Tab 2

ACM Modular Product Line
Theory of Operation and Design

Important

Information contained in this document may change after the date of issue. Review all Field Bulletins before referencing the information contained in this section.

File all Theory of Operation Field Bulletins issued by the Productivity Solutions, Inc. Documentation Department at the back of this section in accordance with company field documentation policies.

Contact the Documentation Department for a complete list of current Field Bulletins.

Table of Contents

ACM® Self-Checkout and BOSS Theory of Operation

The retail world is embracing self-checkout. Self-checkout systems such as the Automated Checkout Machine (ACM®) offer a cost-effective solution for retailers faced with rising labor costs in a tight labor market and an easy-to-use alternative for consumers demanding faster checkout services.

The key is flexibility. The ACM® system allows consumers to scan orders of any size and gives the consumer multiple payment options: a direct substitute for existing conventional lanes. Retailers can manage flexible self-checkout systems just like conventional lanes to achieve predictable labor savings.

Self-checkout offers faster checkout to consumers for better service. As retailers follow advances in technology and move towards wireless networking, PSI has given control of selected functions of the ACM® lane through a wireless handheld device. With it, the retailer monitors the ACM® lane from remote locations inside the store during low usage times. In addition, full ACM® lanes connect to store wireless networks so the retailer can place self-service lanes in different locations and accommodate special needs.

PSI offers multiple security options and lane sizes to fit the retailer's needs, and keeps the most interactive part of the Self-Check identical for each design. This design is friendlier for the customer and eases the knowledge base needed for service in a multilevel store layout.

The ACM® Theory of Operation and Design provides a technical and theoretical explanation of how the ACM® system operates and integrates with the store's point-of-sale (POS) using standard and wireless networking applications.

Figure 1.1 represents a typical architecture of the retail industry information technology flow. General operation and system architecture are discussed in the following section.

