challenges of retrofitting each zone. Given the vast differences in the equipment, configurations, and applications supported by retailer payment systems across the country, an accurate assessment of the challenges and costs of retrofitting requires a guiding schematic. The intent of Part D is to provide such a schematic.

Section III concludes with Part E, entitled *"Structure and Range of Fees"*. This section begins with an historical analysis of how ATM and POS fee structures have evolved. Comparative fee schedules for major shared regional network POS programs are presented. Recognizing that network fees are only part of the total cost of deploying and operating a POS system, additional fees for services are analyzed according to who pays, how much, and the service or function covered.

A. FNS FUNCTIONAL REQUIREMENTS FOR POS DEVICES

PIN Encryption and Non-Display

The EBT regulations require the utilization of the Data Encryption Standard (DES) algorithm method of encryption at the point-of-entry of the recipient's personal identification number (PIN). An additional requirement relating to the PIN is that POS terminal devices used for Food Stamp EBT are prohibited from displaying the PIN on the terminal screen. The regulatory language setting

forth these requirements is found at 7CFR §274.12(h)(7)(iii) and 7CFR §274.12(h)(7)(ii) respectively.

Balance Inquiry and Non-Display

Terminal requirements mandated by the EBT regulations further specify that while balance information must be available to households, it cannot be displayed on terminal screens in the check-out lane. Separate terminals, deployed away from the check-out lanes, to support balance inquiries are exempt from this rule. The implications of this rule on terminal device functions are two-fold: (1) terminals must be capable of supporting the balance inquiry function; and, (2) screen-display of balance should be supported for those devices deployed outside of the check-out lanes. The regulatory language setting forth these requirements is found at 7CFR §274.12(h)(7)(i).

Printed Receipt

Under the EBT regulations, POS equipment supporting on-line Food Stamp EBT must be capable of printing a receipt for each transaction performed. At a minimum, the receipt is required to contain the transaction type, purchase amount, remaining balance, date of transaction, terminal location, and account code or recipient code. The regulatory language setting forth these requirements is found at 7CFR §274.12(f)(3).

Minimum Transaction Set

An additional regulation with implications for POS device functionality is found at 7CFR §274.12(h)(9), and pertains to the FNS minimum transaction set. The regulation requires that, at a minimum, the EBT system, including third party processors and retailers driving their own terminals, must be capable of providing for authorizing or rejecting purchases, refunds or customer credits, voids or cancellations, key entered transactions, balance inquiries and settlement or close-out transactions.

B. TAXONOMY OF POS AND ECR DEVICES AND THEIR CAPABILITIES

A vast spectrum of electronic payment systems are deployed in the food retail industry today. In the most basic sense, all systems can be described in terms of the equipment configuration, and the functions supported by each piece of equipment. Equipment configurations can be as basic as a full-function stand-alone POS terminal, and as complex as a controller-based ECR system integrated with POS terminals and other peripherals. As with any major purchase of a good or service, the type of equipment selected by a retailer, its configuration, and its capabilities are largely driven by price. Other factors influencing the decision include store type, anticipated transaction volumes, number of applications (e.g., credit, debit, check authorization) desired, and ability to upgrade. In short, on-line debit transaction authorization and settlement (the focus point of our research) can be supported by a myriad of equipment configurations.

With our focus on-line debit, we identified the leading POS and ECR devices (as determined by market share) currently deployed and collected detailed information on the configurations and functions supported by each. This section presents the results of that research, with POS presented first followed by ECRs.

Two important notes before continuing:

(1) Although their descriptions are presented separately, ECRs and POS terminals are deployed together to achieve the required functions of an integrated system. The POS terminals described include stand-alone and ECR-connect capable devices. Often a terminal can be both. The ECR devices profiled, however, include only those that are controller-based; as only those types can support debit and ultimately EBT.

(2) If the costs to retrofit a device to support EBT were estimated to exceed the cost of replacement, the device was not included in the taxonomy.

POS Terminal Profiles

Through extensive discussions with terminal vendors and data subsequently provided, we have gathered information regarding the features and functional capabilities of the most common POS terminals in the food retailer environment. Each of the terminal models discussed in this section, according to the manufacturers, is designed for the food retailer market segment and has the capability of processing EBT transactions. That is, these terminals have been represented by their manufacturers as being fully capable of meeting the functional requirements for terminal devices set forth in the EBT regulations at 7CFR §274.12(h)(7).

This discussion contains data on POS terminal components, POS terminal configurations, POS terminal transactions supported, major POS terminal vendors, and POS terminal pricing.

POS Terminal Components

A standard in-lane POS terminal consists of the following components:

Keypad: The terminal provides a keypad which is integrated into the hardware for data entry. This keypad typically consists of 12 numeric keys (much like a telephone or calculator) for entering the dollar amount of the transaction, several fixed function keys (which may be software programmable) to allow the user to select from a variety of transaction functions (i.e. credit, debit, EBT, etc.), and sometimes several software programmable (also called screen addressable) keys to allow the user to select from choices listed on the screen to provide for easier user interface.

Magnetic stripe card reader: The card reader is an integrated part of the terminal, and is used by either the customer or merchant cashier to swipe the debit, credit, EBT, or check card through in order to capture the card information. POS terminal card readers are typically configured to read Track 2 on the card.

Printer: A printer must be connected either through the electronic cash register (ECR) or be directly connected to the POS terminal. A customer receipt is required to complete all electronic payment transactions.

PIN encryption device: The customer must always enter his/her PIN in order to complete a debit or EBT transaction. The PIN must be encrypted for security reasons either through the POS terminal, if it is entered there, or through a separately attached PIN pad. The PIN must always be encrypted at the initial point of customer entry.

Memory: POS terminals can have varying degrees of memory from 8K to 768K of RAM (typical terminals have between 32K and 128K). The amount of memory dictates the level of functionality the terminal may provide. As more functions and applications (i.e. credit, debit, EBT, check authorization, data capture, etc.) are supported by the POS terminal, more memory becomes necessary. In many cases, memory may be expanded or enhanced to allow the terminal to support additional applications.

Ports: Ports are necessary in order for the POS terminal to interface with separate PIN pads, printers, ECRs, POS terminal controllers, bar code wands, scanners, LANs (local area networks), etc. The industry standard port used is an RS-232 interface. An RS-485 port is similar to the RS-232, but provides for faster communications. Typically, POS terminals have a minimum of one port for a printer and one for a PIN pad, but many have additional ports for additional interfaces.

Communications capability: The terminal must be able to communicate with the host and/or switch in order to process the transaction, receive authorization, and settle the completed transaction. This can be accomplished several ways, either through a POS terminal controller, through the individual POS terminals themselves, or through the ECR or ECR controller (a mini or micro computer which acts as controller for the in-lane ECR terminals). All communications with the host/switch are facilitated through one of these devices, and communications are carried through a dial-up or leased line. POS terminal modems are defined by the baud rate, which refers to the speed with which they may communicate and transfer data. Most POS terminal modems have an option for either a 300 or 1200 baud rate. In addition, POS terminals may communicate through several protocols, namely synchronous (SDLC), asynchronous, or bisynchronous. Protocol refers to the method by which voice and

data travel across telecommunication lines such that both the transmitter and receiver can understand what is being sent. (Asynchronous is the least advanced protocol type and applies when data can only travel in one direction at a time. Bisynchronous refers to situations in which data can be sent and received at the same time. SDLC is the most highly advanced protocol type of the three.) Networks will generally communicate using any of these standard protocols.

Software: The specific functions supported by an individual POS terminal are provided by the terminal's software. There are standard software packages, which are purchased separately from the terminals, available for various commonly used functions. Alternatively, users may program the terminals on their own, using the programmable language provided in the terminal (e.g. standard "C" or a proprietary language such as "TCL", which is a VeriFone language used in many VeriFone terminals).

Peripherals: Additional peripherals may sometimes be attached to the POS terminal for different functions. These include bar code wands, hand held scanners, smart card readers, etc.

POS Terminal Configurations

There are a number of configurations which POS terminals may be able to accommodate depending on a variety of terminal characteristics. Configurations supported depend on the number of ports, the memory, and the communications capability of the POS terminal. The three general configurations possible for POS terminals are as follows:

Stand alone: This configuration refers to a set up in which the POS terminal may act as an individual device with no connection or support necessary from a controller or ECR. In effect, the POS terminal has all of the functionality and capabilities in order to act alone to complete the transaction at the point-of-sale. For the POS terminal to have this capability, it must have a modem to communicate with a host or switch for authorization and settlement, must have the capacity to interface with separate PIN pads and printers, and must have adequate memory to process the different types of transactions performed within the specific retail environment.

ECR connect: This configuration refers to situations in which the POS terminal may be connected with an ECR for various functions at the point of sale. The POS terminal must have adequate ports to support an ECR interface, and the ECR itself must have the capability to interface with the POS terminal as well. Primarily, this configuration is found with advanced ECRs in place, and typical interface functions revolve around input of the dollar amount of the transaction directly from the ECR to the POS terminal, and the printing of the customer receipt through the ECR rather than a separate printer attached to the POS terminal.

PC controller connect: This configuration is similar to the ECR connect configuration, except the POS terminal interfaces with a PC controller, usually a mini or micro computer, which drives the ECRs. Again, the POS terminal must have a dedicated port for this interface and the PC controller must have interface capability as well. In addition, the interface generally supports the amount and print components of the payment transaction. This configuration is likely found in large supermarket environments with advanced payment systems and ECRs in place.

POS terminals may sometimes have the capacity to drive other POS terminals, acting as a "master" for the other "slave" terminals. In this case, the master has more advanced intelligence, higher functional capabilities, and better interface and communications capabilities than the slaves which it drives. The master typically communicates with the host or switch and relays all pertinent data and communications to the appropriate POS terminal. In addition, the master often times interfaces with a PC or ECR controller which drives the ECRs. Through this interface, transaction and print functions can be performed through the ECRs at the lane level, even though no direct interface is necessary between in-lane POS terminals and ECRs.

POS Terminal Transactions Supported

POS terminals may support several transaction types and perform various payment applications. As mentioned above, the functions supported depend upon the memory capacity of the POS terminal, the hardware specifications (i.e. the keypad, number of ports, etc.), and the software installed in the terminal. The most

common types of payment applications and transactions supported in the supermarket industry include the following:

Direct debit: A direct debit is the electronic transfer of funds from a customer's demand deposit account to a merchant's account. These transactions are performed by using a magnetic stripe debit card and require customer input of a PIN. Transaction authorization and settlement are performed on-line.

ACH debit: ACH debit transactions are performed with a magnetic stripe card, but no PIN is required. This type of transaction also draws funds against a customer's demand deposit account. However, the transaction is authorized against a store or chain negative file and settlement is performed off-line through the ACH.

Credit: Credit transactions rely on signature verification, and also involve the use of a magnetic stripe card. This type of transaction draws funds against an unsecured line of credit to which the customer has access through a card issuing bank or organization. Transaction authorization may be on-line or off-line and is generally performed through a VISA or Mastercard authorization center. Settlement is performed in batch mode.

Check authorization: Check authorization or verification transactions involve the use of a magnetic stripe card or bar-coded card. This type of transaction provides the merchant with some guarantee that there are adequate funds in the customer's checking account to cover the amount of the check written. This is typically tracked through store or chain files containing only negative account data or sometimes total customer checking account data. Settlement is not necessary for this type of transaction.

Target marketing / frequent shopper programs: Target marketing and frequent shopper transactions involve the use of a magnetic stripe card but generally no PIN or signature verification. These types of applications are specifically related to shopper habits and provide incentives or reimbursements for certain shopping behavior.

Electronic data capture: Electronic data capture has evolved to allow POS terminals to automate the settlement component of various payment applications. It allows POS terminals to settle transactions electronically and eliminate the paper based process previously used for settlement. There are three basic possible data capture possibilities which terminals may offer. First, the terminal may offer no storage capabilities, in which case all transaction data must be recorded through paper receipts, which are later sent to the acquiring bank. Second, the data may be saved on paper records, but may be processed electronically in batch mode after a clerk re-enters the data into the POS terminal at another time. Finally, with some terminals, transaction data is captured and stored and then automatically forwarded to the host, and electronically processed. (This type of function is called "store and forward" capability.)

POS Terminal Vendors

Figure III.B.1 below displays the leading POS terminal manufacturers in the United States with market share percentages for 1992 shipments. This chart includes all POS terminal manufacturers, not just debit capable terminals.

There are numerous vendors of electronic payment / POS terminal devices, some of which do not manufacture terminals for the supermarket industry. Others' terminals are not considered retrofittable to support the EBT application. While their contributions to total shipments appear above, some of these vendors' terminals have been excluded from this study. For example, Omron, DataCard, and NaBanco all manufacture POS terminals but primarily concentrate on the banking or oil industries, and do not manufacture terminals for the food retailer industry. Meanwhile, VeriFone, the largest overall POS terminal vendor with roughly 60% of the total terminal market share, and IVI are the two most prominent players in the food retailer industry.

The total number of POS terminals (credit, debit, EDC, etc.) deployed to date (June 1993) is approximately 1.6 million. This includes over 1.3 million electronic draft capture (EDC) terminals,

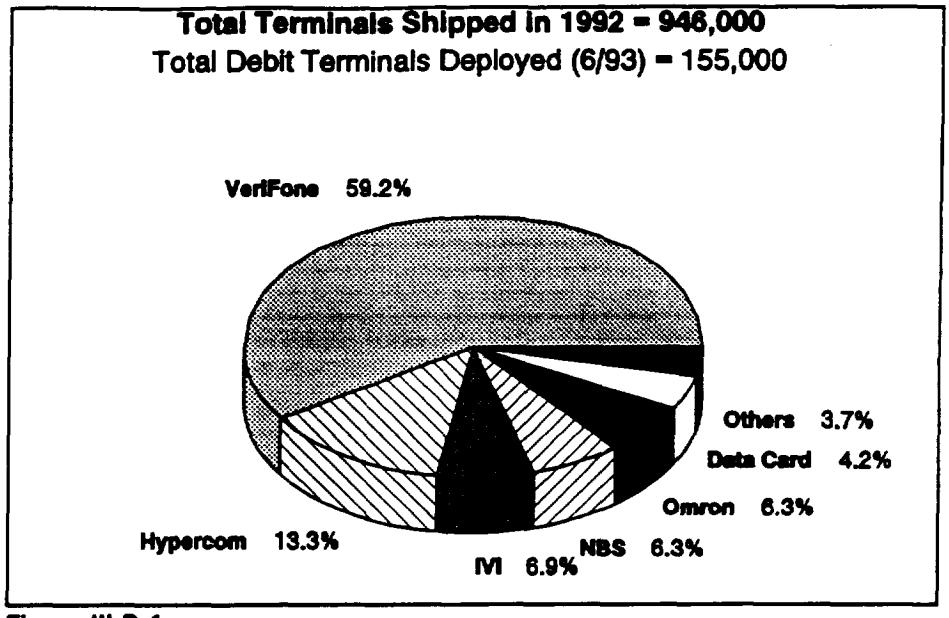

Figure III.B.1

over 155,000 debit terminals, and roughly 200,000 credit authorization terminals.

The six major manufacturers distributing POS debit terminals to the food retailer industry in the U.S. today are listed below:

- VeriFone
- Hypercom
- International Verifact Inc. (IVI)
- NBS
- Atalla
- Concord

POS Terminal Pricing

In the 1990 National Feasibility Study[2], terminal deployment cost was divided into the following components:

- Average price of fully configured, dial-up terminal

[2] Kirlin, J.A., King, C.R., Davis, E.E., Jones, C., and Silverstein, G.P. (1990). *The Feasibility of a Nationwide Electronic Benefit Transfer System for the Food Stamp Program.* Cambridge, MA: Abt Associates, Inc.

- Average cost to install telephone lines
- Average cost to provide electrical service
- Average cost to physically install the terminal

There was no reference made to software, printers, PIN pads, or other peripheral devices, which, depending upon the configuration in the retail environment, could impact the overall cost. Furthermore, significant advances in the sophistication of terminal devices and configuration capabilities have occurred in the past three years. In order to compare similar data, the costs of currently available POS terminals have been segmented into the above mentioned categories in this discussion.

The following figures for the cost of a standard terminal today reflect the cost of the hardware only, and do not include software charges -- hence they are not "fully configured." The average cost for a standard POS terminal with a dial-up modem ranges between $300 - $500, depending on the quantity purchased. Installation charges have remained fairly consistent. The terminal installation charge averages roughly $50 per terminal, the same as in the previous study. The cost of wiring telephone and electrical lines averages between $200 and $300 per terminal depending on the configuration setup, although experience suggests that wiring can be done less expensively if electricians already familiar with the store configuration are used.

