# ATM 101

**(Revision E)**

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# Introduction

The objective of this booklet is to provide the reader a basic understanding of the electronic funds transfer industry and its direct relationship to our company, EFT Datalink. This manual has been designed as a guide for the inexperienced and the advanced users alike. This isn't exactly the booklet that you want to take to the beach for a casual read but this booklet does yield information to the casual reader.

When our team began the design of this document, it was our goal to accomplish the following:

- Create an industry overview manual that is "easy to read".

- Educate readers that are unfamiliar to our trade.

- Provide graphical images to support the topics discussed.

- Compile a detailed glossary of industry terminology.

Everyone who reads this document will glean something different from it. You will find that this publication was not written to "hammer home" the technical aspects of the ATM world. Instead, with some added humor, we hope that you will retain the *concepts* of the subject matter defined within these pages.

For supplemental information about our industry, please refer to the *References on the Web* section of this publication. We have found that there are literally volumes of useful information available through the internet for you to research.

# History of the ATM Machine

## In the Beginning…

Barclays Bank in the UK claims to have installed the first cash dispenser in the world in June 1967. This machine operated very differently from today's devices. There were no magnetic cards. Customers were issued paper vouchers, that were fed into the machine, which retained the voucher, and dispensed a single £10 note. Other banks used machines that accepted thin plastic cards. These were returned to the customer through the bank after processing so that they could be used again.

Within a year of Barclays' introduction of cash dispensers, there were machines installed in France, Sweden, and Switzerland by the world's first "national" cash dispenser network. In 1969, both the USA and Japan installed their first machines, each designed by domestic manufacturers. However, most countries stayed aloof during the late 1960s and the first half of the 1970s. During this early period, well over half the installations were in Europe.

The first record of an ATM in the United States belongs to Chemical Bank at its branch in Rockville Centre, New York.  A Chemical Bank customer, using a coded card, was able to dispense a plastic package containing a set sum of money. When the early machines worked – and they were fairly unreliable – they operated 24 hours a day, seven days a week, and gave out the cash in a matter of seconds. Customers who wanted more than $10 simply used more than one voucher or card. The first generation machines were off-line. They were not connected to the bank's computers and so they could not check whether the voucher or card had been reported as being lost or stolen.

## Second Generation Machines

The next major step forward occurred in 1972, when Lloyds Bank in the UK installed the first on-line "Cash-Point" machines which had been developed by IBM. These used plastic cards with a magnetic stripe which identified the customer's account. Consequently, the bank did not need to process the card physically and it could be returned to the customer at the end of the transaction. Machines were connected directly to the bank's central computers and were not capable of working when not connected. In Japan, Fujitsu was also developing an on-line cash dispenser which came into service in the early 1970s, also based on using a card with a magnetic stripe.

These second generation machines proved to be cheaper to operate and more reliable than the old off-line machines. By the mid 1970s, virtually all new installations were of the new type and by the end of the decade, almost all first generation machines had been replaced.

## Emergence of the ATM

Meanwhile, as early as 1973 the Japanese had developed machines where a passbook with a magnetic stripe could be used to access cash. In the mid 1970s, both American and Japanese manufacturers extended the self-service machines beyond the idea of just a device that dispensed cash to one that offered a whole range of other services – the automated teller machine emerged.

However it was more than a decade after these innovations, in the mid-1980s, that cash dispensers truly became a worldwide phenomenon. It took 16 years for the first 100,000 cash dispensers to be installed, but only four years more for the next 100,000.

## Today's Machines

Today's machines represent the progressive culmination of thirty years' development. The customer display has evolved from none at all, to a single LCD line, to monochrome monitors, and to full color- full graphics screens. Multiple currencies and denominations can now be dispensed. Transaction speeds have been greatly improved. Many extra services have been added. The reliability of machines has been progressively improved as the note handling capabilities were refined and simplified, and as the PC became the core of the electronic intelligence of the machines.

Although the cost of machines has fallen in real terms, the components remain complex electromechanical devices and until recently typically cost between $ 15,000 - $ 20,000. The most recent development has been the introduction of low price cash dispensers designed for use at retailers and other indoor locations. These machines sell at half the price of traditional machines and led to a surge of installations in the USA in the mid-1990s.

## Current Deployment

Since the introduction of the first cash dispenser thirty years ago, the cash dispenser and the automated teller machine (ATM) have gradually become the electronic face of banking for most customers.

The banking industry has invested over $ 30 billion in simply buying these machines and many times that amount in installing and running them. About one million machines have been purchased since the first installation, most of them during this decade. By 1999, the cash dispenser and the automated teller machine were found in most countries, developed and less developed. Today Asia-Pacific is clearly the largest market in the world, followed by Europe, North America and, some distance behind, Central and South America. Africa is the only continent where the machines have had a modest impact – only in South Africa are numbers substantial and several African countries have no machines at all.
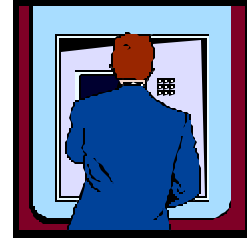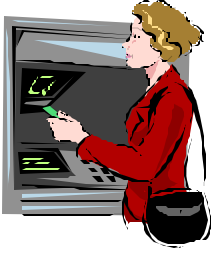
# ATM's:  What Are They?

## Let's Talk about ATM's

Approximately thirty years ago, all financial related transactions took place within the confines of a bank or other financial entities.  Most banks at the time conducted daily business Monday through Friday (some closed at noon on Friday) and were not open on the weekends.  [This spawned the coined adage: "Banker's Hours."]  At the time, the global economy was growing larger as well as the overall population.  Many countries, including the United States, began working on a technology that would allow banking customer to obtain access to their accounts using machinery.  Over time, this machinery evolved into today's automated teller machine or ATM.

An ATM is defined as an electronic device that allows authorized cardholders to access their accounts for the purpose of conducting certain banking or financial transactions.  ATM's were designed around the premise that individuals could conduct banking activities without the interaction of a bank employee.

## What's Under the Hood?

Essentially, most ATM's are comprised of input and output mechanisms.  These mechanisms are centrally controlled by the main circuit board (or mother board).  Let's take an in-depth look at what a common ATM is composed of today.

### Input Devices

Throughout the world, an ATM has three basic input devices.  They are the card reader, the keypad, and the depository (if the machine has one).  Here's a closer look at each component:

- The Card Reader simply reads the magnetic strip of the reverse side of the ATM card.  Some card readers take the card and hold it inside of the unit which are common among bank owned units and other machines have a simple card swipe.  Most ATM cards are encoded with two tracks or two strings of data encoded in the magnetic strip.
- The Keypad is a device which allows the user to select their options.  Typically, most keypads are comprised of a number pad, much like a telephone, and four option keys.  These option keys can also be found on the side of the LCD screen.
- And finally, the Depository is an input device.  The depository is useful for placing checks, currency, or other negotiable tenders into a envelope and inserting the envelope into the acceptor. (**Note – Video surveillance cameras could be deemed an input device, however, they are usually not found on off-premise or non-bank ATM's.  Cameras are typically a separate system.)