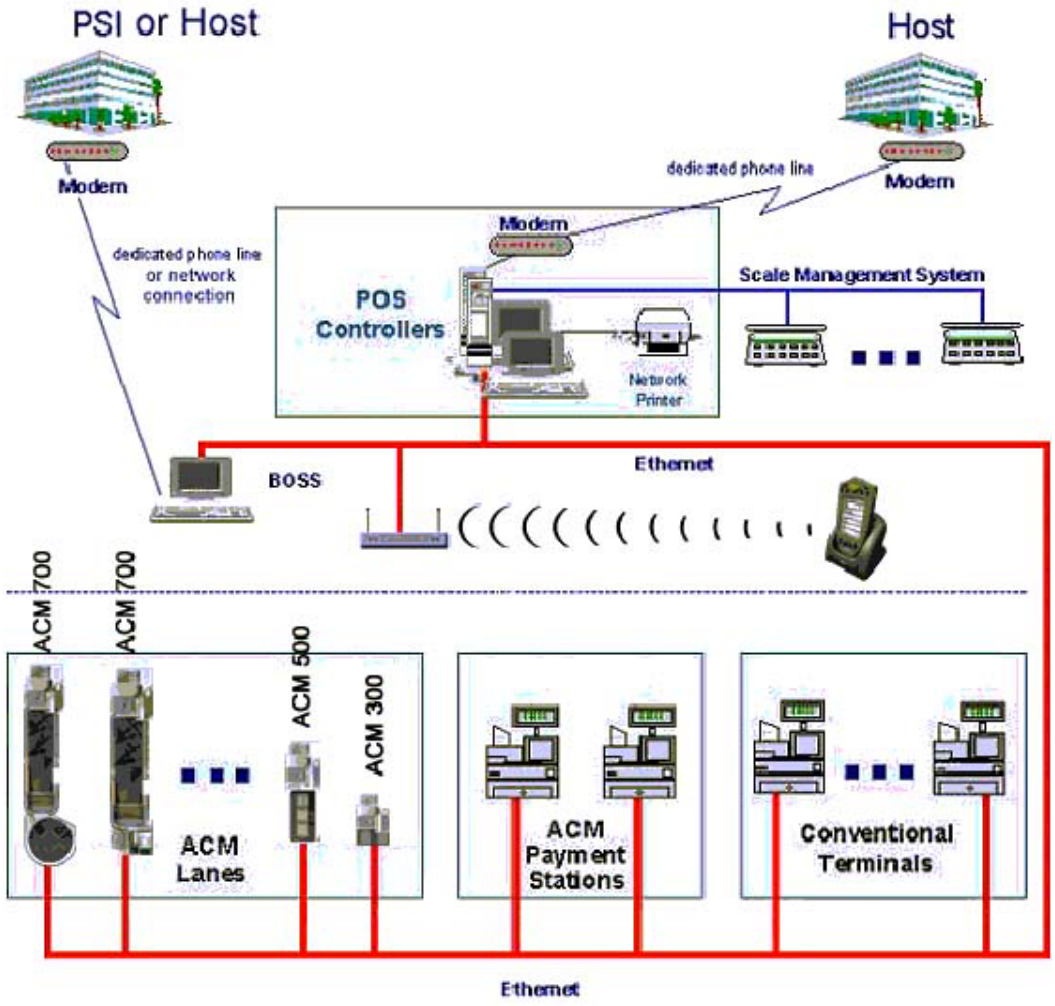

PSI or Host
Host
Modem
Modem
dedicated phone line
dedicated phone line or network connection
Modem
POS Controllers
Network Printer
Scale Management System
BOSS
Ethernet
ACM 700
ACM 700
ACM 500
ACM 300
ACM Lanes
ACM Payment Stations
Conventional Terminals
Ethernet

Figure TOD-1

Front End

The store front-end is the area of the store comprised of conventional lanes, ACM® lanes, and ACM® Paystations. When customers have finished shopping and are ready to tender their orders, the front end is the area where items are scanned and purchased. It may have anywhere from twelve to forty checkout lanes. Typical store front end architecture is shown in figure 1-2.

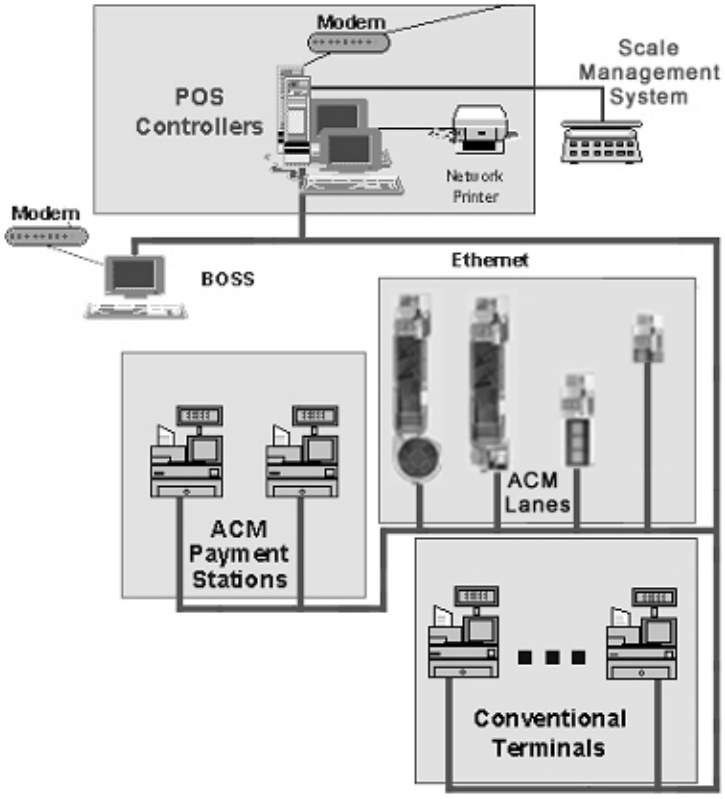


Figure TOD – 2
Handheld device not shown.

Conventional Lanes

Conventional lanes require constant attendance of a cashier for operation. Most have a conveyor to transport items to a cashier who scans the Universal Product Code (UPC), also known as a barcode, and processes items to be purchased and tendered. Conventional lanes use a small computer to communicate to the store's Point-of-Sale (POS) system. This computer is called a terminal.