Several factors can affect the full cost of a POS terminal. For example, additional peripheral devices such as printers and separate PIN pads may be needed depending on the configuration supported at the lane level. Printer cost between $180 and $400, and PIN pads cost approximately $100 to $150. Additionally, software requirements will vary as a function of store size, configuration, and the capabilities of the ECR or controller to which the terminal is connected. Thus the fully burdened cost of a standard terminal including software ranges between $490 and $640 (not including peripherals).

Importantly, many food retailers installing electronic payment systems are choosing an integrated solution (where the POS terminal function is an integrated part of the overall electronic cash register) rather than a stand-beside solution. There are immediate quantifiable savings in eliminating the need for

additional peripheral devices (printers, PIN pads, etc.). Moreover, there are labor savings because an integrated solution reduces labor required at the front-end in support of the transaction, e.g., duplicate entry of the transaction amount. This is particularly important to high volume retailers, with closely managed cashier staffing.

POS Terminal Descriptions

The following provides detailed descriptions of POS terminal models. To emphasize again, included in this study are only those terminals which the manufacturers themselves claim to be EBT capable. For quick reference, the descriptions are followed by a table containing summary data for the terminals included in the analysis. For each terminal model[3], there is a one page description outline containing the following data:

- Manufacturer / model
- Description of the keypad
- Description of the card reader
- Printers which may be attached
- Separate PIN pads which may be attached
- Memory capacity and possible upgrades
- Number of ports, types of ports available (RS-232, etc.), possible interfaces for those ports
- Communications protocol (sync, async, or bisync) / modem speed (baud rate)
- Programming language
- Terminal configurations possible (stand alone, ECR interface, PC controller interface, master capability and number of terminals master can drive)
- Terminal transactions supported (debit, credit, check authorization, EBT, EDC)
- Pricing (terminal, installation, maintenance, PIN pad, printer, other peripherals)

[3] The terminals profiled in the following pages reflect current-generation equipment at the time of data collection under this study. Differences between these devices and others, produced by the same vendor, that one might encounter in the food retail industry are most likely due to generational changes in the vendors' product lines.

- Comments

The detailed descriptions begin on the following page.

POS Terminal Description

Manufacturer: **Concord**
Model: **LINX 1075**

Hardware

- **Keypad:** 20 keys, including 8 transaction keys
- **Card Reader:** Integrate into the terminal, supports tracks 1 and 2
- **Printer:** Concord uses VeriFone printers, generally the P250 roll printer
- **PIN Pad:** Terminal will support a Concord PIN pad
- **Memory:** 64K ROM and 8K to 64K RAM
- **Ports:** 2 telephone style jacks for external connections to host, PIN pad, or printer
- **Communications/Modem:** Modem supporting bisynchronous and asynchronous protocol
- **Programmability:** Proprietary language

Configuration

- **Stand-Alone:** Yes
- **ECR Connect:** No
- **PC Controller Connect:** No
- **Master / Number of Terminals it can Drive:** No, 0

Transaction Support

- **Debit Capable:** Yes
- **Credit Capable:** Yes
- **Check Authorization Capable:** Yes
- **EBT Capable:** Yes
- **EDC:** Yes

Pricing

- **Terminal:** $475
- **Installation / Maintenance:** $50 / lane for installation (no wiring included) ; $35 / year for maintenance
- **PIN Pad:** $140
- **Printer:**
- **Other:** LINX 1555 *controller, which can control up to 64 terminals costs $600*

Comments: This terminal is moderately functional, but not very common in the food retailer industry. It has a benefits key on the keypad so it is easily programmable for EBT. Concord is not a very large player in the retail POS terminal business, and makes up a very small portion the market.

POS Terminal Description

Manufacturer: **Atalla**
Model: **ACTT (Atalla Customer Transaction Terminal)**

Hardware

- **Keypad:** 16 keys, including 4 configurable function keys
- **Card Reader:** Integrated into the terminal, supports tracks 1 and 2
- **Printer:** Terminal integrates with Hypercom P7E printer
- **PIN Pad:** Terminal acts as a PIN pad for transactions - No separate PIN pad used
- **Memory:** 32K RAM with 128K total RAM available
- **Ports:** Communication port to PS/2 via Aux port, optional RS-232 port, optional RS-485 port for integrating with ECR systems
- **Communications/Modem:** No modem included but can be connected through a port
- **Programmability:** Standard C language

Configuration

- **Stand-Alone:** No
- **ECR Connect:** Yes
- **PC Controller Connect:** Yes
- **Master / Number of Terminals it can Drive:** No, 0

Transaction Support

- **Debit Capable:** Yes
- **Credit Capable:** Yes
- **Check Authorization Capable:** Yes
- **EBT Capable:** Yes
- **EDC:** Yes

Pricing

- **Terminal:** $300 - $600 depending on quantity and functionality needed (Sales rep estimated approximate cost at $300 - $350 / terminal)
- **Installation / Maintenance:** N/A
- **PIN Pad:** N/A
- **Printer:** N/A
  Other: N/A

Comments: This terminal has a dual processor, one for security and the other for programming, making the information secure. It was built to conform with Australian and Canadian security standards, which are stronger than those in the U.S. It appears to be a functional terminal, but not specifically for food retailers, and tailored more for banking environments. Atalla is a relatively small player in the retail POS terminal business.

POS Terminal Description

Manufacturer: Hypercom
Model: T7E

Hardware

- **Keypad:** 35 keys, including 23 function keys which can be pre-programmed
- **Card Reader:** Integrated into the terminal, supports tracks 1 and 2
- **Printer:** Terminal will power the Hypercom P7E printer
- **PIN Pad:** Terminal will integrate with Hypercom PIN pad
- **Memory:** 32K EPROM and 256K of RAM (1 Mb RAM optional)
- **Ports:** 1 parallel port (TTL) for P7E printer, 1 dedicated PIN pad port (RS-422), 1 RS-232 port for connection to ECR, smart card reader, bar code reader, check reader, or signature capture pad, 1 RS-485 2 wire port for LAN connection
- **Communications/Modem:** SDLC (synchronous) and asynchronous protocol through modem (1200/300), 2400 bps optional; dial, LAN, or leased line operation possible
- **Programmability:** N/A

Configuration

- **Stand-Alone:** Yes
- **ECR Connect:** Yes
- **PC Controller Connect:** Yes
- **Master / Number of Terminals it can Drive:** Yes, up to 16 terminals may be supported through a LAN.

Transaction Support

- **Debit Capable:** Yes
- **Credit Capable:** Yes
- **Check Authorization Capable:** Yes
- **EBT Capable:** Yes
- **EDC:** Yes

Pricing

- **Terminal:** under $1000
- **Installation / Maintenance:**
- **PIN Pad:** N/A
- **Printer:** N/A
- **Other:** N/A

Comments: This terminal offers a great deal of functionality and reliability, and requires little modification for EBT capability.

POS Terminal Description

Manufacturer: **International Verifact Inc.**
Model: **C2000 - POSPAD**

Hardware

- **Keypad:** 18 keys, including 3 screen addressable function keys
- **Card Reader:** Integrated into terminal, bi-directional, supports tracks 1 and 2
- **Printer:** Terminal will support printers such as Citizen 3530, Citizen 562, Epson RP267, and Datac 1012, or print through the ECR or controller
- **PIN Pad:** Terminal will support IVI PIN pads, such as PIN pad TTL, and RS232
- **Memory:** 128K EPROM and 128K RAM
- **Ports:** 1 general purpose ECR port (RS-232, RS-485, or OCIA), 1 RS-485 LAN port, and 1 RS-232 printer port
- **Communications/Modem:** Cord to connect for communications to ECR or LAN; no integrated modem with this model
- **Programmability:** Standard C language

Configuration

- **Stand-Alone:** No
- **ECR Connect:** Yes
- **PC Controller Connect:** Yes
- **Master / Number of Terminals it can Drive:** No, 0

Transaction Support

- **Debit Capable:** Yes
- **Credit Capable:** Yes
- **Check Authorization Capable:** Yes
- **EBT Capable:** Yes
- **EDC** Yes

Pricing

- **Terminal:** $351 - $393 depending on quantity, memory, and ports included
- **Installation / Maintenance:** not known; $35 / year for maintenance
- **PIN Pad:** $100 - $150
- **Printer:** $180 - $250
- **Other:** Cables for connections cost approximately $30; mounting posts for market aisles cost $20; face plates for terminal cost $10; various software modules also available

Comments: This terminal can be hand held by the customer, offers a high level of security with the Verifact Secure Chip (VSC) integrated into the processor, and has enough memory and functionality to accommodate EBT. It is not a stand alone device but must be connected to a controller or ECR for communications with a host. This is reflected in its lower price per unit.

POS Terminal Description

Manufacturer: International Verifact Inc.
Model: C2000 - Protege

Hardware

- **Keypad:** 28 keys, including 5 screen addressable function keys
- **Card Reader:** Integrated into the terminal, bi-directional, supports tracks 1 and 2
- **Printer:** Terminal will support printers such as Citizen 3530, Citizen 562, Epson RP267, and Datac 1012, or print through the ECR or controller
- **PIN Pad:** Terminal will support IVI PIN pads
  Memory: 128K EPROM and 128K RAM
- **Ports:** 1 ECR port (RS-485, RS-232, or OCIA), 1 RS-485 port for LAN, 2 RS-232 general purpose ports for a printer, bar code reader, cash pad, PIN pad, etc.
- **Communications/Modem:** 1 dial modem (300/1200)
- **Programmability:** Standard C language

Configuration

- **Stand-Alone:** Yes
- **ECR Connect:** Yes
- **PC Controller Connect:** Yes
- **Master / Number of Terminals it can Drive:** No, 0

Transaction Support

- **Debit Capable:** Yes
- **Credit Capable:** Yes
- **Check Authorization Capable:** Yes
- **EBT Capable:** Yes
- **EDC:** Yes

Pricing

- **Terminal:** $431 - $504 depending on memory, modem, ports included, and quantity (1-1500 unit prices used)
- **Installation / Maintenance:** not known; $25 / year for maintenance
- **PIN Pad:** $100 - $150
- **Printer:** $180 - $250
- **Other:** Cables for connections cost approximately $30; face plates cost $10; various software modules also available

Comments: This terminal offers a high level of security with the Verifact Secure Chip (VSC) integrated into the processor, and it has a high level of functionality and memory, capable of handling most applications including EBT.

POS Terminal Description

Manufacturer: VeriFone
Model: Omni 380

Hardware

- **Keypad:** 16 keys
- **Card Reader:** Integrated into the terminal, supports tracks 1 and 2 (track 2 and 3 reader available)
- **Printer:** Terminal will support most VeriFone printers, such as 150 slip printer, 250 roll printer, 500 slip/journal printer, 600 report printer, and 700 sprocket printer
- **PIN Pad:** Terminal will support most VeriFone PIN pads, such as PIN pad 101, PIN pad 201
- **Memory:** 64K EPROM, and 64K, 128K, or 256K of battery-backed RAM
- **Ports:** RS-232 serial port for slip, roll, sprocket, or journal printer, RS-232 port for PIN pad or bar code wand
- **Communications/Modem:** asynchronous dial modem (300/1200); 1200 bps synchronous dial modem
- **Programmability:** Standard C language under the TXO operating environment

Configuration

- **Stand-Alone:** Yes
- **ECR Connect:** No
- **PC Controller Connect:** No
- **Master / Number of Terminals it can Drive:** No, 0

Transaction Support

- **Debit Capable:** Yes
- **Credit Capable:** Yes
- **Check Authorization Capable:** Yes
- **EBT Capable:** Yes
- **EDC:** Yes

Pricing

- **Terminal:** $306 - $368 depending on memory and quantity (1-1000 unit prices used)
- **Installation / Maintenance:** not known; $36 - $56 /year for maintenance
  PIN Pad: $100 - $190
- **Printer:** $215 - $420
- **Other:** Bar code wands cost $100 - $125; TRANZfones cost $39; overlays cost under $10; various software tools and manuals also available

Comments: This terminal is the simplest, most inexpensive member of the OMNI family, and offers more memory and thus the possibility for higher functionality than the VeriFone Tranz models.

POS Terminal Description

Manufacturer: **VeriFone**
Model: **Omni 390**

Hardware

- **Keypad:** 24 keys, including 8 color coded function keys to easily lead users through transactions
- **Card Reader:** Integrated into the terminal, bi-directional, supports tracks 1 and 2 or tracks 2 and 3
- **Printer:** Terminal will support VeriFone slip, roll, or journal printer
- **PIN Pad:** Terminal will support most VeriFone PIN pads
- **Memory:** 64K EPROM and 128K or 256K of battery-backed RAM
- **Ports:** RS-232 port for printer, RS-232 port for PIN pad, smart card reader, or bar code wand, Telco port for a TRANZFone
- **Communications/Modem:** Asynchronous dial modem, 1200 bps synchronous dial modem; asynchronous dial modem (300/1200), 1200 bps synchronous dial modem; application selects between asynchronous and synchronous protocols
- ***Programmability:*** Standard C language under the TXO (VeriFone module to ease process) operating environment

Configuration

- **Stand-Alone:** Yes
- **ECR Connect:** No
- **PC Controller Connect:** No
- **Master / Number of Terminals it can Drive:** No, 0

Transaction Support

- **Debit Capable:** Yes
- **Credit Capable:** Yes
- **Check Authorization Capable:** Yes
- **EBT Capable:** Yes
- **EDC:** Yes

Pricing

- **Terminal:** $325 - $375 depending on quantity
- **Installation / Maintenance:** not known; $30 - $50 / year for maintenance
- **PIN Pad:** $$100 - $190
- **Printer:** $215 - $420
- **Other:** Bar code wands cost $100 - $125; TRANZfones cost $39; overlays cost under $10; various software tools and manuals also available

Comments: This terminal is more suitable for the hospitality industry and can be found more often in restaurants, hotels, etc. but it does have food retailer application possibilities.

POS Terminal Description

Manufacturer: VeriFone
Model: Omni 490

Hardware

- **Keypad:** 24 keys, including 4 screen addressable and 8 function keys
- **Card Reader:** Integrated into the terminal, bi-directional, supports tracks 1 and 2
- **Printer:** Terminal will support most VeriFone printers
- **PIN Pad:** Integrated into terminal
- **Memory:** 256K EPROM and 256K battery-backed RAM
- **Ports:** 3 RS-232 serial ports for a slip, roll, sprocket, or journal printer, a cashier pad, a bar code wand, or an external synchronous modem; options include 1 LAN port, 1 port for connection to an ECR, or 2 ports (1 for a LAN and 1 for an ECR)
- **Communications/Modem:** No modem is included but an external modem may be connected through a port; software selectable between asynchronous and synchronous
- **Programmability:** Standard C language

Configuration

- **Stand-Alone:** Yes (with an external modem)
- **ECR Connect:** Yes
- **PC Controller Connect:** Yes
- **Master / Number of Terminals it can Drive:** No, 0

Transaction Support

- **Debit Capable:** Yes
- **Credit Capable:** Yes
- **Check Authorization Capable:** Yes
- **EBT Capable:** Yes
- **EDC:** Yes

Pricing

- **Terminal:** $429 - $635 depending on quantity
- **Installation / Maintenance:** not known; $30 - $50 / year for maintenance
- **PIN Pad:** $100 - $190
- **Printer:** $215 - $420
- **Other:** Bar code wands cost $100 - $125; TRANZfones cost $39; overlays cost under $10; various software tools and manuals also available

Comments: This terminal is designed for a multi-lane supermarket environment, integrates with an ECR system, has an integrated PIN, and works like an ATM.