### Output Devices

The output devices on an ATM typically include the following: a display screen (LCD, monitor, or touch screen), a receipt printer, a cash dispenser and a sound device (such as a speaker or beeping mechanism).  Here's an in-depth look into these devices:

- The Display Screen prompts the user through each step of the transaction thus letting the cardholder know what to do. The display is the one device that has probably changed the most over the last thirty years. The display is the true interaction with the user. This has prompted many companies to implement color screens, touch screens, advertisements, movie trailers, and full motion video images.
- The Receipt Printer has a simple purpose. The receipt printers job is to give a tangible record of the transactions that occurred to the cardholder. Receipt printers are either a thermal model (which heat the image onto a special coated paper) or a dot matrix model that uses nine pins and an ink ribbon (cartridge) to print the text.
- The Cash Dispenser deposits the withdrawn money into the dispenser tray. It counts and "picks" the bills from the currency cassette(s) inside the machine. The dispenser also rejects bills that are detected as unusable currency into the reject bin or "divert tray".
- Finally, the Sound Device is commonly used to make the user or manager of the machine aware of a problem. Newer types of ATM's use computer speakers to play music or other sound effects from the machine.

**Internal Workings**

The intestines of the common ATM machine are composed of a safe, a journal recorder, a modem, and a mainboard. Here's a brief look at each of these:

- The Safe is the place where the currency cassettes are kept. A currency cassette is basically a tray where bills of the same denomination are kept. Thus, one cassette can have 10-dollar bills and another cassette can have 20-dollar bills. Most off-premise ATM's typically only have one cassette in the safe. Safes in ATM's are listed as a "24 hour safe" or a "day safe/business hours safe". A 24 hour safe is an ATM that can be left unattended, usually outside, without an attendant monitoring it for tampering. These types of safes are typically found in bank-owned ATM's. A "day safe" is a unit that, although secure, is not rated to be used without some type of monitoring. These ATM's are not placed outside and weigh much less than a unit with a 24 hour safe.
- The Journal is a mechanism that records all transactions generated by an ATM. This may even include opening the safe door, maintenance issues, bill jams, and so on. The journal can be another printer located inside the machine or it can be an electronic journal that is written to magnetic media or memory. The journal allows the operator or administrator of the machine to check the transactions of the unit. It is also an extremely useful tool for troubleshooting problems with the machine.
- The Modem is the means by which the ATM communicates with the host (referred to as the switch). Once the user invokes a transaction on the ATM, it's the modem that is responsible for dialing the switch through a standard phone line and transfer the information. Some ATM's will allow the operator or administrator to dial into the machine from a remote location (like the office or home) and check the status of the machine. This makes the ATM more efficient in that the owner can manage the machine effectively. It is also important to note that bank owned ATM machines are typically connected to the network(s) via a dedicated circuit for high speed transmissions rather than a dial-up connection.
- The Mainboard is the central nervous system of the unit. The mainboard is the piece that makes the ATM function together. It operates in much of the same fashion as a computer (many mainboards are computers). The board is typically comprised of computer chips, resistors, capacitors, and other intricacies of the same likeness. It is the mainboard that connects all input and output devices and "drives" the components on the machine.
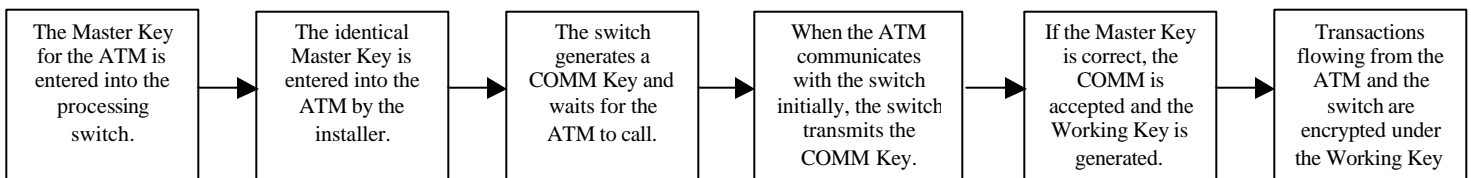
# Setup and Configuration

Before any ATM can interact with a switch and process a transaction, the installer of the machine must configure the ATM to conform with the switch specifications. Some of the items include:

- Name and address of the physical location of the machine.
- The terminal ID (a number in which the host recognizes an ATM; pre-determined by the switch)
- Phone number to dial to call the host (or switch).
- Surcharge Amount
- Bank Notification Message
- Denomination to Dispense Amount (i.e. $10's, $20's, ect.)
- Encryption information (known as the Master Key)

# Encryption

The last bullet point mentioned above lists that the installer would configure the encryption information. Let's take a short overview of encryption.

For high security reasons, the data that the ATM accepts from a cardholder must be encrypted before it is sent to the processor or switch. This prevents computer hackers or thieves from obtaining the cardholders information. The installer enters in a "Master Key" into the ATM for this purpose. The Master Key is the numeric code (much like a combination lock) that the cardholder information is encoded with. The identical Master Key must be programmed into the switch as well so that both know how to unlock (or de-encrypt) the information. Typically, the Master Key is a 16-digit set of numbers that are entered into the ATM and stored into memory. When the Master Key is entered for a terminal, the switch generates a "Communications Key" or COMM Key. When the ATM communicates with the switch for the first time, the COMM Key is sent to the ATM and a "Working Key" is established. All transactions, until new keys are generated, are encrypted under the Working Key. Take a look at the chart below to follow the flow of automated teller machine encryption.

| The Master Key for the ATM is entered into the processing switch. | → | The identical Master Key is entered into the ATM by the installer. | → | The switch generates a COMM Key and waits for the ATM to call. | → | When the ATM communicates with the switch initially, the switch transmits the COMM Key. | → | If the Master Key is correct, the COMM is accepted and the Working Key is generated. | → | Transactions flowing from the ATM and the switch are encrypted under the Working Key |

# Reporting

Embedded in the functionality of the ATM is the ability to generate reports. Depending on the manufacturer of the ATM, machines produce different types of reports. Here's an overview of some of the basic ones.

- Last Transaction Report – This report shows the communications between the host processor and the ATM on the last transaction performed. This report is very useful when troubleshooting communications errors with the ATM.
- Journal Report – Shows all transactions that occurred in a specified range of dates.
- Day Close Report – Typically, this report is performed by the operator when the ATM is "settled" for the business day. The ATM will call the processor for the "host totals". This helps the operator keep records on the day-to-day activities of the unit. It is also performed when a new load of cash is deposited in the ATM. The "running totals" are printed and, when completed, the totals are cleared from memory (but not cleared from the journal).
- Trial Day Close Report – Basically, the same report as the Day Close Report except the totals are not cleared from memory and the processor is not called.
- System Setup Report – A detailed report listing the configuration of the ATM. It is also useful for troubleshooting

## Making It All Work

In summary, the ATM is composed of many input and output devices. The devices are connected to mainboard - which acts as the brains of the machine. When the installer configures the machine to work properly with the host computer (and adds the money, of course), the ATM is ready to process transactions. The transactions are encrypted so computer hackers cannot obtain the cardholder information.

## The Future of the ATM

With every passing day, the future of the automated teller machine continues to evolve. Many ATM companies are beginning to look at other additions and improvements to the ATM. AmStar Systems next generation of ATM, named the eCashier®, is a multi-function unit. The eCashier® incorporates the following types of financial transactions.