ACM® Self Checkout Lanes

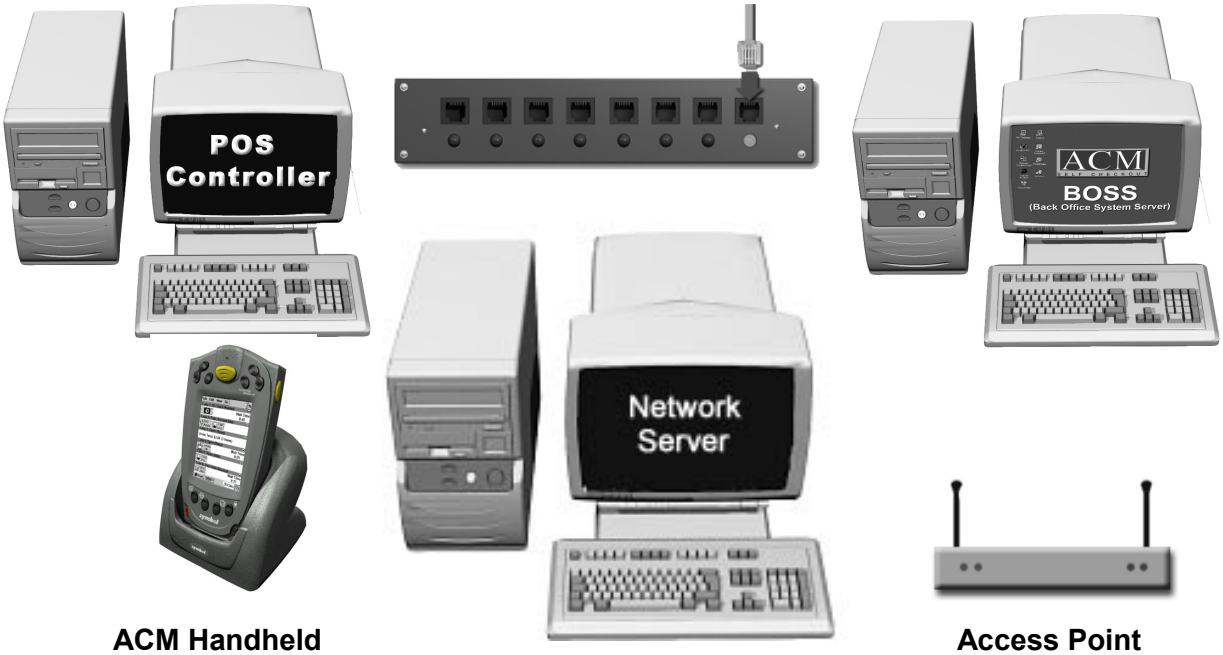
ACM® lanes do not require constant attendance of a cashier for operation. Like conventional lanes, ACM® Lanes communicate to the POS with a terminal or have a lane computer that emulates conventional terminal functions. ACM® lanes communicate with the store's POS system the same as conventional lanes. Because the ACM can process items without a cashier, it allows a single cashier to operate multiple lanes.

ACM® Paystations

The ACM® paystation operates like a conventional lane without a conveyor but with a Scanner/Scale. Typically, the paystation has a handheld scanner for reading barcodes. The paystation primarily tenders those customers who choose pay with an option not offered at the self-checkout lane. Paystations can stand independently from the ACM® Self Checkout lane or integrate as a section of the ACM® Self Checkout lane bagging area. The retailer may even designate other conventional registers to function as an ACM Paystation.

Back Office

The back office is the central point of communication for the store's information process. In most cases it contains the following: POS Controllers, the network server, a server hub, the ACM® back office system server (BOSS) and other necessary equipment (see figure 1-3). The back office is the "Control Room" for most of the store's operations.



ACM Handheld **Access Point**

Figure TOD - 3

POS Controller

The POS controller contains store Point-of-Sale data. Retailers control item pricing, order information, cost, sales, etc. with the POS controller.

Most locations have two POS controllers. Controller #1 is used for normal operation; controller #2 is a mirror copy of #1 and is used in the event of a #1 failure. Each controller contains information about every item sold by the retailer.