POS Terminal Description

Manufacturer: **VeriFone**
Model: **PinStripe**

Hardware

- **Keypad:** 27 keys, calculator or telephone style, including 4 soft function keys to lead users through transactions
- **Card Reader:** Integrated into the terminal, bi-directional, supports tracks 1 and 2
- **Printer:** Terminal will support most VeriFone printer such as 150, 250, etc.
- **PIN Pad:** Terminal will support most VeriFone PIN pads
- **Memory:** 64K or 128K and up to 768K of battery-backed RAM
- **Ports:** RS-232 or RS-485 serial ports for a printer, PIN pad, LAN connection, bar code wand, ECR, or PC
- **Communications/Modem:** Baud modem (300/1200) for dial line, and additional asynchronous RS-232 port; baud modem (1200) for leased line and additional asynchronous RS-232 port; 2 additional synchronous or asynchronous RS-232 ports
- **Programmability:** Standard C programming language

Configuration

- **Stand-Alone:** Yes
- **ECR Connect:** Yes
- **PC Controller Connect:** Yes
- **Master / Number of Terminals it can Drive:** Terminal may act as controller and drive up to 31 other VeriFone terminals

Transaction Support

- **Debit Capable:** Yes
- **Credit Capable:** Yes
- **Check Authorization Capable:** Yes
- **EBT Capable:** Yes
- **EDC:** Yes

Pricing

- **Terminal:** $515 - $794 depending on memory capacity, quantity (1 - 1000 unit prices used)
- **Installation / Maintenance:** not known; $50 - $80 / year for maintenance
- **PIN Pad:** $175
- **Printer:** $215 - $420
- **Other:** Bar code wands cost $100 - $125; TRANZfones cost $39; overlays cost under $10; various software tools and manuals also available

Comments: This terminal is very sophisticated and uses a multitasking operating system, allowing it to handle many functions simultaneously. The memory is expandable up to 768K, creating large price differentials within the same model class.

POS Terminal Description

Manufacturer: **VeriFone**
Model: **PNC 330**

Hardware

- **Keypad:** 16 keys
- **Card Reader:** Integrated into terminal, supports track 2 (track 1 available)
- **Printer:** Terminal uses ECR system printer
- **PIN Pad:** Terminal will support most VeriFone PIN pads
- **Memory:** 32K EPROM and 32K battery-backed RAM
- **Ports:** RS-232 serial port for connection to ECR, PC, gas pump controller, other POS devices, and one port for connecting a PIN pad or bar code wand
- **Communications/Modem:** Standard 300/1200 baud modem
- **Programmability:** TCL programming language

Configuration

- **Stand-Alone:** Yes
- **ECR Connect:** Yes
- **PC Controller Connect:** Yes
- **Master / Number of Terminals it can Drive:** No, 0

Transaction Support

- **Debit Capable:** Yes
- **Credit Capable:** Yes
- **Check Authorization Capable:** Yes
- **EBT Capable:** Yes
- **EDC:** Yes

Pricing

- **Terminal:** $285 - $327
- **Installation / Maintenance:** not known; $25 / year for maintenance
- **PIN Pad:** $100 - $190
- **Printer:** $215 - $420
- **Other:** Bar code wands cost $100 - $125; TRANZfones cost $39; overlays cost under $10; various software tools and manuals also available

Comments: This terminal is a basic, inexpensive terminal that will connect to an ECR, PC, or other POS system, and thus makes it applicable for the food retailer industry.

POS Terminal Description

Manufacturer: VeriFone
Model: Tranz 330

Hardware

- **Keypad:** 16 keys
- **Card Reader:** Integrated into the terminal, supports tracks 1 and 2
- **Printer:** Terminal will support most VeriFone printers
- **PIN Pad:** Terminal will support most VeriFone PIN pads
- **Memory:** 32K EPROM and 32K battery-backed RAM
- **Ports:** RS-232 serial port for a slip or roll printer, one communications port for a PIN pad, or third party device such as a bar code wand or hand held scanner
- **Communications/Modem:** Baud modem (300/1200) for dial line, leased line configurations
- **Programmability:** TCL, a unique VeriFone POS terminal control language

Configuration

- **Stand-Alone:** Yes
- **ECR Connect:** No
- **PC Controller Connect:** No
- **Master / Number of Terminals it can Drive:** No, 0

Transaction Support

- **Debit Capable:** Yes
- **Credit Capable:** Yes
- **Check Authorization Capable:** Yes
- **EBT Capable:** Yes
- **EDC:** Yes

Pricing

- **Terminal:** $250 - $277
- **Installation / Maintenance:** not known; $20 / year for maintenance
- **PIN Pad:** $100 - $190
- **Printer:** $215 - $420
- **Other:** Bar code wands cost $100 - $125; TRANZfones cost $39; overlays cost under $10; various software tools and manuals also available

Comments: This is the most widely used, inexpensive VeriFone terminal.

POS Terminal Description

Manufacturer: VeriFone
Model: Tranz 380

Hardware

- **Keypad:** 16 keys
- **Card Reader:** Integrated into the terminal, supports tracks 1 and 2 (track 2 and 3 reader available)
- **Printer:** Terminal will support most VeriFone printers, such as 150 slip printer, 250 roll printer, 500 slip/journal printer, and 600 report printer
- **PIN Pad:** Terminal will support most VeriFone PIN pads, such as PIN pad 101, PIN pad 201
- **Memory:** 64K EPROM, and 64K battery-backed RAM (128K battery-backed RAM option available)
- **Ports:** RS-232 serial port for slip or roll printer, one communications port for PIN pad or bar code wand
- **Communications/Modem:** Asynchronous dial modem (300/1200)
- **Programmability:** TCL, a VeriFone terminal control language

Configuration

- **Stand-Alone:** Yes
- **ECR Connect:** No
- **PC Controller Connect:** No
- **Master / Number of Terminals it can Drive:** No, 0

Transaction Support

- **Debit Capable:** Yes
- **Credit Capable:** Yes
- **Check Authorization Capable:** Yes
- **EBT Capable:** Yes
- **EDC:** Yes

Pricing

- **Terminal:** $294 - $317
- **Installation / Maintenance:** not known; $20 / year for maintenance
- **PIN Pad:** $100 - $190
- **Printer:** $215 - $420
- Other: Bar code wands cost $100 - $125; TRANZfones cost $39; overlays cost under $10; various software tools and manuals also available

Comments: This terminal is similar to the Tranz 330 but offers additional memory and thus the possibility for additional functionality. It is EBT capable with slight software modification.

POS Terminal Description

Manufacturer: **NBS**
Model: **727**

Hardware

- **Keypad:** 24 keys, including 12 function keys
- **Card Reader:** Integrated into the terminal, bi-directional, supports track 2
- **Printer:** Terminal will support printers such as Citizen, Epson, Star, Softprint
- **PIN Pad:** Terminal will support NBS PIN pads such as PIN 20, 40, or 50
- **Memory:** 32K EPROM and 32K to 416K RAM
- **Ports:** 1 printer port (RS-232), 1 PIN pad port (RJ-11 or DIN), 1 LAN or external modem port optional (RS-485)
- **Communications/Modem:** Asynchronous dial modem (300/1200)
- **Programmability:** Standard C language

Configuration

- **Stand Alone:** Yes
- **ECR Connect:** No
- **PC Controller Connect:** No
- **Master / Number of Terminals it can Drive:** No, 0

Transaction Type

- **Debit Capable:** Yes
- **Credit Capable:** Yes
- **Check Authorization Capable:** Yes
- **EBT Capable:** Yes
- **Data Capture:** Yes

Pricing

- ***Terminal:*** *$224 - $259 depending on quantity and specifications*
- **Installation / Maintenance:**
- **PIN Pad:**
- **Printer:** 3rd party printers used so no pricing included
- **Other:**

Comments: There are six possible configurations for this terminal model, each with different memory capabilities and features.

POS Terminal Description

Manufacturer: NBS
Model: Turbo

Hardware

- **Keypad:** 24 keys
- **Card Reader:** Integrated into the terminal, bi-directional, supports tracks 1 and 2
- **Printer:** Terminal will support printers such as Citizen, Epson, Star, Softprint
- **PIN Pad:** Terminal will support NBS PIN pads such as PIN 20, 40, or 50
- **Memory:** 64K EPROM with 128K up to 1 MB RAM available
- **Ports:** 1 LAN port ((RS-485 or RS-422), 1 printer port (RS-232), 1 PIN pad port (RJ-11), and 1 auxiliary port for an ECR or PC (RS-232)
- **Communications/Modem:** Asynchronous dial modem (300/1200)
- **Programmability:** Standard C language

Configuration

- **Stand Alone:** Yes
- **ECR Connect:** Yes
- **PC Controller Connect:** Yes
- **Master / Number of Terminals it can Drive:** No, 0

Transaction Type

- **Debit Capable:** Yes
- **Credit Capable:** Yes
- **Check Authorization Capable:** Yes
- **EBT Capable:** Yes
- **Data Capture:** Yes

Pricing

- **Terminal:** $341 - $376 depending on quantity and memory
- **Installation / Maintenance:**
- **PIN Pad:**
- **Printer:** 3rd party printers used so no pricing included
- **Other:**

Comments: This terminal is the more advanced NBS model, can expand to have a great deal of memory, and has high functionality. It is EBT capable with slight software modification.

Summary Tables

The descriptions presented on the previous pages are summarized in **Exhibit III.B.1,** ***"POS Terminal Specifications, Functionality, Pricing"*** following this page.

Electronic Cash Register (ECR) Profiles

When examining the current payments environment in the food retailer industry, POS terminals provide the core of the discussion. Depending on the sophistication of the ECR and its capabilities, however, debit applications (including EBT) are supportable through an ECR system. Through data obtained from ECR system vendors and other data collected from various sources, we have compiled information on the features and functional capabilities of the most common debit capable ECR systems found in the food retailer environment. This section begins with a discussion of ECR terminal configurations (stand-alone, master-slave, and controller-based), and then describes the ECR terminal components (related specifically to the payment function), and major ECR vendors.

ECR Terminal Configurations

There are a number of possible ECR configurations that can currently be found in food retailer environments. These range from simple manual cash registers that might be found in small grocery stores to fully integrated ECR systems that would be found in the large supermarket chains. For each of the possible electronic configurations, there exist a number of available solutions for making POS debit and Electronic Benefits Transfer available to food retailers. These range from separate stand beside POS terminals (such as many described earlier in this section) to fully integrated EBT and debit capable ECR systems (descriptions forthcoming). The sections below provide an introduction to the most generic configurations found in the food retailer industry, namely the following:

- Stand-Alone ECRs
- Master-Slave ECR configurations
- Controller Based ECR configurations

Table of Contents

POS TERMINAL SPECIFICATIONS, FUNCTIONALITY, PRICING

	Manufacturer	Model	Keypad	Card Reader	Printer	Separate PIN Pad	Memory	Ports	Comm/ Modem	Prog. Lang.
1.	Concord	LINX 1000 1075	20 keys 8 transaction keys	tracks 1, 2	VeriFone P250 roll	Concord PIN pad	64K EPROM 8K-64K RAM	2 ports for printer, PIN pad, host connection, etc.	modem w/ bisync, async	propr.
2.	Atalla	ACTT	16 keys 4 function keys	tracks 1, 2	Hypercom P7E	no separate PIN pad	32K RAM	1 comm port, 1 ECR port, 1 printer or PIN pad port	no modem	C
3.	Hypercom	T7E	35 keys 23 function keys	tracks 1, 2	Hypercom P7E	Hypercom PIN pad	32K EPROM 256K RAM	1 printer port, 1 PIN pad port, 1 LAN port, 1 for ECR, bar code, etc.	SDLC, async 1200/300 bps	
4.	Intl Verifact Inc.	C2000 - POSPAD	18 keys 3 scrn addressable	tracks 1, 2 bidirectional	Citizen, Epson, Datac, others	most IVI PIN pads	128K EPROM 128K RAM	1 ECR port, 1 LAN port, 1 printer port	no modem	C
5.	Intl Verifact Inc	C2000 - Protege	28 keys 5 scrn addressable	tracks 1, 2 bidirectional	Citizen, Epson, Datac, others	most IVI PIN pads	128K EPROM 128K RAM	1 ECR port, 1 LAN port, 2 ports for printer, bar code, PIN pad, etc.	300/1200 dial modem	C
6.	VeriFone	Omni 380	16 keys	tracks 1, 2	most VeriFone printers	VeriFone PIN pads 101, 201	64K EPROM 64K-256K RAM	1 printer port, 1 port for PIN pad or bar code wand	async 300/1200 1200 bps sync	C
7.	VeriFone	Omni 390	24 keys 8 function keys	tracks 1, 2 bidirectional	most VeriFone printers	VeriFone PIN pads 101, 201	64K EPROM 128K-256K RAM	1 printer port, 1 port for PIN pad, bar code wand, or smart card reader	async 300/1200 1200 bps sync	C
8.	VeriFone	Omni 490	24 keys 8 func, 4 scrn adrss	tracks 1, 2 bidirectional	most VeriFone printers	no separate PIN pad	256K EPROM 256K RAM	3 ports for printer, cashier pad, bar code, ext modem (1 LAN, 1 ECR opt)	no modem	C
9.	VeriFone	PinStripe	27 keys 4 scrn addressable	tracks 1, 2 bidirectional	most VeriFone printers	VeriFone PIN pad 176	64K or 128K + up to 768K RAM	2 ports for printer, PIN pad, LAN, bar code wand, ECR, or PC	async or sync 300/1200	C
10	VeriFone	PNC 330	16 keys	track 2 (track 1 opt)	uses ECR system printer	VeriFone PIN pads 101, 201	32K EPROM 32K RAM	1 port for ECR, PC, or pump controller, 1 port for PIN pad or bar code wand	300/1200	TCL
11	VeriFone	Tranz 330	16 keys	tracks 1, 2	most VeriFone printers	VeriFone PIN pads 101, 201	32K EPROM 32K RAM	1 printer port, 1 port for PIN pad, bar code wand, hand held scanner, etc.	300/1200	TCL
12	VeriFone	Tranz 380	16 keys	tracks 1, 2	most VeriFone printers	VeriFone PIN pads 101, 201	64K EPROM 64K RAM	1 printer port, 1 port for PIN pad, bar code wand, etc.	async 300/1200	TCL
13	NBS	727 (1,2,5,6,8,EX)	24 keys 12 function keys	track 2 (track 1 opt)	Citizen, Epson, Star, Softprint	PIN 20, 40, or 50 PIN pads	32K EPROM 32K - 416K RAM	1 printer port, 1 PIN pad port, LAN & external modem port optional	async 300/1200	C
14	NBS	Turbo	24 keys	tracks 1, 2 bidirectional	Citizen, Epson, Star, Softprint	PIN 20, 40, or 50 PIN pads	64K EPROM 128K - 1MB RAM	1 LAN port, 1 printer port, 1 PIN pad port, 1 ECR or PC or modem port	async 300/1200	C

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POS TERMINAL SPECIFICATIONS, FUNCTIONALITY, PRICING

For each configuration there is a brief description, an estimate of pricing, and a list of the primary vendors who deal in that particular configuration type.

Stand-Alone ECRs

Stand-alone ECRs are found today in virtually all retail environments including the food retailer industry. These devices are the most limited in terms of functionality. **Figure III.B.2** depicts the generic stand-alone ECR configuration.

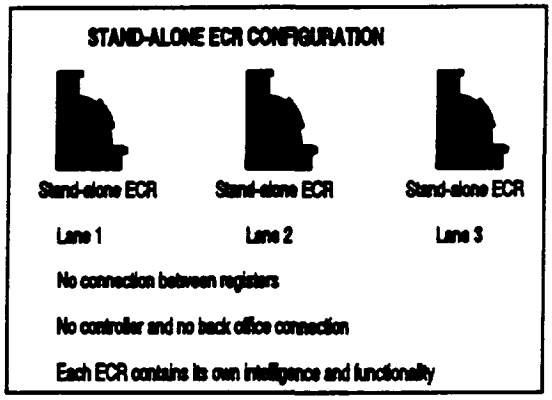

Figure III.B.2

The configuration of these devices is very simple since they are not connected to any controller, and further are not connected to each other in any way. Each ECR possesses the intelligence and functional capability necessary to perform payment transactions, and does not rely on a controller or other master ECR for any functions.

These ECR devices generally sell for less than $2,000, and sometimes as low as $400. In general, stand-alone ECRs are most appropriate and commonly found in the smaller grocery store environments where there is low volume and no plans for expansion.

The advantages offered by this configuration over others are its cost (it is the least expensive of the three configurations discussed), its simplicity (it has no back office connection, no controller, and no other ECR interface), and the fact that each stand-alone ECR terminal has adequate intelligence and functionality to operate independent of other devices.

The major stand-alone ECR vendors include:

- Cash Register Sales, Inc.
- Casio, Inc.
- Datacap Systems, Inc.
- Fujitsu-ICL Systems, Inc.
- Omron Systems of America, Inc.