- Standard ATM transactions (withdrawals, balance inquiries, etc.)
- Cash acceptance
- Creating money orders
- Dispensing pre-paid Phone Cards (Calling Cards)
- Payment of Fines or Services (Library fines, parking tickets)
- Dispensing coupons
- Wire transfers from one machine to another
- Creating an account using a "Smart Card" which has a read/write chip
- Much, much more

As the ATM market has increasingly become more saturated, the volumes of transactions per ATM are beginning to decline. Thus, manufacturers have to develop new products into the ATM to set themselves apart and attract customers. As the United States is becoming a paper-less society combined with the rising of technology stocks and "dot com" companies, it is inevitable that the ATM industry will continue it's upward trend.

# Flow of a Typical ATM Transaction

**Diagram 2.1**



| A | B | C |
|---|---|---|
| ATM Customer | EFT Datalink Switch | Financial Networks | Customer's Bank |
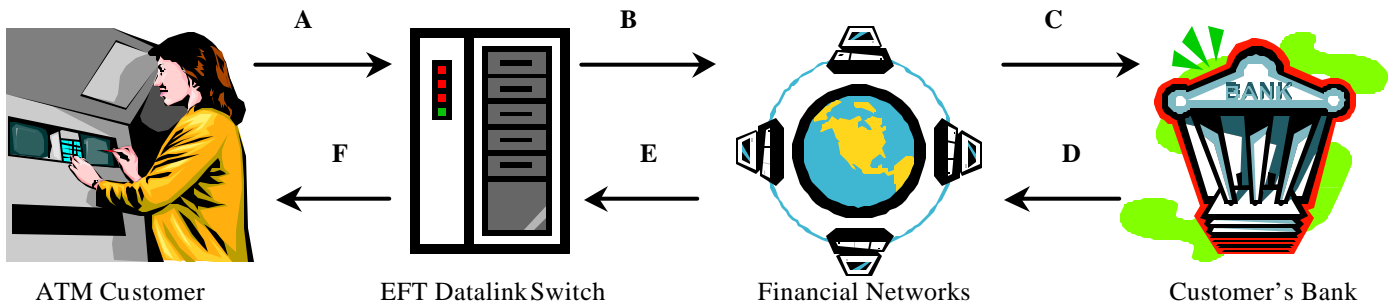
This section will attempt to give you a better understanding of an ATM transaction. Please examine the diagram 2.1 shown above.

Once the ATM is installed correctly and ready for operation, it is ready to begin accepting transactions. The user (or customer) determines if their card can be accepted by this machine (by matching the networks listed on the back of the card with the logo(s) listed on the outside of the machine) and inserts, or swipes, the card and we're ready to begin.

The card reader of the ATM reads the magnetic stripe on the reverse side of the card. Most ATM's prompt the user for a language of their choice (e.x. English, Espanol, etc.). Then, the user enters in their P.I.N. or Personal Identification Number. The ATM display prompts the user for an action. Most often, this prompt implies performing a withdrawal, deposit, transfer, or balance inquiry. Next, if the user selected a withdrawal transaction, the ATM will prompt the user to enter the "amount requested". Then, the user enters a choice which may prompt another screen which usually implies, "From Checking", "From Savings", or "From Credit". It is also important to note that if the ATM will surcharge the transaction, a message stating the surcharge fee must display on the screen. A "surcharge notification" message might look like this:

> *The owner of this ATM, XYZ Bank, charges a fee of $1.75 for this transaction. This charge is in addition to any fees that may be assessed by your financial institution. Do you wish to accept this fee?*

The user has the option to approve or decline the surcharge on the transaction. Assuming the user accepts the surcharge fee, the ATM has all of the information that it needs and we are ready for the processing portion to begin.

## A.

The ATM will encrypt the input information and prepare it for transport via the modem connection. Typically, the ATM modem is connected to a standard analog telephone line - much like the type of line that you would have connected to your home computer or fax machine. (*Note - Most "bank owned" ATM's are connected through a high-speed leased line link and do not use dial-up modem technology.)

Due to communication costs and maintenance, many processors, including EFT Datalink, contract another company to receive these incoming ATM calls and sends those transactions through one high speed circuit (like an **X.25** connection) to the processor. Currently, the communications company that routes the inbound transactions to EFT Datalink is Transaction Network Services, or TNS. TNS is the largest financial data communication delivery service in the United States.

## B.

Once the data has been received by TNS, it is routed to the EFT Datalink "switch". A switch is defined as a computer system(s) that accepts information from the terminal and repackages the message for re-transmission to the regional/national financial networks. The switch is connected to one or more financial networks via high-speed communications, such as a frame-relay circuit. Parameters are set-up in the switch to determine the best way to route a particular transaction.

Basically, the switch's primary job is:

1) To receive the incoming ATM data (from TNS in our case).
2) Read the message using de-encryption.
3) Determine where the transaction should be routed next, usually through "least cost routing" methodology.
4) Add the surcharge listed at the switch to the requested amount.
5) Add the ATM address to the data.
6) Re-package the data (and re-encrypt it).
7) Send it off to the sponsoring financial network (i.e. CIRRUS, PLUS, etc).
8) Record the transaction in the "transaction logs".

In addition, some switches provide other functionality as well. These other functions might include, back office reporting, transaction monitoring, detailed transaction history, and/or transaction message tracing.

## C.

The switch has now routed the transaction to the appropriate Financial Network. But, it's not quite as easy as it may appear to be. What if the switch does not have a direct connection to the network shown on the back of the ATM card? If the cardholder swipes a card with a network not affiliated with the switch, it is still possible for the transaction to be routed to the correct location if a "gateway" to the card holder's network exists with one of the switch's networks (for a fee, of course). Here's an example of this concept:

> Joe attempts to use the ATM at the convenience store next to his campsite. On the back of Joe's ATM card is the CIRRUS logo. The convenience store ATM is connected to the EFT Datalink switch. However, the switch has a connection only to the PLUS network. If a "gateway" relationship is established between the switch and the PLUS network, the switch will have the capability to reach any network that PLUS can reach. If PLUS has a connection to CIRRUS (and they do), the transaction will go through. Joe is a happy camper.

As you can imagine, a transaction has the potential to "bounce" to multiple networks depending on the number of connections that it must take to get to the cardholder's bank network.

## D.

Once the cardholder's bank receives the inbound transaction, it de-encrypts and filters the information out, checks the cardholder's account, and sends a reply message back. If the transaction is approved, it will send the approval code along with the authorization number (like a serial number). If the transaction is denied, the bank will respond with a "denial reason code". These replies are sent back to the financial network that delivered it. All transactions that are processed by the bank are, obviously, recorded for reconciliation purposes. These records are used to help generate the bank statement.

## E.

Again, the financial network(s) that delivered the request message receives the response message. This message is recorded in their log records as well. The response message is then delivered to the EFT Datalink switch.

## F.

The switch reads the message, records it, and then translates it into the format that the ATM will read. The switch ships the transaction down to the ATM (via the same connection with TNS mentioned before). If the ATM does not respond back to the switch after receiving the reply from the originating bank, the switch assumes that the transaction has completed successfully. The cardholder receives a receipt of the transaction (and money will dispense if requested and approved).