Server and Hub

The Server is a centralized computer that links (networks) other computers together. A network is the connection of two or more computers. Many ACM® installations connect

through an Ethernet Hub. The Hub serves as the common connection point for a network, joining the network cables together at the server.

Back Office System Server (BOSS)

The BOSS shares information among all the ACM® lanes installed in a store. It maintains the master security file for system operation and system configuration information such as shopper assistant card privileges. It also records operating information and produces system reports. The BOSS serves as the client server for the handheld application for the Remote Terminal (Handheld) Device.

ACM Handheld

The ACM® Shopper Assistant uses the handheld to resolve order issues requiring attention and/or intervention and monitors the operation of the ACM® Lanes "assigned" to the Handheld. The key elements of the Handheld include:

- Connects and communicates wirelessly with the ACM®
- Provides individual security so only authorized users can sign on to a Handheld.
- Displays all relevant status information (i.e. system summary) for connected ACM® 's that are assigned to that Handheld.
- Requires the user to acknowledge various informational messages pertaining to a specific ACM®.
- Allows the Shopper Assistant to use the barcode scanner integrated with the Handheld device to add single or multiple items to a new or open transaction on an assigned ACM®.

The Handheld can add items to an order with the built-in scanner before the order has been suspended in the POS or before the order has been completed using any one of the "Pay at the Lane" options. To add items to an order, the order must be open on the ACM® Lane. Items cannot be added to orders with the Handheld after the order has been retrieved at the paystation.

Access Point

Access points are network HUBS used to connect wireless components to a wired network. It must have a physical (wired) connection to the LAN for communication. There are no requirements on an access point's location for purposes of connecting it to the network other than the standard requirements of the CAT5 cable. However, there is a limit on the allowable distance for RF communication. Access points are utilized in a store for receiving and transmitting data to and from wireless components

Scale Management System

The scale management system contains pricing data for Type 2 (items sold by weight) and other items sold as price per pound. When the price changes for an item, the change is made in the scale management system. The system then automatically updates all store scales connected to the network. Typically, an item with a Type 2 UPC or SLU is found in the meat, deli or bakery department. Items using a PLU (Produce lookup) are found in the produce department.

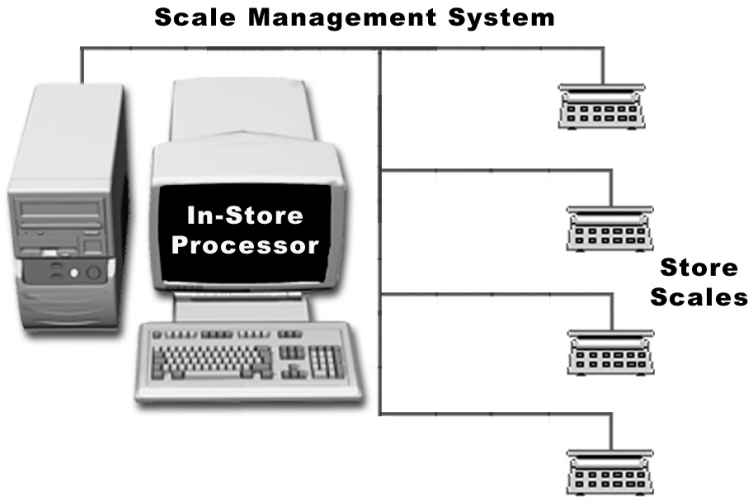


Figure TOD - 4

Retailer Corporate Office

The retailer's corporate office plays a limited, but critical role in the store's operation. In most cases, they are responsible for sending pricing information and POS configuration data. Through this connection they update the Item pricing, configure terminal options, troubleshoot potential POS problems, add new items and perform other required tasks.

PSI Corporate Office

The PSI corporate office is similar to the retailer's office. PSI can remotely connect to the BOSS computer to update the ACM® software, troubleshoot and correct reported problems with the ACM® system as well as gather crucial error log files (Extracts) and store performance information. PSI has no connection to the POS.