Master-Slave ECR Configurations

A master-slave ECR configuration refers to a system in which one ECR has more intelligence and memory than others in the same store environment. This single "master" ECR is selected to have the intelligence and functionality for all of the ECRs within the store. The other "slave" ECR terminals are "dumb" terminals, referred to as such because they do not possess the functionality or intelligence to operate as independent devices and rely on the master for all computing capabilities and intelligence. The master terminal receives data from the slave terminals and serves as the central store computer in the master-slave ECR configuration. Figure III.B.3 depicts the generic master-slave ECR configuration.

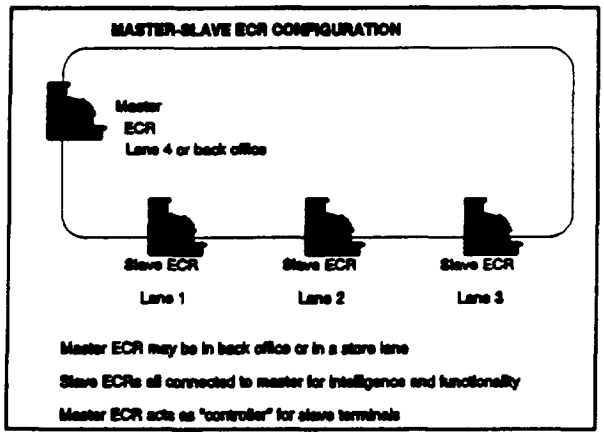

Figure III.B.3

Master-slave ECR configurations are adaptable to a variety of environments with larger sales volumes where the cost of POS hardware and software is a critical consideration. They can be built upon stand-alone ECRs with expansion capability, and are marketed for use in environments such as hospitality, convenience

stores, fast food outlets, supermarkets and grocery stores, specialty stores, and restaurants.

These systems are generally composed of high-end ECRs which cost between $1,000 and $5,000, with the software applications either included or priced separately as individual modules.

The advantages offered by the master-slave configuration are several. First, they provide greater memory capacity for additional volume processing, programmability, configuration flexibility, and greater expansion capability than stand-alone ECRs. In-house and host communications are also possible with many systems, and most systems offer additional functionality such as data capture for input to an in-house computer, consolidation of store registers in order to provide a shared file for price look up (PLU) and credit authorization functions. Many systems also offer a backup primary terminal, an integrated credit / check authorization feature, and even a debit feature, although this feature to a much lesser extent.

The primary vendors in this market are the following:

- Cash Register Sales, Inc.
- Casio, Inc.
- Datacap Systems, Inc.
- Fujitsu-ICL Systems, Inc.
- Omron Systems of America, Inc.
- TEC America, Inc.

Controller-Based ECR Configurations

Controller-based ECR configurations consist of two basic components, the ECR terminal and a system controller. The controllers are either minicomputers or microcomputers, and these systems will typically be found in large sales volume food retailer environments such as national chain supermarkets. These systems have the capabilities to take full advantage of captured transaction data in order to contribute to more accurate management reporting, reduce inventory shrinkage, and provide benefits for both the retailer and the consumer. Figure III.B.4 depicts the generic controller-based ECR configuration.

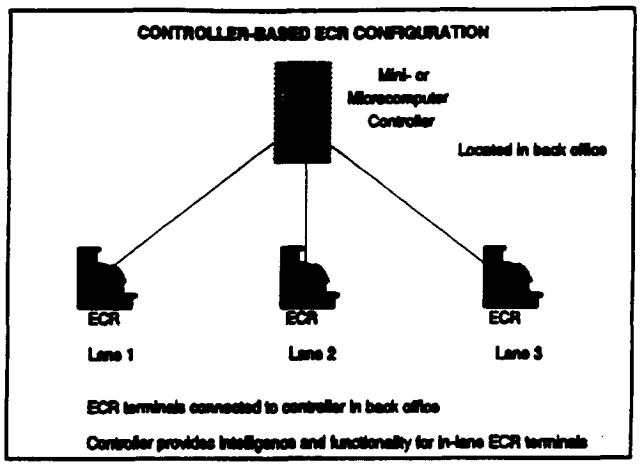

Figure III.B.4

The controller can typically function on a single store or multi-store basis, and its functionality depends on whether it is supporting intelligent (programmable) or non-intelligent dumb terminals. A dual controller arrangement is usually set up in which the processors back up each other in order to avoid the possibility of total system failure.

These systems generally cost between $5,000 and $10,000 per lane with numerous optional peripherals, configurations and software packages available depending on the size and needs of the specific food retail environment.

The advantages offered by a controller-based ECR system are the result of the highly advanced nature of these systems. The system controller is the focal point for all sales, merchandise, and credit data, although the terminals themselves often perform a variety of computations for the sales transaction itself. The controller, in addition to acting as a data collection unit, has the capability to perform such functions as collection, processing, and analysis of sales data; departmental sales analysis; central PLU; credit and check authorization at the store level; collection of terminal sales data during the day; and manager access to the adjacent store-level controller for departmental or store wide sales or merchandise information or customer credit information. In addition, the terminals are programmed from the manager's

workstation, and the manager's terminal has access to information at all times.

The primary vendors and products in this market include the following:

- IBM 4680 and 4690 Store Systems
- NCR 1255, 2127 Retail System and 7000 CPS
- Fujitsu-ICL Systems Inc. 2100 and 2200 Terminals, Atrium 9000, and GMS2 System

ECR System Components

ECRs vary tremendously in intelligence and capabilities. However, there are standard components and features which provide ECR systems with their functionality. These components and, more specifically, the level and capacities of these components, provide measuring benchmarks to compare different ECR systems and configurations. For the purposes of this study, only controller-based ECR systems are included because only those systems have debit and EBT capabilities; and are thus the only ECR systems with direct relevance to our analysis. The primary components of an ECR system relating to payments include the following:

Controller and Terminal Memory: The memory capacity of the controller as well as the terminals are important because the applications which run on these systems must be loaded into the controller and the ECR terminals. The software applications exist for each of these systems to provide debit and ultimately EBT capability, and the only issue which need be addressed is the specific configuration of the store and the question of adequate memory capacity.

Communications: The communications capabilities of the system involve in-store communications, usually accomplished through a LAN (local area network), and host communications. Both in-store and host communications are very important to our discussion of the electronic payment function, because an integrated electronic payment solution relies on existing in-store wiring between the ECR terminal and the controller as well as the ECR controller to host communications in order to complete a transaction. The idea behind this is an "integrated" path for both the payment function

and all other point-of-sale data, avoiding the need for a separate communications path for the payment function. Thus, a debit or EBT transaction may use the already established and in-place communications network of the ECR system to complete an electronic payment transaction. Each of the common controller-based systems offer integrated solutions with in-store and host communications capabilities.

Configuration Flexibility / Peripheral Connectivity: The ability to serve low or high volume environments and the possibility of modular or integrated terminals are important features for these advanced systems. These options allow a food retailer the luxury or deciding how large an investment in technology to make initially, then offering the possibility of expanding and adding functionality in the future. The ability of the controller and the ECR terminals to easily connect with peripheral devices such as PIN pads, POS terminals, and so on gives the food retailer the opportunity to meet the requirements of the environment today with the flexibility to make adjustments as the environment changes. In addition, the capability to download data from the ECR controller or ECR terminal to a POS terminal is important to this discussion, because this allows the ECR system to provide additional functionality to the POS terminal for applications such as debit and EBT. These connectivity features, which are typical among the advanced controller-based systems, are important in analyzing the capacity of a system to provide debit and EBT functionality.

Store Management Capabilities: Each of the advanced controller-based ECR systems offer a package of various store management type functions. These include applications supporting:

- processing of sales data
- consolidated reporting
- transaction analysis
- system back up
- redundancy
- employee performance analysis
- inventory management
- sales analysis
- central price look up (PLU)

These applications are not all related to the payment function. PLU allows the purchased items to be identified through the bar code scanner to an inventory database within the ECR system.

Software: The major issue when dealing with ECR systems is not the hardware but the software capabilities. Depending on the system configuration, the software will be resident at different locations. For example, in a stand-alone configuration, the software is all at the individual ECR terminals. In master-slave configurations, the software is primarily resident on the master terminal. Finally, in controller-based ECR configurations, the software is primarily loaded into the controller with certain functions resident at the terminal level in selected systems. Given that each of the controller-based systems is PC-based, the functionality for a food retailer is a direct result of the applications loaded into the system controllers and terminals. Some systems, the IBM 4680 Store System for example, offer specific applications for supermarkets. Others, such as the NCR 7000 Continuous Processing System which is open systems based, are easily programmable and allow the food retailer to write their own applications or purchase the software from another vendor.

Hardware: In terms of hardware specifications focusing on payment related applications, the only major component important for this analysis is the printing mechanism. Each of the controller-based ECR systems have PC units in the lanes and are essentially debit and EBT ready. Because each of these systems have integrated or attachable printers, a food retailer using such a system does not need to attach an additional dedicated printer for debit or EBT receipts and may use the printer integrated into the ECR terminal.

The core of our analysis revolves around whether or not these systems can provide debit and EBT functionality for food retailers. Each of the controller-based systems offers an EFT feature, and thus can be configured to accept those payment tenders. In each case however, ultimate EBT readiness is a function of software applications, in-store and host communications, and connectivity between ECR terminals and peripherals, and ECR terminals and terminal controllers.

Important Note

In the discussions here, the terms "ECR controller" and "POS terminal controller" have been used to describe the back office controllers for ECR terminals and POS terminals. In the retailer environment however, different language may be used to describe these devices. Specifically, retailers often refer to the ECR as the "POS" device and thus the controller for those terminals as the "POS controller". Similarly, the POS terminal is commonly referred to as the "EPS" or electronic payment system device, and thus its controller is the "EPS controller". We mention this because these differences in terms will likely become evident in discussions with retailers, and it is important to realize which device is being discussed at any given time.

ECR Terminal Descriptions

The following pages include detailed descriptions of those controller-based ECR systems which offer integrated payment solutions, and are debit and EBT capable. The page-long descriptions contain the following data:

- Manufacturer and model
- Controllers supported by the system
- Different ECR primary and satellite terminal options for the system
- Memory capacity of the ECR controller
- Description of local and host communications methods
- Integrated printer capability
- Integrated magnetic stripe reader available
- Description of the POS terminals supported by the system
- Whether or not the system is currently in production
- EFT capability
- Number of ECR terminals per controller
- Pricing for a typical ten lane configuration of the system
- Pricing for a basic ECR terminal
- Software packages available
- Comments

Controller-Based ECR Description

Manufacturer: **IBM**
Model: **4680 Store System**

Controller

- **Controllers Supported:** IBM PS/2 models 57SX or higher, IBM 5170 PC AT, or IBM 4684 terminal controller
- **Controller Memory:** PS/2 models 70,80-A16/A31 have up to 8MB, models 80-081/161/321 have up to 4MB, models 90/95 have up to 32MB, models 56/57 have up to 16MB
- **ECR Terminals Per Controller:** 128 (64 primary and 64 satellite)

ECR Terminal

- **ECR Terminal Options:** Primary terminals are 4683-1, 4683-P11, and 4683-P41; satellite terminals are 4683-002 and 4683-A02
- **Integrated Printer Capability:** Yes, IBM 3800 (model 1), IBM 6400 (model 2), and IBM 4700 (model 3)
- **Integrated Magnetic Stripe Reader:** Yes, integrated into the keyboard

System

- **Local / Host Communications:** In-store through a LAN; host through dial-up or leased line
- **POS Terminals Supported:** Any POS terminal with integrated capabilities
- **EFT Capability:** Yes
- **Currently in Production:** Yes
- **Software Packages:** IBM 4680 Supermarket Application

Pricing

- **Per Lane (Based on Typical 10 Lane Configuration Including Controller):** $8,000 - $9,000 per lane
- **ECR Terminal:** $3,000 - $4,000 per primary terminal; $1,500 - $2,000 per satellite terminal

Comments: This system is ideally suited for large supermarket chains with numerous checkout lanes. It operates on the IBM 4680 operating system. It is software configurable to support EBT.

Controller-Based ECR Description

Manufacturer: **IBM**
Model: **4690 Store System**

Controller

- **Controllers Supported:** IBM PS/2 models with 386SX up to 486SLC2 processors, IBM 4684 or 4693 terminal controllers, IBM RISC System/6000, or IBM AS/400
- **Controller Memory:** PS/2 models range from 4MB to 32MB, 4693 terminal controllers range from 2MB to 32MB
- **ECR Terminals Per Controller:** 128 (64 primary and 64 satellite)

ECR Terminal

- **ECR Terminal Options:** Primary terminals are 4693-541, 4693-421, 4693-321, and 4694-001; satellite terminal is 4693-202
- **Integrated Printer Capability:** Yes, IBM 6400 (model 2), IBM 4700 (model 3), and IBM 4800 (model 4)
- **Integrated Magnetic Stripe Reader:** Yes, integrated into the keyboard

System

- **Local / Host Communications:** In-store through a LAN; host through dial-up or leased line
- **POS Terminals Supported:** Any POS terminal with integrated capabilities
- **EFT Capability:** Yes
- **Currently in Production:** Yes (to be released September of 1993)
- **Software Packages:** IBM 4680 - 4690 Supermarket Application

Pricing

- **Per Lane (Based on Typical 10 Lane Configuration Including Controller):** $8,000 - $10,000 per lane
- **ECR Terminal:** $3,000 - $4,000 per primary terminal; $1,500 - $2,000 per satellite terminal

Comments: This system is the newest controller-based ECR system model from IBM, and is a replacement or upgrade from the 4680 Store System. This system, like the 4680, is designed for large chain supermarkets with multiple checkout lanes, and shares the same EBT potential.

Controller-Based ECR Description

Manufacturer: **NCR**
Model: **2123 or 2127**

Controller

- **Controllers Supported:** NCR 2435 controller or NCR 2127 master terminal controller
- **Controller Memory:** 8MB to 32MB
- **ECR Terminals Per Controller:** approximately 30 depending on the controller

ECR Terminal

- **ECR Terminal Options:** Primary terminals are 2127-1000, 2127-1100, 2127-3000, 2127-3100, and 2127-3012; satellite terminals are 2127-2000, 2127-2100, 2127-4000, 2127-4100, and 2127-4013
- **Integrated Printer Capability:** Yes
- **Integrated Magnetic Stripe Reader:** Yes

System

- **Local / Host Communications:** In-store through a LAN; host through dial-up or leased line
- **POS Terminals Supported:** Any POS terminal with integrated capabilities
- **EFT Capability:** Yes
- **Currently in Production:** 2123 and 1255 processor are no longer in production; 2127 is still in production
- **Software Packages:** Third party vendors supply software for this system

Pricing

- **Per Lane (Based on Typical 10 Lane Configuration Including Controller):** Approximately $7,000 per lane
- **ECR Terminal:** $2,700 - $3,500 per primary terminal; $2,200 - $2,700 per satellite terminal

Comments: The NCR 2123 was upgraded to the 2127 model, and is in widespread use today. The 2127 is EBT capable with proper software modification.

Controller-Based ECR Description

Manufacturer: **NCR**
Model: **1255**

Controller

- **Controllers Supported:** NCR T-91XX controller
- **Controller Memory:** Up to 256KB
- **ECR Terminals Per Controller:** 48

ECR Terminal

- **ECR Terminal Options:** NCR 1255 terminal
- **Integrated Printer Capability:** Yes
- **Integrated Magnetic Stripe Reader:** Yes
- **EFT Capability:** Yes

System

- **Local / Host Communications:** In-store through a LAN; host through dial-up or leased line
- **POS Terminals Supported:** Any stand-beside POS terminal
- **Currently in Production:** No
- **Software Packages:** Third party vendors supply software for this system

Pricing

- **Per Lane (Based on Typical 10 Lane Configuration Including Controller):** $10,000 per lane (in 1989)
- **ECR Terminal:** $3,500 - $3,700 per terminal

Comments: This system is no longer in production, but there are a large number of these systems in use in the food retailer industry today. They can be retrofitted to perform EBT functions.

Controller-Based ECR Description

Manufacturer: **NCR**
Model: **7000 Continuous Processing System**

Controller

- **Controllers Supported:** NCR 7031 processor
- **Controller Memory:** 16MB (with dual processors)
- **ECR Terminals Per Controller:** 48 (96 with dual processors)

ECR Terminal

- **ECR Terminal Options:** Primary or satellite terminals are 7053-1100 and 7053-1300
- **Integrated Printer Capability:** Yes, NCR 7250 Multifunction
- **Integrated Magnetic Stripe Reader:** Yes

System

- **Local / Host Communications:** In-store through a LAN; host through dial-up or leased line
- **POS Terminals Supported:** Any POS terminal with integrated capabilities
- **EFT Capability:** Yes
- **Currently in Production:** Yes
- **Software Packages:** Third party vendors supply software for this system

Pricing

- **Per Lane (Based on Typical 10 Lane Configuration Including Controller):** Approximately $7,000 per lane
- **ECR Terminal:** $1,500 - $2,000 per terminal

Comments: This is an open system, so third party software applications and peripherals can easily be loaded or interfaced for use with this system. This system is EBT capable when loaded with the appropriate software applications.