If the ATM machine mis-dispenses or an error occurs, the ATM will re-dial the switch and transmit a "reversal transaction". A reversal is defined as the act in which the ATM will credit the proper amount to the card holder. Reversals tend to occur when the network approves a withdrawal transaction and the ATM is out of money or mis-dispenses. A reversed transaction is sent through the switch and financial networks similar to the way the originating transaction does, except that the switch will not send a reply back to the ATM. After the ATM delivers the reverse command to the switch, the ATM simply hangs up.

As you can imagine, the transaction itself routes through countless computers and networks to reach its destination and back. It is important to also note that the average ATM transaction (once the switch is dialed by the ATM) takes only eight (8) seconds to complete.

## Summary

An ATM Cardholder attempts to use an ATM machine at a given location (in this case, one that is processed by EFT Datalink). After entering in the PIN and other transaction information, the ATM dials the EFT Datalink switch (or processor) and sends the encrypted transaction message. The switch decodes the message, repackages it, and sends it off to the financial network in which it is affiliated with, such as PLUS, PULSE, and CIRRUS. The financial networks reach the cardholder's bank for an answer. The originating bank or financial institution accepts the message and the transaction is given a response. The response is sent back through the financial networks. The processor receives the information and delivers it to the ATM. The ATM decodes the information and carries out the instructions (i.e. dispense money, print the receipt, ask for correct P.I.N. etc.)

# Evolution of ATM Financial Networks

When the first cash dispensing machines were developed, they were not connected to financial networks. The bank would check the machine daily for paper vouchers and adjust the account of the bank customer accordingly. As you might suspect, this caused many overdrafts, bank errors, and required the bank to devote a substantial amount of time to reconcile the cash dispenser and bank accounts.

In 1972, the first on-line "Cash Point" machine arrived on the banking scene in the United Kingdom. This machine used plastic cards with a magnetic strip, which directly tied to the bank account electronically through a computer inside of the bank. The only problem was that the cardholder had to use the branch that opened the account - dubbed the "home" branch. Soon thereafter, banks would develop a small network of computers that interconnected their branches. This allowed the cardholder the ability to use any machine at a branch that belonged to their particular bank.

As more cardholders and bank machines became available, banks wanted to offer the service of allowing their cardholder to use any machine within the area, or region. The owners and management of these banks collaborated to form banking associations. These banking associations would be the start of today's regional networks. Regional networks offered the capability for cardholders, affiliated with the regional network, to conduct bank transactions from any "member" automated teller machine. Examples of today's regional networks include: Pulse®, Star®, Honor®, NYCE®, TYME®, and Green®.

In 1982, PLUS Systems Inc. formulated a business plan that would launch the first national financial network. Plus reached an agreement with 26 U.S. banks to establish a shared nationwide ATM network. Then, in 1984, PLUS agreed to provide Visa International a gateway as a communications link with Visa cardholders. This allowed Visa cardholders the ability to obtain cash almost anywhere in the United States. Three years later, Visa purchased PLUS Systems. Soon thereafter, MasterCard developed their answer to the PLUS network – and CIRRUS was born. Today, PLUS and CIRRUS are able to process transactions throughout the U.S., Canada, and 109 other countries.
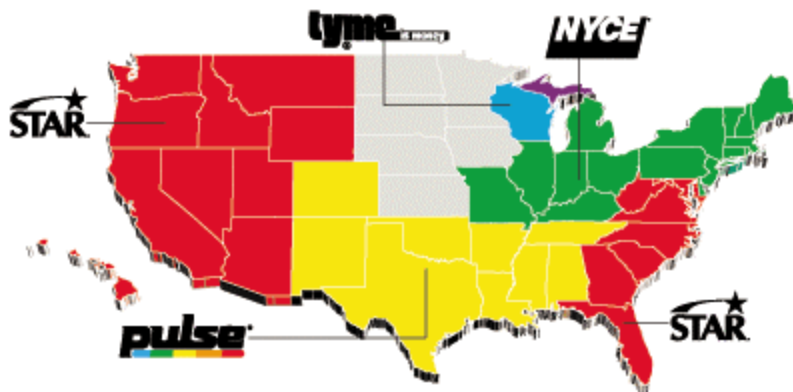
## Why Do We Need Processors?

Processors, such as EFT Datalink, provide a means for merchants or independent sales organizations (ISO) to connect ATM's to financial networks. Processors are the only facilitator for ATM's to communicate with financial networks.  So, in order to sell a working machine to the merchant, the ISO contracts with a processor to bring the terminal "live".

| **Entity** | **Communication Method** |
|---|---|
| The ATM | Communicates with Processors. |
| Processors | Provide commu nication between ATM's and Financial Networks. |
| Financial Networks | Provide communication between Processors and Cardholder Bank |
| Cardholder Bank | Communicates with Financial Networks |

## Acquirers and Issuers

In card processing, there are two basic categories of banking entities. They are card "Issuers" and "Acquirers".   An Issuer is a financial institution that distributes, or issues, bank cards to its customers.  An Issuer is typically the entity where the account of the card resides.  An Acquirer is a financial institution that owns or operates the ATM or Point-of-Sale (POS) device.

It is very common for financial institutions to play both roles.  If a financial institution operates their own ATM and issues the account holder a card, that entity is both the Issuer and the Acquirer.  On the other hand, a small credit union, which is not directly connected to a bank network, may only be an Issuer.   Most processors, such as EFT Datalink, are simply Acquirers.
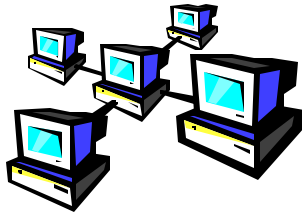
# Processing: The EFT Datalink Switch

## Just What Is A Switch Exactly…

When the term "processing" in the ATM world is used, generally we are talking about the act of a computer system(s) that carries-out the automated teller machine's instructions. Processing involves getting the information from the ATM, repackaging it so the financial networks can read the information, getting the information back from those networks (ultimately, the cardholders bank) and sending the data back to the ATM. This is what is referred to as "switching" the transaction, thus, the word "switch". In addition to this, the switch initiates the withdrawal of money from the cardholder's account and replenishes the "settlement" account, which will be discussed later.

## In-Depth Look At The EFT Datalink Switch

As mentioned before, the switch is a computer system(s) that receives transactions from the ATM and converts the message (or switches) to the format the major financial networks can understand. It then receives the response back, then ships it off the ATM. Take a look at the illustration below. This will aid in giving you a visualization of how a switching system works.