Controller-Based ECR Description

Manufacturer: **Fujitsu-ICL**
Model: **2200**

Controller

- **Controllers Supported:** IBM PC/XT/AT or Fujitsu-ICL 286 ISP
- **Controller Memory:** 640KB
- **ECR Terminals Per Controller:** 32

ECR Terminal

- **ECR Terminal Options:** Fujitsu-ICL 2100 or 2200 terminal
- **Integrated Printer Capability:** Yes
- **Integrated Magnetic Stripe Reader:** No

System

- **Local / Host Communications:** In-store through a LAN; host through dial-up or leased line
- **POS Terminals Supported:** Any stand beside POS terminal
- **EFT Capability:** Yes
- **Currently in Production:** Yes
- **Software Packages:** Third party vendors supply software for this system

Pricing

- **Per Lane (Based on Typical 10 Lane Configuration Including Controller):** $5,500 per lane
- **ECR Terminal:** Not available

Comments: This is a low-cost, limited-function Fujitsu-ICL controller-based system model. It is EBT ready.

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Controller-Based ECR Description

Manufacturer: **Fujitsu-ICL**
Model: **GMS2**

Controller

- **Controllers Supported:** RSS 2000 processor
- **Controller Memory:** Up to 67MB
- **ECR Terminals Per Controller:** 120 (with dual processors)

ECR Terminal

- **ECR Terminal Options:** Fujitsu-ICL intelligent 9518/200 terminal
- **Integrated Printer Capability:** Yes
- **Integrated Magnetic Stripe Reader:** Yes, integrated into the keyboard

System

- **Local / Host Communications:** In-store through a LAN; host through dial-up or leased line
- **POS Terminals Supported:** Any POS terminal with integrated capabilities
- **EFT Capability:** Yes
- **Currently in Production:** Yes
- **Software Packages:** Third party vendors supply software for this system

Pricing

- **Per Lane (Based on Typical 10 Lane Configuration Including Controller):** Approximately $8,000 per lane
- **ECR Terminal:** $3,000 - $4,000 per terminal

Comments: This system is Fujitsu-ICL's newest controller-based system model, and it offers high functionality. It is EBT capable with the appropriate software.

Summary Tables

The descriptions presented on the previous pages are summarized in **Exhibit III.B.2,** *"Controller-Based ECR Systems Specifications, Functionality, Pricing"* following this page.

Summary

For EBT to become a viable payment application in the food retailer environment, there must be a device within each grocery store capable of handling such payment applications as credit, debit, and of course Electronic Benefits Transfer. POS terminals may provide this function depending on the specific model involved, its software, and capacity to support peripheral devices. ECR systems also may have the capability to provide these functions, again depending on the system and model. In addition, there are a number of configurations possible so that these POS terminals or ECR systems may interface with each other for certain tasks, function as separate individual units, or fully integrate for the payment transaction.

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CONTROLLER-BASED ECR SYSTEM SPECIFICATIONS, FUNCTIONALITY, PRICING

	Manufacturer	Model	Controllers Supported	Controller Memory	ECR Terminals Per Controller	ECR Terminal Options	Integrated Printer Capability	Integrated Mag Stripe Reader Available
1.	IBM	4680 Store System	IBM PS/2 model 57SX or higher, IBM 5170 PC AT, or IBM 4684 terminal	PS/2 models 70, 80-A16/A31 - up to 8MB models 80-081/161/321 - up to 4MB models 90/95 - up to 32MB, models 56/57 - up to 16MB	128 (64 primary + 64 satellite)	Primary terminals are 4683-1, 4683-P11, and 4683-P41 Satellite terminals are 4683-002 and 4683-A02	Yes 3800 (model 1), 6400 (model 2), 4700 (model 3)	Yes integrated into the keyboard
2.	IBM	4690 Store System	IBM PS/2 models with 386SX up to 486SLC2 processors, IBM 4684 or 4693 terminals, IBM RISC System/6000, or IBM AS/400	PS/2 models range from 4 to 32MB, 4693 terminals range from 2 to 32MB	128 (64 primary + 64 satellite)	Primary terminals are 4693-541, 4693-421, 4693-321, and 4694-001 Satellite terminal is 4693-202	Yes 6400 (model 2), 4700 (model 3), 4800 (model 4)	Yes integrated into the keyboard
3.	NCR	2123 or 2127	NCR 2435 controller, NCR 2127 master terminal controller	8 to 32MB	30 +-	Primary terminals are 2127-1000, -1100, -3000, -3100, and -3012 Satellite terminals are 2127-2000, -2100, -4000, -4100, and -4013	Yes	Yes
4.	NCR	1255	NCR T-91XX controller	Up to 256KB	48	1255 terminal	Yes	Yes
5.	NCR	7000 CPS	7031 processor	16MB (with dual processors)	48	Primary or satellite terminals are 7053-1100 and 7053-1300	Yes 7250 Multifunction	Yes (integrated or modular)
6.	Fujitsu-ICL	2200	IBM PC/XT/AT or Fujitsu-ICL 286 ISP	640KB	32	2100 or 2200 terminal	Yes	No
7.	Fujitsu-ICL	Atrium 9000	PC 386SX, controller terminal 80386SX, or controller terminal 80286	up to 16MB	128 (64 primary + 64 satellite)	Primary/286 terminal, Primary/88 terminal, and non-intelligent satellite ECR terminal	Yes	Yes integrated into the keyboard
8.	Fujitsu-ICL	GMS2	RSS 2000 processor	up to 67MB	120 (dual processors)	Intelligent 9518/200 terminal	Yes	Yes integrated into the keyboard

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CONTROLLER-BASED ECR SYSTEM SPECIFICATIONS, FUNCTIONALITY, PRICING

	Manufacturer Model	Local/Host Communications	POS Terminals Supported	EPT Capability	Currently in Production	Software Packages	System Pricing Per Lane (10 Lanes + Controller)	ECR Terminal Pricing	Comments
1.	IBM 4680 Store System	In-store with LAN, Host through dial-up or leased line	Any with integrated capability	Yes	Yes	4680 Supermarket Application	$8,000 - $9,000 per lane	$3,000 - $4,000 per primary terminal $1,500 - $2,000 per satellite terminal	Operates on IBM 4680 Operating System
2.	IBM 4690 Store System	In-store with LAN, Host through dial-up or leased line	Any with integrated capability	Yes	Yes (to be released Sept of 1993)	4680-4690 Supermarket Application	$8,000 - $10,000 per lane	$3,000 - $4,000 per primary terminal $1,500 - $2,000 per satellite terminal	Operates on IBM 4680 or 4690 Operating System
3.	NCR 2123 or 2127	In-store with LAN, Host through dial-up or leased line	Any with integrated capability	Yes	2123 no longer in production 2127 still in production	third party vendors provide software	$7,000 +- per lane	$2,700 - $3,500 per primary terminal $2,200 - $2,700 per satellite terminal	2123 replaced by 2127, which is still popular
4.	NCR 1255	In-store with LAN, Host through dial-up or leased line	Any stand-beside POS terminal	Yes	No	third party vendors provide software	$10,000 per lane (in 1989)	$3,500 - $3,700 per terminal	No longer in production but many still in use
5.	NCR 7000 CPS	In-store with LAN, Host through dial-up or leased line	Any with integrated capability	Yes	Yes	third party vendors provide software	$7,000 +- per lane	$1,500 - $2,000 per terminal	NCR 7000CPS is open systems based, so easily configured for various software applications
6.	Fujitsu-ICL 2200	In-store with LAN, Host through dial-up or leased line	Any stand-beside POS terminal	Yes	Yes	third party vendors provide software	$5,500 per lane	Not available	Lowest Fuj-ICL controller-based ECR system model, but is less expensive and has good functionality
7.	Fujitsu-ICL Atrium 9000	In-store with LAN, Host through dial-up or leased line	Any with integrated capability	Yes	Yes	third party vendors provide software	$5,000 - $7,000 per lane	$4,000 - $5,000 per primary terminal $3,000 per satellite terminal	Open architecture with modular configuration, runs on OS/2 operating system
8.	Fujitsu-ICL GMS2	In-store with LAN, Host through dial-up or leased line	Any with integrated capability	Yes	Yes	EPS with Integrated Payment System or third party vendor software	$8,000 +- per lane	$3,000 - $4,000 per terminal	Advanced functionality, newest Fujitsu-ICL ECR controller-based system

C. ZONES OF SERVICE PROVISION SUPPORTING ON-LINE POS DEBIT

Introduction

One useful way to view retailer payment systems is to separate system functions into Zones of Service Provision, reflecting major physical separations of the systems themselves. **Figure III.C.1**, entitled *"Zones of Service Provision"* depicts the five zones in which payment functions reside.

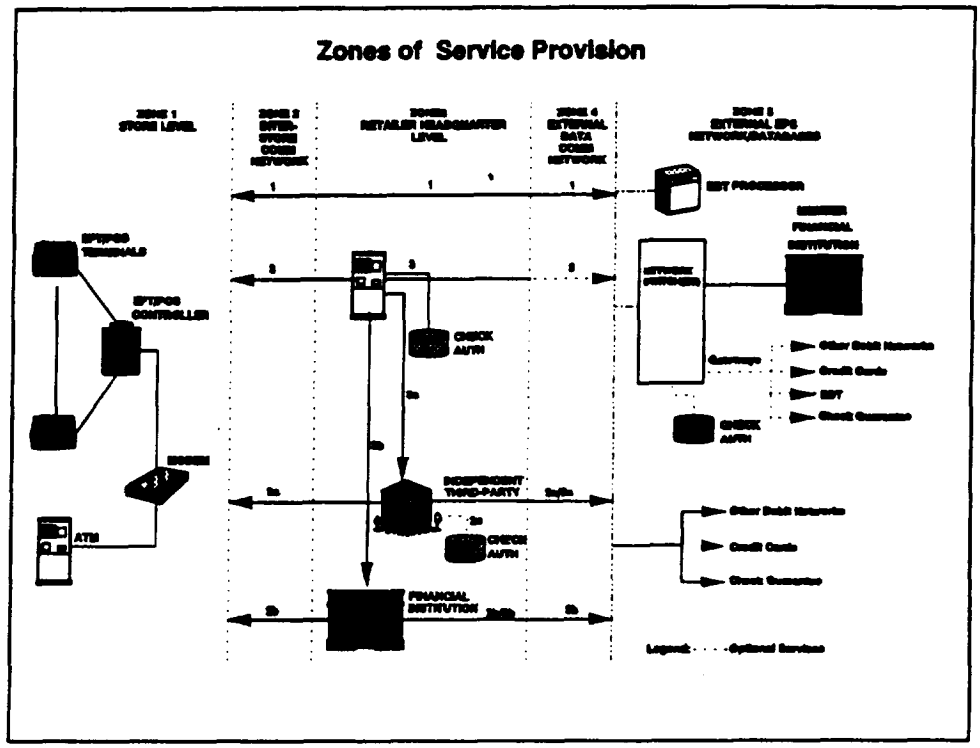

Figure III.C.1

Zone 1: Store Level

The first zone of interest is within the stores. Devices that operate within this zone may communicate with each other through local connections, either via direct interfaces or on Local Area Networks (LANs). There are often several systems operating within stores, especially in larger supermarkets. These systems may or may not interface with each other. For example, a

receiving system may communicate receipts to an inventory system, but a time and attendance system is less likely to communicate with other systems within the store. Most store systems do communicate with other systems at the central site through some mechanism.

The systems of most interest within Zone 1 are the Point of Sale (POS) system and the Electronic Cash Register System (ECR). As retailers modernize their systems, these two systems are becoming one through integration. Various configurations of these terminals are discussed in the part B of this section, "Taxonomy of POS and ECR Devices and their Capabilities."

The ECR system provides accurate and speedy checkout of a customer and the recording of the effects of the sale (or return) on inventory and tender on hand, cash, coupons, checks, gift certificates, food stamps, etc. The ECR system also reconciles totals for electronic items, although the detail is usually kept in the POS system. When a customer checks out, the ECR system looks up each item, using a scanned bar code. The item(s) are extended[4] by the stored price, printed on the receipt, taxable status is determined, and the total is maintained. Often "by weight" purchases are weighed at checkout, and the weight-price extensions are also performed by the ECR system. ECR systems may also pre-process the totalling to reflect variable tender. Inventory accounting is kept as a by-product of this process, so that reordering of goods is facilitated.

The ECR and POS functions meet at the point of tendering, i.e., paying for the goods. The ECR system determines an order total, from which coupons, gift certificates, and food stamps are subtracted. At this point, if electronic tendering is selected by the customer, the POS system is employed to get the necessary authorizations and account for the detail. If cash is tendered, the POS system is not involved. If a check is presented, the POS system may provide check authorization services, or alternative systems may be employed. Technically, a check authorization is not an electronic payment, but the POS infrastructure provides a convenient mechanism for authorization activities.

[4] Extended refers to the adding of data to the basic information unit.

The POS system is responsible for obtaining authorizations for electronic tenders, debit, credit, or EBT. Normally, this involves on-line communication to and through other zones. Communication originates at the EPS store system.

Payment Configurations

The payment tendering process starts at the POS device; the customer's first point of contact with the electronic payment system. These devices are most typically located in the checkout lanes, but may also be found at the customer courtesy booth or area register supporting peripheral departments in the store.

The POS devices are typically connected to a store controller to support the transaction authorization function. Similarly, electronic cash registers (ECRs) are connected to a controller to support functions such as sales, price look-up, inventory, and scanning. The controller used to support ECR functions may be a separate device or it may be connected to the POS terminal controller.

Some of the more common configuration alternatives are described below.

Stand-Alone Configuration

The simplest of the electronic payment system configurations is stand-alone (also referred to as stand-beside). Here, the POS devices have no connection to the ECR, that is, the POS device "stands-beside" the ECR. **Figure III.C.2** illustrates the stand-alone configuration. All transaction data in support of the tendering process is entered into the POS terminal data, separately from ECR entries. In the stand-alone configuration, the POS device and the ECR controllers do not exchange any data. The payment transaction may flow directly from the terminal to a third-party acquiring system or to an in-store controller that connects to the retailer's central headquarters. Thus, electronic payment functionality is achieved through a totally separate system.

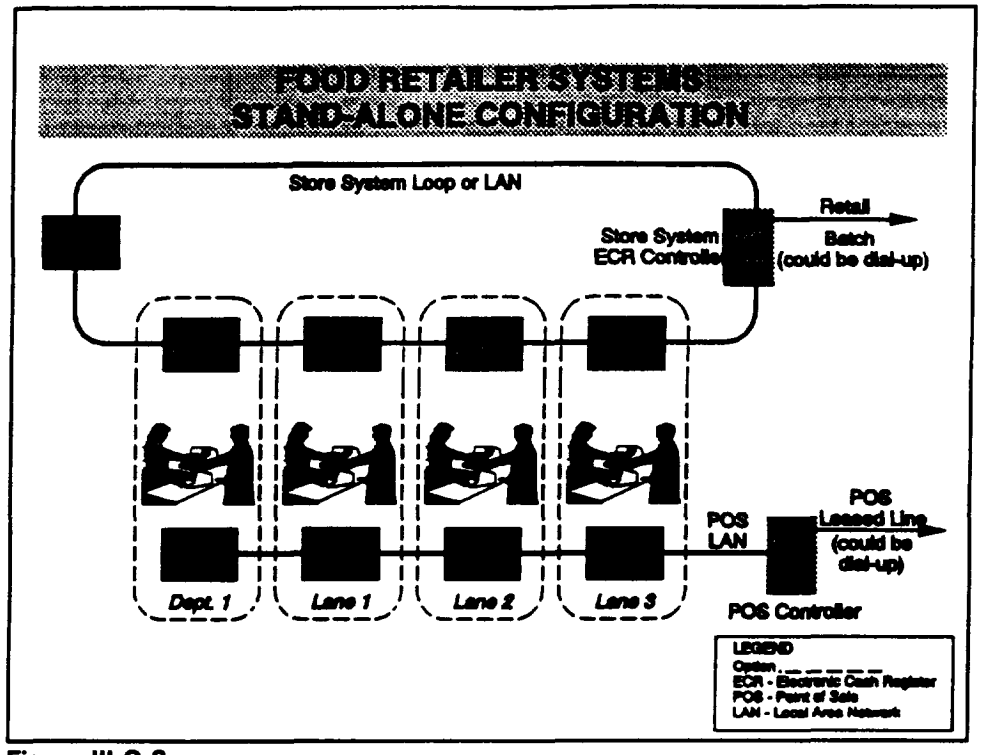

Figure III.C.2

The stand-alone configuration requires dual data input at the lane level for the ECR and the POS device. The cashier must re-enter the transaction amount from the POS device to the ECR to maintain consistency between the totals within both systems. This function increases the potential for human error, e.g., mis-keying of the dollar amount, thereby causing reconciliation problems during system settlement.

Dual balancing and settlement functions must also be performed to reconcile the POS device and the ECR. Since the POS and ECR systems are separate, the stand-alone configuration requires a separate printer for the POS device. This further complicates the settlement process at the lane level, as duplicate receipts are required to keep the system in balance. Furthermore, the separate POS printers add to the overall cost of the fully burdened POS device.

There are other limitations with the stand-alone solution. Typically, the POS controller has limited intelligence, thereby

precluding options for stand-in processing in the event of system downtime. Moreover, this configuration does not support store and forward capability for either debit or credit transactions, thus requiring manual back-up to support system downtime which, again, is labor-intensive and increases overall operation costs.

This option provides a good starting point for "mom & pop" stores, or food retailers with less sophisticated store system configurations.

Interfaced Configuration

In the interfaced configuration, as illustrated in **Figure III.C.3**, the connection between the ECRs and the POS devices in the checkout lanes is made at the controller level by interfacing the POS controller (or PC) to the ECR controller. This is shown graphically by the connection between the store ECR controller and the POS controller. While the POS and ECR controllers act as separate sub-systems, the controllers are physically linked to support payment data at the terminal level or controller level. The POS devices and ECRs actively exchange payment data at the terminal or controller level, and data flow is bi-directional between the POS device and the ECR. Synchronization of these devices must occur during the tendering process.

This configuration requires a extra piece of hardware (the POS controller), which can be a significant capital expense in a large chain environment. It also requires incremental store office space, which may also be at a premium. Due to the interfaces with the existing ECR controller, this solution requires access to the architecture of the major suppliers of supermarket equipment.

The POS controller generates its own balancing and reconciliation controls for each of the checkout lanes. It can also generate separate reports on POS terminal activity, generate integrated reports with the ECR controller, and exchange data with central headquarters for systems reconciliation. Many retailers prefer this configuration because it allows the retailer to use the sales and inventory functions provided by the ECR system in the event that one or more POS devices fail.

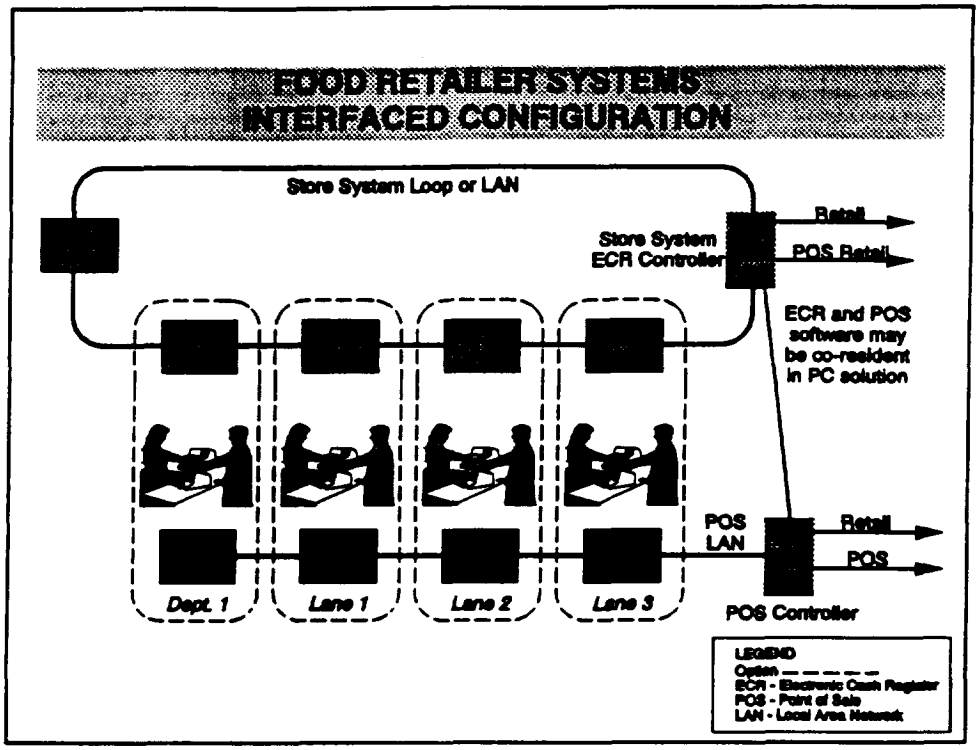

Figure III.C.3

This configuration overcomes many of the limitations of the stand-alone configuration. First, the interfaced solution eliminates the need for an additional printer, because the printer on the ECR can be used to support the requirements for the EFT receipt. Also, this solution integrates the electronic payment services with other ECR functions, eliminating the need for the cashier to re-enter customer transaction data and thus avoiding potential human error.

While not routinely supported, the interfaced configuration does permit the retailer to link product information to payment transaction information. This functionality may be particularly valuable because it allows the retailers to track product movement by individual customer, thus enhancing information on customer purchasing habits.

Fully Integrated Configuration

In a fully integrated configuration, one controller is used to support the requirements of both the POS and ECR, thus

eliminating the need for a separate POS controller. **Figure III.C.4** illustrates the fully integrated configuration. This system operates on an in-store LAN configuration.

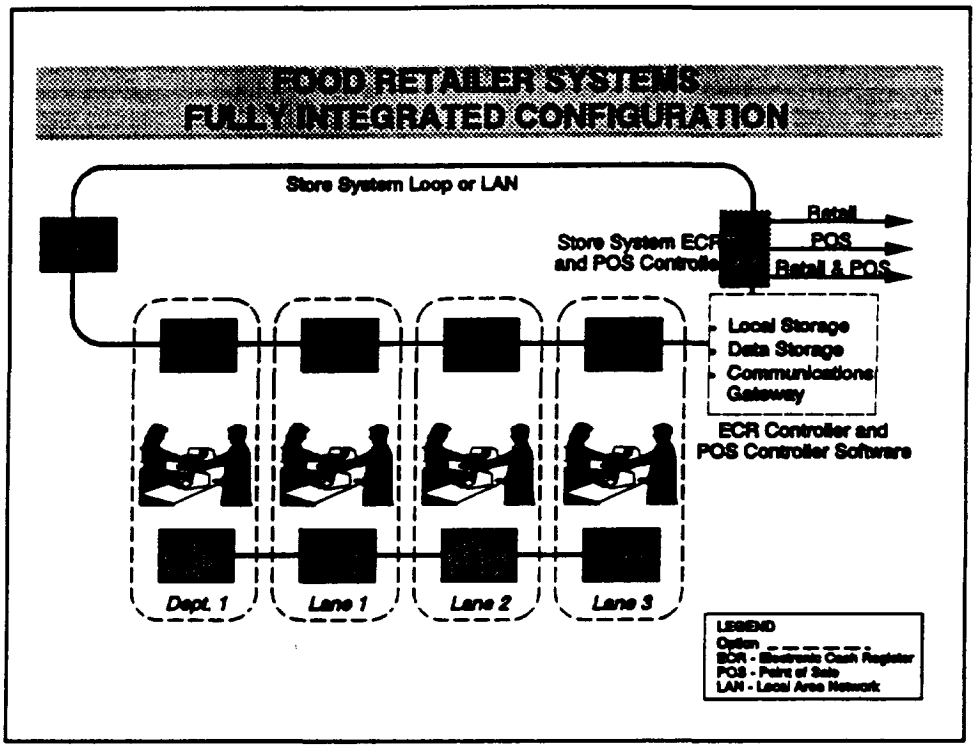

Figure III.C.4

The POS applications are resident on the same controller with other ECR applications. Moreover, the ECR and POS terminals share payment data from combined software that resides on the controller.

This configuration, as the name implies, is heavily dependent upon the ECR system capabilities, and is the most complex of the configuration options. However, it shares the advantages of the interfaced system by eliminating the re-entry of POS totals (reducing vulnerability to human error) and providing the linkage of product information to payment transaction information.

The more integrated the solution, the more difficult it is to separate POS and ECR processing for routing POS to a bank or

third-party. Generally in these circumstances, POS transactions are routed first to a headquarters central site. EBT transactions would also follow this path if the store's ECR/POS system is used.

The fully integrated configuration is the long-term direction of the industry.

Zone 2: Inter-Store Communications Network

Zones 2 and 4 are communications zones. The POS transactions flow in Zone 2 from the stores to the terminal driving systems in Zone 3. The most typical form for Zone 2 is a private multi-drop network, connecting the stores with the central site, Zone 3. Other wide area network (WAN) approaches are used, employing multiplexers on high-speed backbones and packet switching networks. Retailers with large IBM mainframes often deploy SNA networks for the WAN.

As systems evolve toward an "Open Systems" philosophy, many Zone 2 networks will probably evolve to a TCP/IP protocol packet network which offers considerable flexibility in sourcing the physical paths among traditional copper wire and newer broad-band fiber alternatives.

In some situations, the Zone 2 network is the public voice or data network, when the POS terminals are programmed to dial out to an authorization source or use a specialized shared service such as 950 service (Feature group B), Data Over Voice (DOV), or Integrated Services Data Network (ISDN). In these cases, the terminal driving host is not typically the retailer's central site, but rather a bank, network, or third-party processor which performs the same functions.

A number of retailers are moving to satellite (VSAT) communications, although this trend is stronger among general merchandisers, especially discounters such as K-Mart and Wall-Mart, where stores are spread over a wide geography.

In summary, Zone 2 represents a communication from the store to the terminal driving central site systems in Zone 3. The

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Zone 4: External Data Communications Networks

Zone 4 is typified by heterogeneous communications to each external authorization source. While Zone 2 communications can be homogeneous and controlled by the store or the store and a single third-party, Zone 4 communications are controlled by as many parties as there are interface points to the outside world.

The realities of Zone 4 really force requirements upon Zone 3 systems for the retailer. The most stringent are message formats. Virtually no network and few third parties can accept more than one or two message formats. This means that interfaces must be created for each network, even those using the same software packages, since they each define response and error codes for their own needs.

Zone 5: External Electronic Payment Systems Network/Databases

Zone 5 represents the "outside world" of authorization services. If the first Zone 5 interface point is a merchant bank, it authorizes some of the transactions itself and passes the rest on to one or more networks for approval. If the first interface is the local network, transactions for local authorizing institutions are routed there and processed, otherwise the switch in Zone 5 reformats and sends the transactions to another switch where the process is repeated. In reality, Zone 5 is a series of layers of Zones 3 through 5 (with financial processors rather than retailers playing the Zone 3 role).

Once a transaction is authorized, provided that the acquiring was according to operating rules, the transaction is guaranteed, even if the money cannot be recovered from the customer. For each point-to-point connection in Zone 4, both ends must balance, reconcile, and settle the transactions flowing each day. Electronic transactions represent a monetary exchange between the retailer and whomever is at the other end of a particular "pipe." If the pipe goes to a bank, the settlement causes money to flow into the merchant's account at that bank, If it goes to a third-party or

network, the money is moved to the merchant's account at a designated merchant bank.

If a number of external connections are desired, but the expected volume is low on each, a single connection can carry all the transactions to a specialized processor in Zone 5 which, in turn, passes the transactions on to the appropriate destination. This is a fee-based service called gateway processing, which provides access to multiple external networks or authorizers.

D. RETROFITTING REQUIREMENTS TO SUPPORT EBT

Overview

As EBT programs continue to unfold on a state-by-state basis, the large majority of small-to-midsize food retailers, having no electronic payments system capabilities, will rely on the EBT processor to provide the hardware, software, and implementation support to become EBT-capable.

Retailers with some existing form of electronic payment system capability pose a much different challenge. Our research revealed that retailers want strongly to utilize their existing equipment and communications capabilities, and oppose the prospect of multiple POS terminals in the lane.

The debate thus hinges on the capability and degree of difficulty to retrofit these existing electronic payment systems to support EBT. As previously presented in section II.A, payments systems can vary greatly in terms of sophistication and fit with EBT requirements. Our research confirms earlier research that EBT infrastructure requirements best build upon the existing on-line debit infrastructure, because the requirements for security, card and terminal technology, message formats, and linkages for access to external authorization databases are most similar to debit.

The purpose of this section is to describe the requirements needed within the retailer's environment to retrofit an *existing on-line debit system.* (This presumes that the installed terminals are already debit capable, support Regulation E requirements and PIN encryption at the PIN pad.) The zones of service provision, previously described, provide the backdrop for discussions on retrofitting requirements. The five zones are presented again in **Figure III.D.1.**

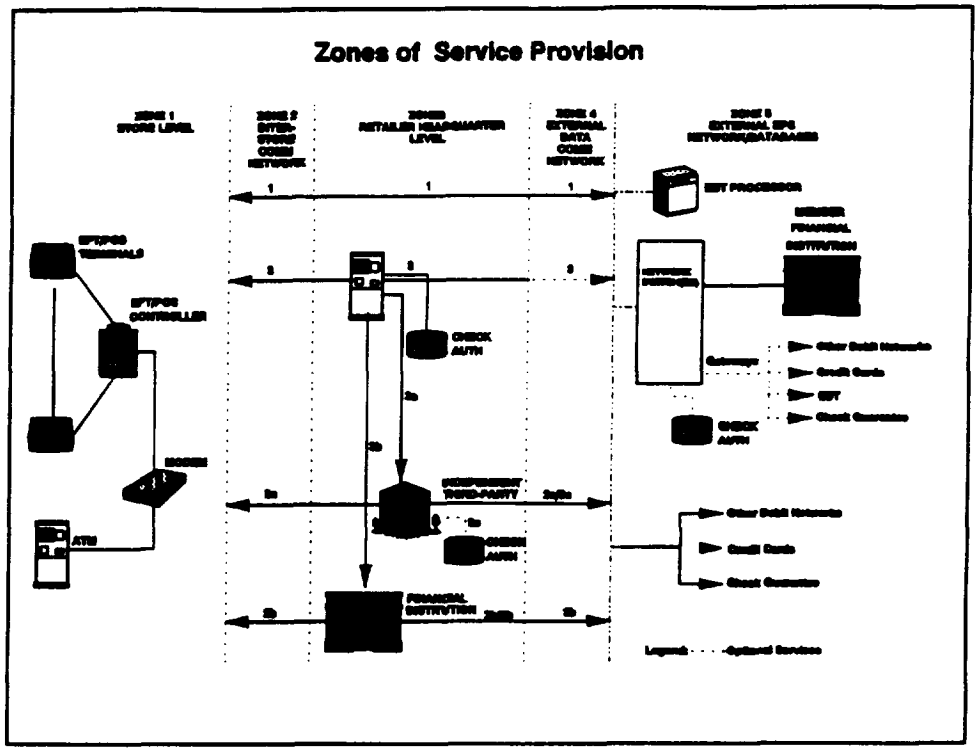

Figure III.D.1

Zone 1: Store Level

Most of the retrofitting requirements to support EBT affect the POS terminal. As stated previously, the newer generation of debit-capable POS terminals have intelligence resident at the terminal itself, thus much of the retrofitting effort entails modifications to the terminal.

Application Requirements

The number of applications supported in an EBT program greatly influences the work entailed in retrofitting the POS terminal.

For a single application supporting just one account relationship, (e.g., food stamp only) the retrofitting requirements are fairly simple. The EBT transaction is treated no differently than debit, but the way the transaction is authorized is slightly different in terms of the actual response message.

One important difference between an EBT and on-line debit transaction is the availability of the cash-back function in traditional debit. Food Stamp Program rules prohibiting cash-back from the food stamp account represent an additional modification to the standard debit application. Typically, when the software is changed, the new transaction type (i.e., FS EBT) is indexed to inhibit the cash back option.