Diagram 4.1

**Switching System**
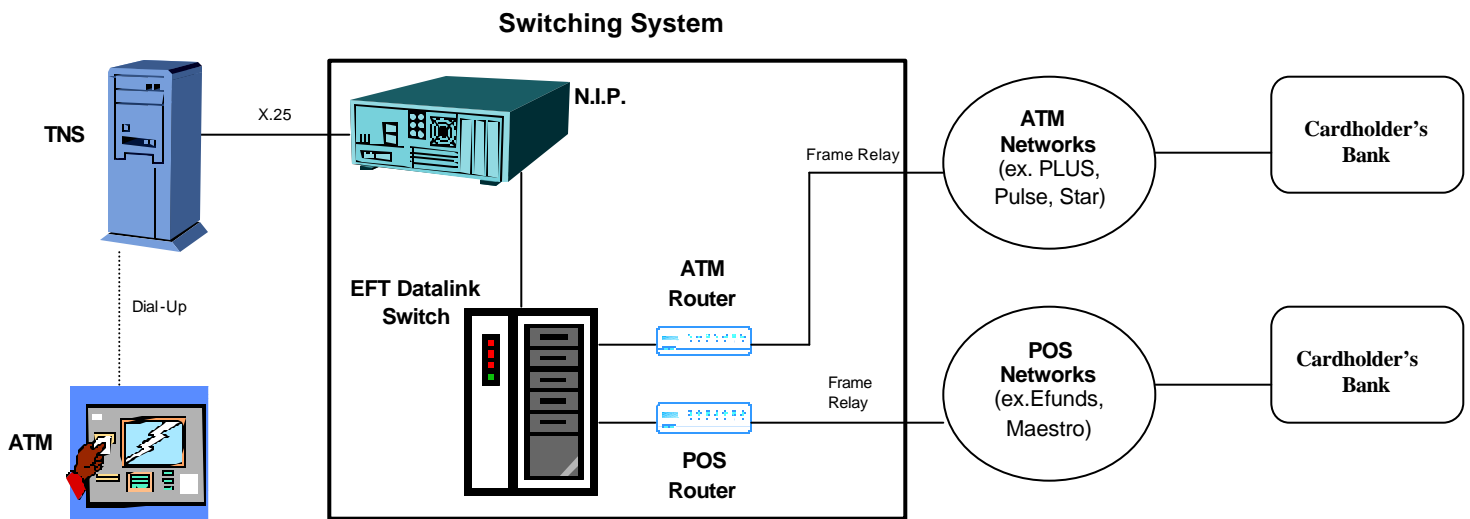


The ATM dials a toll free number via a standard phone line that reaches Transaction Network Services, our transaction provider. TNS reads the message header of the transaction and determines that the incoming call belongs to EFT Datalink and they forward that message to the Network Interface Processor (or N.I.P.).

Note that the N.I.P. physically resides at EFT Datalink and it is connected by an "X.25" circuit. The N.I.P. sends the transaction to the switch for processing. The switch determines which network will get this transaction and passes it to, in this case, the ATM modem. The ATM modem ships the transaction via "Bi-synchronous" high-speed connection to the ATM network (CIRRUS, for example). Note that the "BIN number" of the ATM card determines how the financial network will route the transaction. Once the response comes back from the originating financial institution, the transaction is routed back to the ATM in the same method in which it arrived.

At EFT Datalink, the switching system is also the back-office report generator. The switch incorporates all the bank account information from the merchants and the ISO's and divides the surcharge (and interchange if that is required) and distributes it accordingly. Therefore, the switch keeps tracks of the flow of money.
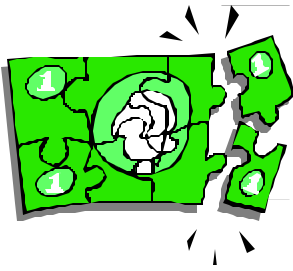
# Settlement and Cash Management

## The Settlement of Money

When we discuss the term "settlement", we are generally speaking of the manner in which all bank accounts involved with an ATM machine receive the amount dispensed and a portion, or cut, of the revenues. Before a new ATM can be programmed into the switch, the processor must know in advance how the money is to be distributed. Contracts are usually the preferred method to iron out the settlement of money. However, to coordinate this, processors use a "installation worksheet" that is provided by the independent sales organization. Here's a list of some of the items typically found with an installation worksheet:
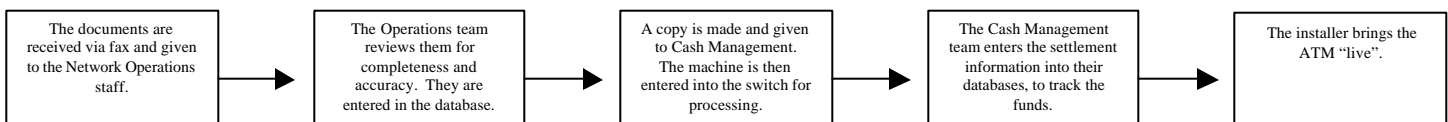
- Name of the merchant (both the corporate and DBA names).
- Physical address of the machine.
- Location phone number.
- Surcharge amount.
- Type of terminal (what kind of ATM it is)
- Denomination of bills to be dispensed.
- Distribution amounts (or percentage amounts) for each bank account.
- A voided check for each bank account involved (or a copy of).
- An ACH authorization form from the ISO and the merchant.
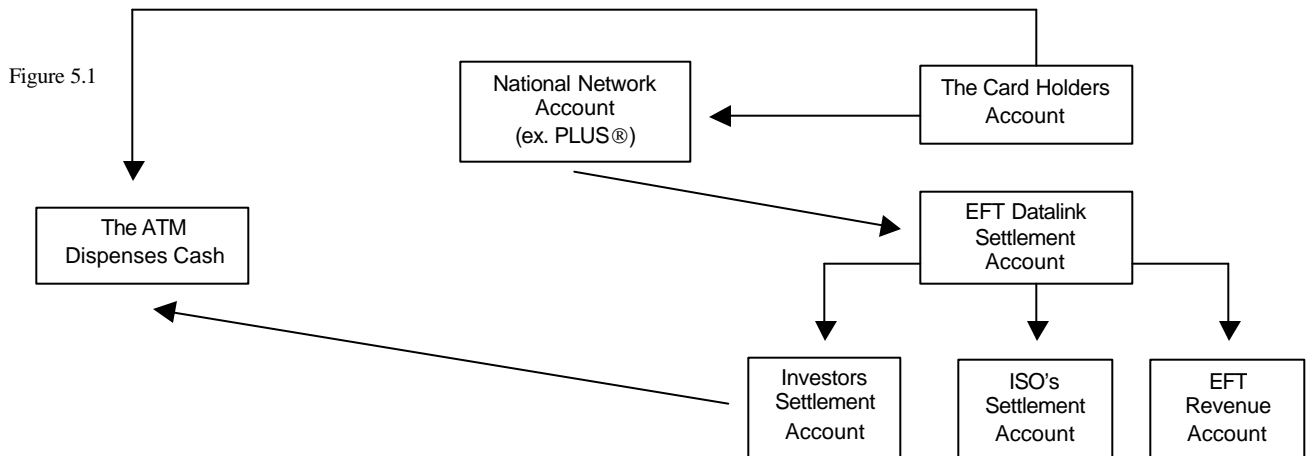
## ACH

In the settlement process, we use the voided check for two reasons. One, to verify the routing number (ABA) and the account number assigned to that settlement account. Secondly, we use it for verification purposes in the event of a dispute. "ACH" is an acronym for Automated Clearing House. It is a method, governed by the United States Treasury Department, in which a bank account can be credited and debited electronically. The ACH authorization form is a document that allows the processor to credit or debit the account. Without a signed ACH form by the account holder, funds cannot be distributed to the account.