Our research indicates that the effort projected to support this new application (i.e., design, develop, and test) is estimated -- on average -- at a minimum of six weeks. Implementing the retrofitted application, however, depends on terminal model and retailer size. For multiple applications that need to function independently of each other, the POS terminals need to be programmed to allow account selection. Terminal modifications then entail developing multiple layer screens that prompts the check-out clerk or customer through the transaction. The design, develop and testing efforts for multiple transaction support is estimated at eight weeks. Again, the implementation time will vary based on terminal type and retailer size. The software is modified and then installed on each terminal.

In either a single or multiple application function, the time and effort to implement the enhancements at all terminals is probably the most time consuming effort. This process may entail downloading software to each terminal, or may require physically adding firmware to each terminal, depending on the terminal type and the capabilities of the host processing system. Larger chain stores or smaller chains serviced by a data service organization typically support downloading over the network, from software at the host site. In this case, multiple stores could be implemented in the same time frame. Alternatively, less technologically sophisticated retailers need to either transport diskettes (or even the terminals themselves) to headquarters for downloading or provide a terminal-to-PC interface to support the download.

Memory Requirements

Terminal memory capacity can be a significant constraint for adding multiple applications to an existing terminal. If the terminal now in use has limited memory, the retailer is faced with three choices:

1. Replace the terminal.

2. Increase the memory on the terminal. Memory requirements vary depending upon the number of additional applications supported. As presented in the Section III.B, some POS terminals may not be physically able to accept added memory (e.g., there are no available memory sockets, or the terminal is designed to operate with one type of memory chip and will not accept chips with more capacity, i.e., 64K to 256K). The newer generation POS terminals are more likely to support these capabilities than the older POS terminals.

3. Trade-off other functionality to increase accessible memory. For example, transaction storage capabilities can be traded for more memory. This option, however, is a more complicated trade-off than pure memory expansion. Furthermore, retailers may not be willing to accept these trade-offs.

Software Requirements

Our discussions with terminal manufacturers revealed a general feeling that the software modifications needed to make a POS terminal EBT-capable are relatively minor.

Phone numbers for EBT authorization need to be programmed into dial-up POS terminals. This is a simple task, often performed by the retailer's staff to avoid third-party charges. The card bank identification number (BIN) determines the phone authorization center contacted.

Most of the new generation POS devices are soft programmable. In these cases, no hard coding (e.g., replacing EPROM chips) is required at the terminal to support EBT. In general, any software-downloadable terminal should be able to support EBT without firmware modifications. Of course, the older POS terminals are less flexible than their newer counterparts. If a terminal is operating in a credit environment only, without a PIN pad, some firmware changes necessary to add the PIN pad should be anticipated. This presumes that the credit terminal could be upgraded to support debit, which in most cases is not possible.

Receipt Requirements

The logic to support printing the available balance of an EBT account on the transaction receipt is resident at the host system, rather than at the POS terminal. Supporting the EBT account balance on the receipt requires accepting additional information in the response message (approved or denied), not currently supported or required in a non-EBT system. Thus, a development effort is needed to support this function.

Wiring and Installation

Wiring for a "Mom-and-Pop" store is minimal, provided that the check-out lane is equipped with a phone. Using the existing telephone lines, the installation requires little more than plugging a Y-Jack or splitter to connect the POS terminal to the existing telephone. The Y-Jack is inexpensive (less than $2.00 each) and can be bought in quantity. Wiring and installation costs vary by geographic location.

In larger, chain store environments with multiple lane configurations, the wiring and installation effort is more complex. Terminals are mounted and wired in the lane, and the wiring is dressed and hidden under the floor. Installation costs average about $300 per terminal.

Integrated ECR Modifications

As described in Section III.B, the newer generation of ECRs with scanner applications and a payment applications component are likely to be capable of supporting a magnetic stripe reader and a PIN pad. Further, they meet PIN and message encryption standards. In practice, most ECR vendors add a POS terminal to the ECR configuration to support electronic payment services.

If this software is not supported, a major development effort is entailed to support the terminals, controller and central site requirements -- which can cost upwards of $100,000. Many retailers have older generation ECRs that do not have the payment application. Most likely, these retailers will install a stand-beside solution to support EBT until they are ready to replace the ECR system.

In an integrated system, the ECR and the POS controllers are physically and logically connected. Therefore, there may be some messaging work required between the two controllers to support an EBT application. Some ECR vendors have already built in the capability to support additional messages.

Controller-level Modifications

The preceding discussions have presumed intelligence resident at the terminal rather than the POS controller. In this case, controller-level changes are primarily message and communications related. At a minimum, the EBT BIN number for transaction routing through the infrastructure must be loaded to the controller. In essence, the new BIN number is added to the existing BIN table identifying the EBT card for acceptance.

However, in some cases the intelligence for the store level system may reside with the ECR or the ECR controller. In this case, message formatting requirements must be done at the ECR or ECR controller, as these devices spoon-feed the POS terminal their functionality. The cost to retrofit at the controller level may vary greatly -- depending on the software, memory capability, controller model, design, quality of programming staff, and numerous other factors.

Whether the software changes need to be made at the terminal or controller level, these modifications may be done by the retailer, the terminal vendor, or the controller-level software vendor.

- Large retailers frequently purchase proprietary software packages to support electronic payment services, and perform any routine maintenance on the package internally. In this situation, the retailer may opt to do the software modifications in-house; as the changes are relatively high-level (e.g., downloads to change phone numbers at the terminal).

- Terminal vendors may or may not support software changes, often times preferring the controller-level software vendors to assume this responsibility.

- Controller-level software vendors often make the POS terminal software changes, in an effort to control the message routing and communications between the store and controller levels.

Costs for this development effort are difficult to estimate. However, contacts within the industry indicate that message reformatting, building and downloading the new loads from the controller to the terminal can range between $10,000 and $50,000.[5]

Zone 2: Inter-store Communications

Any retailer with an electronic payment system solution in place is presumably supporting a leased line between the store and the headquarters or the third-party processor. The POS terminals are linked to the POS controller which, in turn, is connected to an external, private (leased) telecommunications line to the store headquarters. While more expensive than a dial-up line, the leased line can be shared with other applications. No modifications are needed here.

There are exceptions in supermarket chain environments with stand-alone configurations. In these instances, several terminals may share a phone line if transaction volumes are low. However, this is not a common installation.

[5] Estimates of the costs of retrofitting payment system zones to support an EBT application are made throughout this discussion. Under current food stamp regulations, food retailers cannot be made to bear new costs associated with EBT development and operations. This, however, does not preclude the retailers from choosing to support EBT as part of a larger business decision. In the typical EBT model, the costs of terminal deployment are borne fully by the EBT vendor. Retailers not electing to retrofit their payment systems will likely have EBT vendor-deployed single function terminals, as this represents the least cost alternative for the EBT vendor. This decision will have a clear impact on the retailers' ability to preserve their existing business and physical relationships for payment services when adding EBT.

Zone 3: Chain Level Single vs. Multiple Accounts

Host software level changes are required to transmit the EBT messages to the EBT processor. Single account applications require the addition new application codes since the EBT transaction message is virtually identical to an on-line debit transaction.

Again, the retrofitting issues become more complex when supporting multiple accounts. A transaction code for each benefit type must be added and the capability for the recipient to select the benefit account type must be supported. In addition, any of the benefit account types that must be inhibited from cash-back adds to the complexity of the modifications.

Based on the premise that access to any benefit account is a complete transaction and that access to multiple benefit accounts linked to a single card will be handled as separate and unique transactions, retrofitting support of single card, single account application will be nearly the same to implement as single card, multiple benefit account application.

Host interfaces

Retailers that support an electronic payments systems solution already connect to a network switch to support debit transaction authorizations. In terms of using the existing commercial infrastructure, there are no modifications required to support EBT if the EBT processor connects directly to the network switch. The EBT transaction, like an on-line debit is merely routed to the network switch. Alternatively, if a host interface directly to the EBT processor is required, and the same telecommunications and transaction formats are utilized, establishing a telecommunication connection is the largest effort aside from testing.

Trends in the industry suggest that many retailers, food and other sectors alike, are disconnecting direct interfaces to the network switch and outsourcing this function to gateway service providers. The driving force is that each card authorization system interface has associated communications and programming maintenance

expense, which can cost a company between $500,000 and $1,000,000 per year just to remain in compliance with network operating rules. It is anticipated that the outsourcing trend will become even more prevalent among those companies that operate in multiple regions or nationwide.

Message formats

Retailers understanding of Federal requirements for EBT is critical to determining the modifications required at the controller level for routing messages throughout the infrastructure. A major concern among food retailers currently is that the EBT transaction format may not be based on any format standard now being utilized. Utilization of a different format adds to the cost and complexity of retrofitting for retailers that have implemented chain-wide electronic payment systems.

This underscores the importance of using standard message formats across counties and states. Without the use of a common message standard, a retailer that operated state-wide in multiple counties, might potentially have to create several different host interfaces to deal with each of these stores in geographically disbursed locations -- adding to the cost, time, and complexity of the development effort. It is our understanding that current ABA working groups are addressing the issue of message standards for EBT.

Message specification covers the content of all data elements routed through the infrastructure. These elements must be defined to the bit map level (including the value of codes) to ensure a common platform. To accomplish this, retailers' data requirements are collected, and then the semantics of the message flows (e.g., requests, responses, etc.) are defined. Contractor support for this type of systems development work currently averages from $65.00 to $125.00 per hour. Thus, if a significant amount of programming at the store and headquarters switch are required to support EBT, the investment may range between $100,000 and $250,000 in programming labor alone.

Zone 4: External Communications

Dial-up telecommunication lines can be used in "Mom-and-Pop" stores or retailer environments with low transaction volumes. No special communications capabilities are required, as transactions are passed over the existing voice line. Communications configurations using a voice-grade line meet the EBT processing requirements, provided that the PIN component of the message is encrypted. Terminals typically transmit at 1200 baud, which should be sufficient to meet processing throughput requirements.

Leased lines are more commonly used by larger retailer chains with existing external interfaces to outside databases. Here, no additional retrofitting is needed to support EBT in an existing on-line debit environment.

Zone 5: Payment System Network/Databases External Interfaces

Many third-party processors (and even a few of the large grocery chains) have already built external interfaces and telecommunications capabilities to access network switches for on-line debit. Retailers and third-party processors appear to prefer that EBT transactions be routed through existing network switching interfaces to minimize their own internal development costs to support EBT.

Minimal changes are required at the network switch level to support EBT, depending upon the flexibility of the switching software -- again, more flexibility means easier modifications. Those regional network switches driving POS terminals should anticipate a more extensive development to support EBT, to support balancing and settlement down to the terminal level for fraud reporting purposes, and to provide the recipient's balance amount on the receipt.

As more network switches move to support ISO 8583, the EBT requirements should become easier to accommodate. Modifying message structures is nominal compared to building entirely new transactions.

Certification of third-party processors

Additional time and cost should be expected to retrofit third-party processor interfaces to connect to an EBT processor, depending upon the message format supported by the third-party. The development effort may take upwards of six weeks to write and test the program, depending upon the level of complication. The development costs for certification can range upwards of $1,000 per day. The time needed to test the EBT application to run on the commercial infrastructure may take as long as the time it took to write the initial application. The certification process itself may take anywhere between three days to four months.

Large retailer merchants, that will account for the majority of EBT transactions, will likely desire a host interface connection to the EBT processor. It is encouraging to note that most third-party processors have already built, or are planning to build host interfaces to support EBT.

Summary

The "bare bones" minimum requirements to support EBT in an authorized food retail store (with no existing electronic payment system capabilities) are:

- POS terminal with a printer port (for the receipt) and PIN pad port.
- PIN pad.
- Separate key pad or swivel pad -- for the cashier to add the transaction amount.
- Separate printer.
- Dial-up telephone line.
- Y-Jack or splitter to connect telephone line to the POS device.

Yet, retrofitting a retailer with some existing form of electronic payment system is much more complex. For those already debit-capable (i.e., supporting Regulation E and PIN encryption at the PIN pad), the retrofitting requirements impact the store level, the chain level and external payment system networks.

These requirements include:

- Modifying the POS terminal to support account balance information on the receipt and the additional application types.
- Recognizing the new transaction codes for EBT, developed according to standard message formats.
- Adding BIN numbers to the existing BIN tables.
- Modifying the controller to support message exchange between the POS and ECR controllers.
- Developing host interfaces to the EBT processor.
- Testing to ensure that the system is in compliance.

Our research indicates that large retail grocery stores will likely bear the expense of modifying their own internal systems to support EBT. Retailers, however, do expect that the government will provide EBT-related supplies (e.g., ribbons, paper tapes) free

sophisticated electronic payment systems, may also look to the government to share the costs of allocating terminals and telecommunications lines dedicated to support EBT transactions.

E. STRUCTURE AND RANGE OF FEES

Introduction

Fees are established to support both ATM and point-of-sale payment services to compensate financial institutions and other firms (e.g., third party processors, networks, ISOs, etc) involved in processing a transaction. ATM and point-of-sale debit fees vary greatly for a number of reasons. First and foremost, ATMs are generally owned and operated by banks or networks comprised of bank members. Thus, all funds withdrawn or deposited remain within the banking community at large. Banks typically are interested in covering the costs associated with buying ATMs, supporting the 24-hour operation, and the customer convenience of using both their own proprietary machines and another bank's ATM.

Conversely, point-of-sale debit involves an external stakeholder, the merchant, in each and every transaction. Most often, a firm other than a bank owns and operates the merchant terminals. This means that funds movement is initiated in an environment outside of the control of the banking community. As such, bankers believe there are greater risks and potential for fraud on the debit transactions in a merchant setting. Banks want to cover the cost of the transaction risk since they still have to handle and settle the customer account. Moreover, the firms that deploy terminals and sign-up merchants want to be compensated for their efforts. While POS transactions are perceived as more risky than ATM transactions, this risk does not necessarily translate to higher prices. Indeed, the capital expenditures and maintenance costs and general overhead required to support ATMs far exceed their POS counterparts. Given these considerations, ATM and point-of-sale transaction pricing are virtually incomparable.

This section describes the flow of fees and the range of prices generally found in the electronic payment systems market today. The discussion begins by describing the evolution of debit ATM and point-of-sale fees to provide an historical setting for the EFT infrastructure and to provide a means for explaining future trends and directions, and their implications for EBT.

Historical Perspective

When shared networks of ATMs first came into existence in the mid-1980s, fees were established based on who invested in terminal deployment, 24-hour operations, and interbank transaction routing and communications. As a result, the card issuer, which merely authorized or declined the use of a card, always paid the ATM owner and the network switch (regional and/or national) for customer transactions. Generally, the card issuer paid the ATM owner 40 cents for a withdrawal and the regional network 10 cents, in the early days of ATM sharing. **Figure III.E.1**, entitled *"On-line Debit Fees and Flows"*, depicts these historical fee structures.[6]

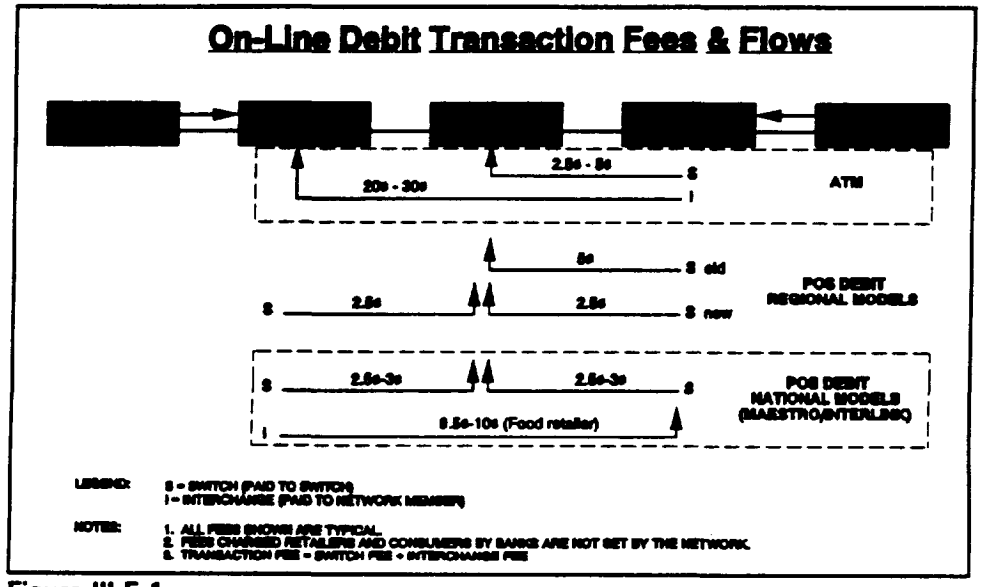

Figure III.E.1

At that time, consumers were less knowledgeable about ATMs and even apprehensive about using them. Transaction volume on the networks was very low, and transactions had to be priced

[6] The fee arrangements between the retailer and their merchant acquirer, usually expressed in fractions of a cent, are one of the most guarded elements of EFT transaction pricing. As such, these fees are not depicted in the referenced figure.

high enough to cover the costs of operating the regional and national networks, and adequately compensate the ATM owner.