## Where Does The Paper Work Go?

Once the installation worksheet, ACH authorization form, and voided check are sent to the processor, the "entry process" is ready to begin. Under most circumstances, these documents are sent via the fax machine. Here's a chart to demonstrate how the these documents are processed.

| The documents are received via fax and given to the Network Operations staff. | → | The Operations team reviews them for completeness and accuracy. They are entered in the database. | → | A copy is made and given to Cash Management. The machine is then entered into the switch for processing. | → | The Cash Management team enters the settlement information into their databases, to track the funds. | → | The installer brings the ATM "live". |

# The Flow of Settlement Money

Figure 5.1

```
                                    ┌──────────────────┐              ┌──────────────────┐
          ┌─────────────────────────│ National Network │◄─────────────│ The Card Holders │
          │                         │     Account      │              │     Account      │
          │                         │   (ex. PLUS®)    │              └──────────────────┘
          │                         └──────────────────┘
          │                                  │                        ┌──────────────────┐
          ▼                                  └───────────────────────►│   EFT Datalink   │
 ┌──────────────────┐                                                 │    Settlement    │
 │    The ATM       │                                                 │     Account      │
 │  Dispenses Cash  │◄──────────────┐                                 └──────────────────┘
 └──────────────────┘               │                           ┌─────────┼─────────┐
                                     │                           ▼         ▼         ▼
                            ┌──────────────┐            ┌──────────┐ ┌──────────┐ ┌──────────┐
                            │  Investors   │            │   ISO's  │ │   EFT    │
                            │  Settlement  │            │Settlement│ │ Revenue  │
                            │   Account    │            │ Account  │ │ Account  │
                            └──────────────┘            └──────────┘ └──────────┘
```

# Categories of Cash

Within settlement, there are three basic categories of cash that are dealt with. They are dispensed cash, surcharge, and interchange. Here's a closer look at these three groupings.

**Dispensed Cash**
Probably the easiest category is dispensed cash. When an ATM dispenses money, the cash provider of the ATM must be reimbursed for the dispensed amount. Through processing and settlement, the cash provider regains all monies that the ATM has dispensed.

**Surcharge**
The owner of an "off premise" or non-bank ATM charges the cardholder a fee for using their ATM machine (for taking their money, really). This fee is called a "surcharge". Surcharging transactions are very commonplace among ATM machines. In fact, some banks impose a surcharge to cardholder's who bank with a different financial institution (called foreign cardholder's). It is important to keep in mind that the surcharge may not always belong to the machine owner completely. Many times, the owner of the machine splits a percentage of the transaction with:
- The location owner (if different than the ATM owner)
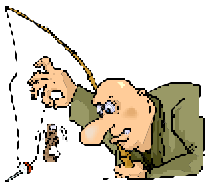- An ISO (this is typical)
- A location finder

However, the owner typically receives the bulk of the surcharge.

**Interchange**
In the ATM processing world, we use the term "interchange". Interchange is a fee, <u>paid by the issuing bank</u>, to the ATM owner for processing a transaction for their customer. Typically, this fee is 50 cents or less per transaction. Interchange was designed to "thank" the non-member ATM owner for allowing a bank's cardholder the ability to obtain money from their account. For processing the transaction, the bank networks would get a portion of the fee (per a contractual agreement), and pass the remainder to the next segment (i.e. another network, the processor, ATM owner)

Let's go through an exaggerated scenario for an example to demonstrate how the financial side of this works (refer also to figure 5.1):
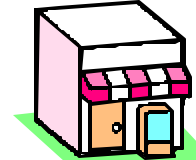
**The Players**

| Joe | Grady | Billy | XYZ Bank | Grady's Bait | EFT Datalink |
|---|---|---|---|---|---|
| The Customer | The ATM Owner | The ISO | Joe's Bank | Where the ATM is. Owned by Grady | The Processor |
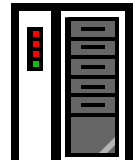
*The Scene*

*Joe is an account holder with XYZ bank. XYZ bank issued Joe an ATM debit card a few months ago. Joe goes camping quite a bit. At the campgrounds, Joe uses the ATM machine at Grady's Bait Store to obtain money for hot dogs, beer, and firewood. The ATM at the bait store is owned by Grady. Billy sold the machine to Grady a year ago. Billy and Grady agree to process the ATM through EFT Datalink. Grady agrees to give Billy a quarter for each transaction because Billy services the machine when it breaks and he gives Grady free receipt paper. EFT Datalink's agreement with Billy is that the processor can keep 15 cents of the interchange for processing fees but EFT Datalink does not get any surcharge revenue.*

*ACT I*

*Joe withdrawals $40.00 from Grady's ATM. Grady invokes a $1.50 surcharge on Joe's transaction because Grady's money is in the machine. So, in effect, Joe is withdrawing a total of $41.50 from his account. Grady's ATM dials into EFT Datalink for processing. Joe's transaction is approved and the machine dispenses two $20 bills. Joe's account is deducted $41.50. XYZ Bank sends the money to the sponsoring financial network. Additionally, XYZ Bank pays 55 cents in interchange to the financial network. The financial network keeps 5 cents for switching the transaction and passes the other 50 cents to the processor, EFT Datalink, for the transaction. Joe buys his hot dogs, beer, and firewood.*

*ACT II – The next day*

*The financial network credits the EFT Datalink settlement account for $41.50. EFT Datalink then distributes the money to all parties involved. $40.00 gets put back into Grady's settlement account so that he can replenish his machine. In addition to that, Grady also gets $1.25 of the surcharge. Twenty-five cents for the surcharge gets deposited into Billy's account.*

*ACT III – End of the Month*

*EFT Datalink gets an interchange payment from the financial network. EFT Datalink takes 15 cents from the interchange and passes the remainder along to Billy (if the contract so stipulates, Grady will get a portion of the interchange too).*

*Joe gets his bank statement from XYZ Bank and sees the transaction that he made at Grady's Bait Shop. He also notices at the bottom of the statement that he was charged an additional 55 cents for using an ATM that did not belong to XYZ Bank (a foreign ATM). So, in total, Joe was charged $2.05 for using the ATM at Grady's Bait.*

As you can see from the story above, the switch not only handles the "bits and bytes" of an ATM transaction, but the switch is also responsible for the distribution of the money. Can you imagine processing a million transactions per week?

# Cash Management

Some processors provide financial management services for the "investor" of the machine. The investor is the person or company that provides the cash for the machine (this can also be the owner or merchant). These services are often referred to as "cash management". Cash management typically involves the following:

- Close monitoring of the ATM in determining when the machine is low on cash.
- Ordering the cash from the financial institution for the machine when funds are needed.
- Scheduling the delivery of pick-up and replacement of the cash through a vault services company, such as Brinks®.

Managing machines can be a time consuming and tedious responsibility for a processor. However, this service is very attractive to larger investors usually because the machine(s) resides in a remote location. Since the processor can best tell how the machine is performing, it just convenient to let the processor manage the flow of money to and from the ATM.

# End of Month Reporting

At the conclusion of the month, a financial statement is printed and mailed to the designated parties. The statement provides a daily overview (and graph) of the volume of transactions that an ATM produces. This statement is used when reconciling the bank account for accuracy. The report can also be used as a check against the transaction activity report of the ATM.

# Disputes (Regulation E)

Once the emergence of electronic funds transfer technology made a presence for itself, the United States Federal Reserve System adopted a new regulation in the banking industry called the Electronic Funds Transfer Act – also known as Regulation E. The purposes of the Electronic Fund Transfer Act, establishes the basic rights, liabilities, and responsibilities of consumers who use electronic fund transfer services and of financial institutions that offer these services. The primary objective of the act is for the protection of individual consumers engaging in electronic fund transfers. Note that this act also covers point-of-sale terminals as well as automated teller machines.

In the event that a cardholder disputes a transaction performed at a POS/ATM terminal, Regulation E provides the cardholder a means by which to dispute the transaction. In the event of a dispute (money did not dispense, for example), the cardholder would file a "Regulation E Adjustment" form with the cardholder's financial institution. The financial institution investigates the claim using processor records, national network records, and reports from the ATM/POS unit. The financial institution makes the appropriate account adjustment based on the findings of the investigation.
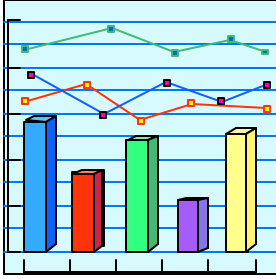
# Demographics and Statistics

## Usage Patterns of U.S.

- The average ATM user is 25 to 44 years of age.
- The average household earnings of ATM users are between $25,000 and $75,000 per year.
- 56% of ATM users own their home.
- 39% are college educated.
- The average ATM user visits an ATM at least six times per month.
- The average withdrawal amount is $67.00

## Volume Times

| | | |
|---|---|---|
| 6:00am to 10:30am | 20% of utilization | |
| 10:30am to 3:00pm | 20% of utilization | |
| 3:00pm to 11:00pm | 50% of utilization | PEAK TIME |
| 11:00pm to 6:00am | 10% of utilization | NON-PEAK TIME |

## Interesting Tidbits

- United States Banks have invested $25 billion to insure that you can always find an ATM when you need one.
- Last year, ATM machines performed nearly 12 billion transactions.
- Each month, $33 billion in cash is withdrawn from ATM machines.
- There are approximately 400,000 active ATM's in the U.S.
- All U.S. banks have over 150 million cardholders.
- People most often visit an ATM when they are in the "buying mode".

*Credits: Charts and Statistics from CIRRUS Systems, Inc.- Star Systems, Inc.- American Bankers Corporation - IBID - Diebold, Inc.*
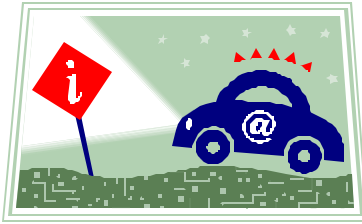
# References on the Web

This document provides a listing of internet web sites that impact the automated teller machine industry.

### News and Views

| | |
|---|---|
| ♦ www.atmmarketplace.com | On-line magazine that provide news about the industry. |
| ♦ www.atmia.com | The Automated Teller Machine Industry Association. |
| ♦ www.banktech.com | Banking Industry News |
| ♦ www.nacha.org | National Automated Clearing House Association |
| ♦ www.banksite.com | Provides a listing of on-line bank internet sites. |
| ♦ www.electronicbanker.com | Electronic Banking News |
| ♦ www.aba.com | The American Bankers Association |
| ♦ www.efta.org | Electronic Funds Transfer Association |

### ATM Manufacturers

| | |
|---|---|
| ♦ www.amstarsystems.com | AmStar Systems, Inc. |
| ♦ www.diebold.com | Diebold, Inc. |
| ♦ www.tritonatm.com | Triton Corporation |
| ♦ www.tidel.com | Tidel, Inc. |
| ♦ www.gmlink.com | Greenlink Technologies |
| ♦ www.wincornixdorf.com | Wincor-Nixdorf, Inc. |
| ♦ www.crossatm.com | Cross International Technologies |

### Regional/National Networks

| | |
|---|---|
| ♦ www.concordefs.com | Concord-EFS (MAC) |
| ♦ www.pulse-eft.com | Pulse Network |
| ♦ www.tyme.com | TYME network |
| ♦ www.star-systems.com | Star Systems, Inc. (HONOR) |
| ♦ www.nycenet.com | NYCE Network |
| ♦ www.efunds.com | Efunds, Inc. (DELUXE) |
| ♦ www.psinet.com | PSINet (TNS) |

# Glossary of General Terms and Definitions

| | |
|---|---|
| **ABA Routing Number** | The basic routing number, devised by the American Bankers Association (ABA) in 1910 and adopted in 1911, that has served to identify the specific financial institution which is responsible for the payment of a negotiable instrument. |
| **ACH** | Abbreviation for Automated Clearing House. The automated clearing house system is the primary electronic funds transfer (EFT) system used by institutions and agencies to make payments which is monitored and regulated by the Department of the United States Treasury – Financial Management Services Division. At EFT Datalink, we use the ACH method to transfer funds to and from merchants' settlement accounts. |
| **ACH Authorization Form** | An official agreement, signed by the account(s) holder(s), that authorizes an institution to debit or credit an account. |
| **Acquirer** | An entity that owns the right to collect interchange fees from the transactions performed on an automated teller machine, Point of Banking, or Point of Sale terminal. This entity can be a financial institution, an authorized terminal operator, or any of the various types of card processors. EFT Datalink is an acquirer. |
| **ARKSYS Ò** | Abbreviation for Arkansas Systems. Arksys software is recognized around the world as the most complete, fully integrated retail-banking suite. Introduced in 1975, Arksys software products are used by more than 175 bank customers in over 60 countries. EURONET is the parent company of Arksys. |
| **AS/400 Ò** | Application System/400. A family of IBM minicomputers designed primarily for business applications. An AS/400 system is the backbone of the new switching system. |
| **ATM** | Abbreviation for Automated Teller Machine. An electronic device that allows authorized cardholders to access their accounts for the purpose of conducting certain banking or financial transactions. Examples of ATM manufacturers include AmStar Systems, Diebold, Triton, Tidel, and NCR. |
| **Bill Counter** | The electronic measurment of notes dispensed from the cassette(s) of an ATM machine. Bill Counters are useful for balancing the ATM with the journal reports (or the host totals). |
| **Bin Number** | The issuer assigned number to a grouping of credit or debit cards. Typically, the bin number is the first six or eight digits of a card number. |
| **Cassette** | An enclosure in which the money resides inside of the safe of an ATM machine. Commonly, ATM's have just one cassette but some have the capacity to hold four. Each cassette has only one denomination of currency. |
| **CIM** | Abbreviation for Customer Interface Module. On the e-Teller, the CIM is the component that controls the keypad and the display screen. |
| **CIRRUS Ò** | National Network developed by MasterCard. |
| **Day Close** | The procedures used to end the "business day" of an ATM machine and start the new business day. The day close report is typically used to balance the machine. The Day Close will dial the switch to obtain the host totals. |
| **De La Rue Ò** | The leading provider of cash handling equipment solutions to banks and other retailers. The De La Rue dispenser is commonly found in many of today's ATM machines. |