As consumers became aware of the ATM service, use of proprietary and shared ATMs for convenience purposes increased. In addition, people who never used a debit card started to use them. The average number of monthly transactions per customer increased, and by 1988 it was not uncommon for regional networks to exceed 1 million monthly transactions. By 1990, this had increased to over 5 million transactions monthly.

As skyrocketing transaction volumes enabled the regional networks to cover their operating costs more effectively, their members sought price relief. As a result, regional network fees started to drop dramatically. Today, it is not uncommon to see card issuers pay a 2.5 to 5 cent regional network ATM switch fee, and 20 to 30 cent acquirer fee. The margins on ATM switch fees are thought to be at their economic minimum. Prices are within 5 to 15 percent of cost. ATM acquirer fees tend to be somewhat non-negotiable since all banks have ATMs and all of them like the incremental revenue the machines generate.

Point-of-sale debit emerged in the mid-1980s as ATM sharing was taking off. The Interlink network in California, developed by the five largest banks in the state, was the first network in the nation to offer on-line authorization, regional debit card point-of-sale services. Point-of-sale debit was, and still is, attractive to high cash and check location merchants, thus, the service started in supermarkets and gas stations.

Initial grocery and gasoline merchants in California developed their own internal processing systems and deployed their own terminals. Literally able to deliver transactions to the banks' front door these merchants scoffed at transaction fees. Many, in fact believed the banks should pay them for transactions. Banks worked hard to convince the merchants that the inherent risk in debit is borne by the card issuing bank. Over time, the merchants accepted this and agreed to pay for the use of debit cards in their terminals.

However, the pricing structure for point-of-sale debit started at much lower levels than the shared ATM transaction pricing

structure. Most grocery merchants still believe it costs them very little to deposit cash and checks, and that debit should be about the same price. Many of the initial point-of-sale programs had the card issuers paying the regional switch fees, averaging about 5 cents per transaction.

Trends and Directions

In 1991 and 1992, both Visa and MasterCard tried to make inroads into the debit point-of-sale business by capturing some of the regional processing business. Neither organization was successful in their attempt. As a secondary position, both decided to join the regional networks in "partnership" arrangements. The credit card companies had two objectives. First, they wanted to increase the use of credit cards overall and make them available in high cash and check locations; traditionally locations which did not accept credit. Second, they wanted to advance their off-line debit products, Visa Debit and MasterDebit, and move the market away from the use of on-line debit cards. The credit card companies decided that the best way to proliferate the off-line cards was to provide an incentive to the member Visa and MasterCard banks to issue them in lieu of proprietary bank debit cards. So, as a very strong competitive move, Visa decided to institute modified credit card pricing for its off-line debit products. Purchasing Interlink, VISA modified Interlink on-line debit pricing to resemble the off-line debit and credit card model. Visa then built the Interlink base into a national debit point-of-sale alternative to the regional networks.

The significance these events is that in the credit card environment, the merchant pays a discount rate (a percentage of each transaction sale amount) to the merchant acquiring bank or front-end processor. Most of the discount, which is called interchange, is ultimately paid to the card issuer. This interchange compensates the card issuer for fraud and other losses associated with the credit cards. The rest of the money is divided among the other firms in the value chain that process the transaction. Most importantly, this interchange is a significant source of income for the card issuing banks. Many banks in the United States now issue off-line debit cards to capture the revenue opportunity each time the card is used. The amount a card issuer can earn on Visa or MasterCard credit/debit interchange is much higher than what

the issuer can earn on an on-line debit transaction. Thus, this phenomenon placed mounting pressure on the regional networks to model debit pricing from the national POS debit (at 2.5 cents per transaction, split between the issuer and acquirer), in an effort to preserve its card issuer member base from erosion.

The evolution of the ATM and point-of-sale debit fees was previously presented in Figure III.E.1. The regional point-of-sale debit model now reflects the same type of switch fee pricing as the national networks, whereby both the acquirer and the card issuer pay the switch equivalent amounts of 2.5 cents a transaction. The difference is the 9.5 to 10 cents in interchange the card issuer now makes on each national transaction versus no interchange on a regional transaction.[7] Trends suggest that most regional networks will begin charging interchange in the near future, but at one-half to two-thirds the national rate. **Figure III.E.2**, entitled *"Shared Networks POS Survey -- POS Pricing"*, presents switch fee pricing arrangements for eleven of the largest regional networks.

Many of the eleven regional networks on the chart are expected to merge with one another, creating super-regional infrastructures which mitigate the need for the national networks and small regional operators. This evolution is consistent with the merger, acquisition, and consolidation activity now occurring within financial institutions, who are the members of the regional networks, nationwide.

Flow of Transaction Fees

Figure III.E.3, entitled *"Fee Settlement -- POS Debit Transactions"*, describes the flow of fees in the on-line debit network environment. Retailers are charged, on average, from 5 to 26 cents per debit transaction. The front-end processor collects the fee amount from the merchant and pays the acquiring bank from 5 to 11 cents per transaction. In essence, the front-end processor

[7] The VISA/MasterCard national debit pricing reflects the original design of the programs to run off the existing credit infrastructure. Some merchants, however, are uncomfortable with the higher fee for national debit as it differs very little from a standard low cost debit transaction.

Shared Networks POS Survey -- POS Pricing

	NYCE	CASH STATION	STAR	MAC	HONOR	PULSE	BHAZAM	MONEY STATION	TYME	MOST	YANKEE 24
NETWORK STRUCTURE		For-profit	Not-for-prf.	For-profit	For-profit	Not-for-prf.		For-profit	Not-for-prf.	For-profit	Not-for-prf.
VOLUME PRICING											
Interchange Fee											
– How much?	None	None	None		None	None	$.16	Yes	$.17		None
– Who pays?							Issuer	Issuer	Issuer		
POS Switch Fee											
– How much?	$.05	$.06	$.05	$.045-$.10	$.05	$.05-.10	$.05	$.05	$.03-.05	$.04	$.10 Issuer-$.04 Retailer-$.04-$.06
– Who pays?	Split	Split	Split	Split	Split	Split	Issuer	Issuer	Issuer	Split	
Volume Discounts		Acquirer				Acquirer					Acquirer

SOURCES: Bank Network News (4/15/93), EFT Report (2/4/91), Booton International telephone interviews with the networks.

Figure III.E.2

keeps approximately 2.5 to 15 cents on each transaction it processes. (If the merchant is a large chain with its own processing infrastructure, it does not pay a front-end processing fee, per se. The merchant acts as its own front-end processor and only pays an acquiring bank fee.)

The acquiring bank takes the 5 to 11 cents made from the front-end processor and pays the network switch 2.5 to 10 cents for each transaction, keeping approximately 1 to 2.5 cents per transaction. The acquiring bank does not make much money on the transaction itself, but rather makes money on the settlement float, which normally represents interest on the overnight deposit of funds.

The network switch keeps 2.5 to 10 cents received from the acquiring bank. The card issuer also pays the network switch a fee from 3 to 5 cents per transaction. In many cases, the card issuer charges the cardholder a service charge or transaction fee on the demand deposit/savings account statement to cover the network switch charge plus a mark-up.

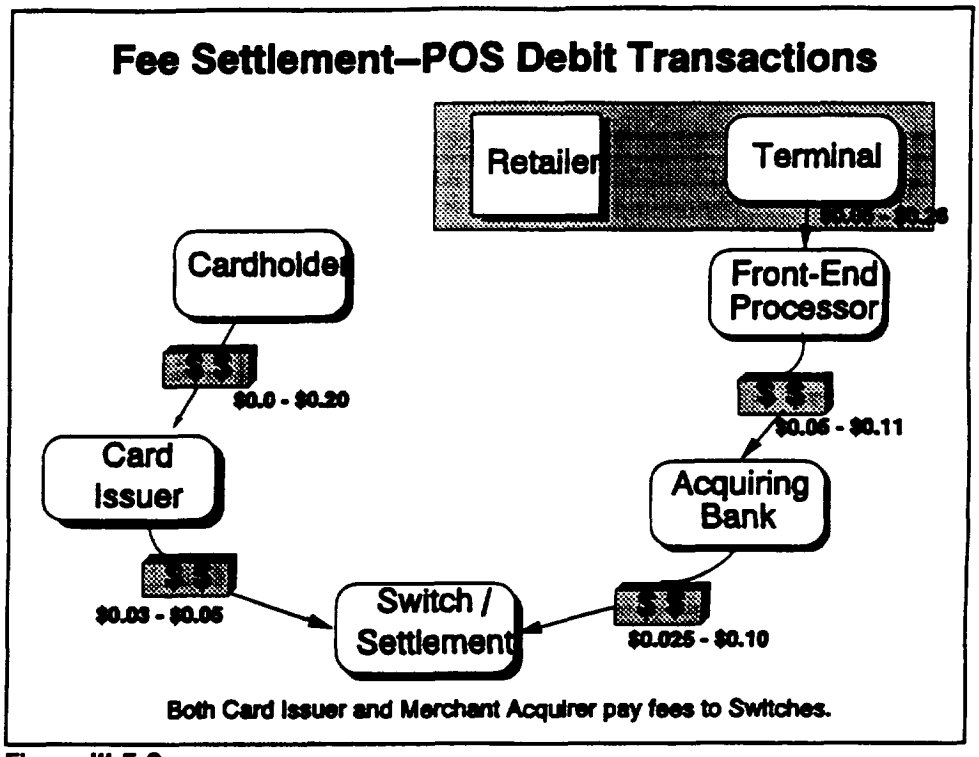

Figure III.E.3

All of these charges from the front-end processor, the acquiring bank, the network switch, and the card issuer are found in Zone 4, the External Communications, and Zone 5, the Payment System Networks and Databases.

Processing Components and Pricing

In support of the flow of fees discussed in Figure III.E.3, an additional chart is presented; **Figure III.E.4**, entitled *"Processing Components and Pricing"*. This chart breaks-down fees into the regions described in the Value Chain. Importantly, the merchant pays all fees associated with a transaction.

Processing Components and Pricing

	Paid By	Paid To	Amount Paid [1]	When Paid
Merchant Contracts	Merchant	Merchant Acquirer	Included in transaction fee, usually 50–100 basis points	Daily on each transaction
Terminal Deployment/ Wiring Charges	Merchant	Merchant Acquirer/ Front-end Processor	Included in equipment lease	

Sale/Lease of Equipment	Merchant	Merchant Acquirer/ Front-end Processor	$35–$65 per month	Monthly at end of month for following month's service
Communications Charges—Leased Lines	Merchant	Telephone Company	At cost	Monthly
Transaction Processing				
Terminal Management	Merchant	Front-end Processor	2.5 to 15 cents per transaction	Daily on each transaction
Transaction Routing	Merchant	Front-end Processor	Included in Terminal Management	
Telecommunication Management	Merchant	Front-end Processor	Included in Terminal Management	
Regional Network Access [2]	Merchant	Front-end Processor and regional network	5 to 10 cents per transaction	Only on regional network transactions, paid daily
National Network Access	Merchant	Front-end Processor and National Network	9.5 to 10 cents per transaction	Only on national network transactions, paid daily
Problem Resolution/Help Desk	Merchant	Acquiring Bank Processing and Support	Included in Terminal Management fees	
Transaction Settlement				
ACH Clearings	Merchant	Acquiring Bank Processing and Support	Included in Terminal Management fees	
Chargebacks/ Adjustments	Merchant	Acquiring Bank Processing and Support	$10–$50 per item	At adjudication of claim or monthly
Merchant Bank of Deposit Charges	Merchant	Merchant Bank of Deposit	Variable	Monthly—on the statement

Notes:

[1] The fees noted in this column **should not be summed.** The total costs to the merchant will vary considerable depending on the payment system configuration and business relationships.

[2] See Figure II.B.5, column two, for more detailed information on nationwide regional network access fees that comprise this range.

Figure III.E.4

Merchant Contracts

The merchant acquirer that signs up the merchant usually is paid a nominal fee from 50 to 100 basis points on each transaction for contract services.

Terminal Deployment and Wiring Charges

The one-time installation of equipment is chargeable to the merchant. Usually store wiring, installation of a telephone line, and configuration of the terminal for the merchant's environment must be performed before the terminal is operational. These one-time charges may be incurred up-front and range from $100 to $300 per terminal. Most often the installation costs are rolled into the equipment lease/rental charge. Either the merchant acquirer or the front-end processor charges this fee directly to the merchants.

Sale/Lease of Equipment

The merchant acquirer charges the merchant for terminal and printer lease/rental each month. These charges, which only apply when the merchant does not own or operate its own platform, range from $35 to $65 per month and depend greatly on the type of equipment, configuration, and services installed in the retail store. In the grocery environment, this equates to a per-lane cost. Therefore, a large merchant with ten lanes per store will pay $350 to $650 for each store in the chain.

If a merchant has built its own EFT infrastructure, the merchant acquirer may only charge a per-location fee from $0 to $20 per month per store, as an ongoing maintenance fee. All costs for the equipment purchase and installation are paid for by the merchant. Purchased equipment configurations are highly dependent upon individual merchant preference and existing merchant data processing platforms. Either the merchant acquirer or the front-end processor charges these fees.

Communications Charges -- Leased Lines

Usually telecommunications expenses are cost neutral, and charged to or picked up by the merchant at cost. For a small merchant, this cost is typically a telephone line charge for dial-up access to an authorization center. Often the charge is included in the equipment rental fee. For larger merchants, this charge could include the cost of a dedicated leased line from the merchant central site location to the front-end processor.

Since the charges typically depend on local, long distance, or WATS service, they differ by location and by merchant.

Transaction Processing

Terminal management, transaction routing, problem resolution/help desk, and telecommunication management are all included in the 2.5 to 15 cent transaction charge from the front-end processor. Regional and national network access charges are assessed on top of the front-end processor transaction charge.

Transaction Settlement

ACH clearings are included in the front-end processor transaction fee. Chargebacks and adjustments are often charged on a per-item basis at the time a dispute is settled.

Merchant bank of deposit charges are not included in the EFT fee structure. These charges are ongoing and part of the normal banking relationship the merchant has with a particular bank. Charges are not specifically directed to EFT. Mostly, these charges are related to cash, coin, and currency daily requirements, and normal depository and cash management relationships.

Systems/Processing Services Fees

There are other processing and service fees which are either monthly recurring expenses or are special expenses, often occurring on a per-request basis.

Surcharges, Rebates, and Discounts

Surcharges. There are a few other ancillary fees that are often tacked onto a transaction. For instance, some retailers such as ARCO, a gasoline retailer that also provides third-party processing services for other smaller merchants, surcharges customers 20 cents for each transaction. This charge is over and above the purchase amount. It is generally visible on the receipt and included in the purchase price of goods and services. Most grocery retailers do not surcharge, but a few have considered the possibility of surcharging as a way to recoup the bank fees. In the EBT environment, retailers will not be allowed to surcharge the customer on an EBT transaction. Often these charges are called explicit fees because they are usually posted at the point-of-sale

and charged by the merchant at the time the transaction takes place.

There are other types of consumer transaction charges that are levied by banks directly on the customer account rather than on the transaction itself. These are generally called implicit fees and are described/listed on the customer demand deposit and savings monthly account statements.

Rebates. Regional network rebates are provided at the end of some time period, usually at year-end, to the owning institutions in proportion to each institution's calculated percentage of transaction volume. Rebates are paid out, primarily by not-for-profit regional networks, for fees amounts taken in over and above budget or network costs. It is a profit distribution mechanism and a way to help members lower their EFT costs.

Discounts. Volume discounts are given to large merchant acquirers and merchants. Usually the volume discount is a tiered mechanism. Each network that offers discounts uses a different tiering basis, but all of them are generally based on volumes between 100,000 to 500,000 transactions a month or greater. Discounts are applied on future transactions based on previous month's volume.

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