| | |
|---|---|
| **Debit Card** | A card that resembles a credit card in its uses but results in a debit to the consumer's transaction account as directly related to the consumer's purchases. As of today, surcharging is not permitted in a debit transaction, however, the transaction does receive interchange. |
| **DELUXE**Ò | A national network primarily involving POS transactions. EFunds Corporation is the parent company of DELUXE. |
| **Denomination** | One of a series of kinds, values, or sizes, as in a system of currency or weights. Also known as "note size" . |
| **Diebold**Ò | A global service and manufacturing company that provides retail solutions and ATM machines to the banking industry. Some Diebold ATM models include the CSP (Cash Source Plus) and the InterBold series. Diebold is located in Canton, OH. |
| **Dispenser** | The mechanism by which items, typically currency, are counted and placed into the dispense tray for the ATM user to obtain. |
| **Divert Tray** | The container in an ATM that receives defective, torn, or jammed bills from the dispenser. This is also know as the "reject bin". |
| **EBT** | Acronym for Electronic Benefits Transfer. EBT is a method that many states have adopted to disperse assisted living benefits to individuals instead of a cash or equivalent. |
| **EBT Card** | The EBT card is used much the same as a credit or debit card but is typically routed through a "state operated" network. See EBT. |
| **eCashier**Ò | AmStar's proprietary Multi-Function Financial Center called the *e*cashier, which incorporates an ATM with enhanced features that allows both banking and "non-banking" customers access to a wide variety of financial services. |
| **EFT** | Acronym for Electronic Funds Transfer. |
| **eFunds**Ò | A national network primarily involving POS transactions. EFT Datalink is certified to process POS/EBT transactions through eFunds. See also DELUXE. |
| **eTeller**Ò | AmStar's ATM that is easy to operate and inexpensive to maintain at half the price of typical wall mounted terminals. *e*teller is the ideal ATM for retail locations, whether banks, credit unions, convenience stores, movie theaters, strip centers, malls or other locations. It's through-the-wall design allows customers easy 24-hour access to cash outside, while allowing you the security of servicing the machine from inside. |
| **Footprint** | The term of measurement by which an ATM will rest on the flooring. |
| **Greenlink**Ò | An ATM manufacturing company based in Fort Worth, TX. Greenlink manufacturers the electronic parts inside of the eTeller unit. |
| **HONOR**Ò | A national network. |
| **Host** | An electronic device connected to a network, that provides data and services. |
| **Host Parameters** | The setup and configuration in which an ATM will communicate with its host or processor. |
| **Interchange** | The fee given to the network by the authorizing bank for processing a transaction for their customer. |
| **ISO** | Acronym for Independent Sales Organization. Typically, an ISO sells the ATM or the "deal" to the merchant. AmStar can be considered an ISO. |
| **Issuer** | A financial institution the distributes debit or credit cards to its account holders. |
| **Kiosk** | A small, stand-alone structure that is open on one or more sides which usually provides information by the means of an electronic display, keyboard, keypad, and/or touch screen. |
| **Lipman**Ò | A manufacturer of mainly POS terminals. Lipman, however, does manufacture the Nurit 5000 – an POS Scrip terminal with a dispenser attached. |
| **MAC**Ò | The only national network that is also it's own ISO. EFT Datalink is certified to process ATM transaction through to MAC. Concord-EFS is the parent company of the MAC network. |
| **MAESTRO** | The sister network of CIRRUS responsible for primarily POS transactions. |

| | |
|---|---|
| **Merchant** | The entity who facilitates the ATM machine. Usually, the merchant is also the owner of the machine. |
| **Mis-dispense** | The act is which the ATM did not dispense correctly. |
| **NACHA** | Acronym for National Automated Clearing House Association. NACHA is the governing body for ACH rules and regulations. |
| **NCRÒ** | National Cash Register Company. NCR is also an ATM manufacturer. |
| **Note Size** | One of a series of kinds, values, or sizes, as in a system of currency or weights. AKA – Denomination |
| **NSF** | Non Sufficient Funds. The act in which the account balance is below the requested amount. |
| **NURIT** | A POS or ATM line of products made by Lipman. Examples include: Nurit 2085, 2085 +, and 5000. |
| **Off Premise ATM** | An automated teller machine that is not owned or located at a bank or one of the banks branches. |
| **PAN** | Acronym for Primary Account Number. Often, this is simply the card number of the credit or debit card. |
| **Pin Pad** | The interface in which the user enters in their personal identification number. |
| **PLUS Ò** | A national network developed by Visa. |
| **POS** | Acronym for Point Of Sale. Generally, this refers to electronic equipment to purchase goods or services that does not dispense money. |
| **Processor** | A financial institution that participates in the advanced self-service banking industry by processing and validating transaction requests for card holders. |
| **QUESTÒ** | The national association that regulates the EBT industry. Often times, QUEST is referred to as a network, however, QUEST is an association and not a national processing entity. |
| **Reversal** | The act in which the ATM will "chargeback" the approved amount to the card holder. Reversals tend to occur when the network approves a withdrawal transaction and the ATM is out of money or mis-dispenses. |
| **Settlement** | The withdrawals, surcharges, and interchange fees distributed on a business day to an account. |
| **STARÒ** | A National Network. |
| **Surcharge** | A fee assessed to the user of the ATM for the privilege of performing a transaction at the machine. Surcharging can occur on withdrawal and transfer transactions. |
| **Switch** | The computer system(s)that accepts information from the terminal and repackages the message to transmit to the national networks. |
| **SYNKEYÒ** | An ATM manufacturing company based in Seoul, Korea. |
| **TBS (ATM Machine)** | A very inexpensive model of an ATM that consists of a Verifone terminal with a NCR dispenser attached. TBS is based in Tampa, FL. |
| **Third Party Processor** | An ATM or POS transaction processor that is not considered a national network but is directly linked to one or more. |
| **TIDELÒ** | An ATM manufacturing company based in Carrollton, TX. Examples include the Tidel IS-1000 and the AnyCard SC. |
| **TNSÒ** | Acroynm for Transaction Network Services. TNS is the largest data transaction handler in the US. TNS was acquired by PSINET. |
| **TPS 2000** | Transaction Processing System 2000. A switching system developed by the, now defunct, ComTrac corporation of Tyler, TX. The TPS 2000 is EFT Datalink's current switching software product. |
| **TRITONÒ** | An ATM manufacturing company based in Long Beach, Mississippi. TRITON is owned by the Dover Corporation. |
| **Under Dispense** | The act in which the ATM dispenses an amount less than the approved amount. This occurs commonly when the cash cassette is out of money. In the event of an under dispense, the non-dispensed portion, as well as the surcharge, is reversed back to originating account. |

| | |
|---|---|
| **UPS** | Acronym for Uninterruptible Power Supply – commonly referred to as a "battery back-up". The UPS will distribute electrical power to its components in the event of an electrical power outage. Often, the UPS will regulate power surges and brownouts. |
| **Z-Report** | A report generated by the terminal in which the running totals are printed on a receipt for reconciliation purposes. When a Z-Report is performed, the host switch is called to transmit the "host totals" to the machine. At the conclusion of the report, the totals are cleared from memory. |

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