The ACM® Modular Product Line Self Checkout System

The ACM® system consists of four major components:

ACM® Lanes

- ACM® Universal Cash Module
- ACM® 300 Series (No Security)
- ACM® 500 Series (Weighted Security Only)
- ACM® 700 Series (Full Security, Height and Weight)

ACM® BOSS

ACM® Handheld (Remote Terminal)

ACM® Paystation

The ACM® Lane

The ACM® Lane can be installed in several different configurations based on the needs of the retailer. The ACM® deploys a modular design where modules can be mixed and matched to create different installation footprints.

Universal Cash Module (C2)

At the Universal Cash Module (C2) shoppers scan and weigh items, pay for orders, submit coupons and receive transaction notifications. The C2 cash module contains multiple pieces of hardware and has been designed as a universal cash module to accommodate all ACM® Lane configurations. By adding security options to the C2 cash module it can be utilized as the order starting point for the **ACM 300, ACM 500, ACM 700** or **ACM 700W** products.

Figure TOD - 5

ACM 300

The ACM 300 Series are the smallest of the ACM Modular Products. By adding different bagging solutions to the C2 Cash Module such as a hanging bagging rack the C2 becomes an ACM 300. This series is primarily designed for short orders. There are no security features for item processing in the ACM 300 series. However, the size of the ACM 300 series does not impair its ability to process any item in the store.

The ACM 300 Series has to current configurations (ACM 301 & 302). The type of bagging solution attached to the C2 determines the series number. The diagrams below show examples of each type of ACM 300 Series configuration.

ACM 300 Series

ACM 301

Figure TOD – 6a

ACM 302

Figure TOD – 6b

ACM 300 Series Data Flow

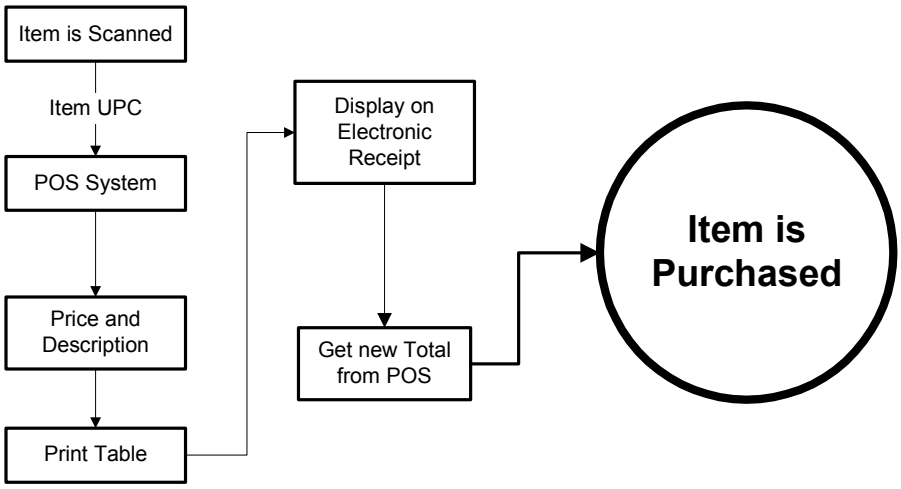


Figure TOD - 7

ACM 500 Series

The ACM 500 series offer two options. The ACM 502 gives the customer the benefit of total payment solution while still giving the retailer the benefit of some level of security (weight). The reduction in size of the ACM 502 also saves the retailer space in the storefront resulting in additional customer comfort. The ACM 502 does reduce the amount of bagging space available for the customer.

The ACM 503 provides the same benefits both to the customer and retailer as the ACM 502. However, the ACM 503 adds the additional benefit to the customer of more room for bagging items and for the retailer, no less security.

The C2 Cash Modules functionality remains the same as in the ACM 300 series applications. With the addition of the B3 and B5 bagging solution the ACM 500 series allows the lane PC, security module, UPS, and required POS components (if applicable) to be relocated inside the bagging areas which allows more room inside the C2 and eases some of the difficulties during servicing.

ACM 502 With Weighted Security

Figure TOD – 8a

ACM 503 With Weighted Security

Figure TOD – 8b

ACM 500 Data Flow

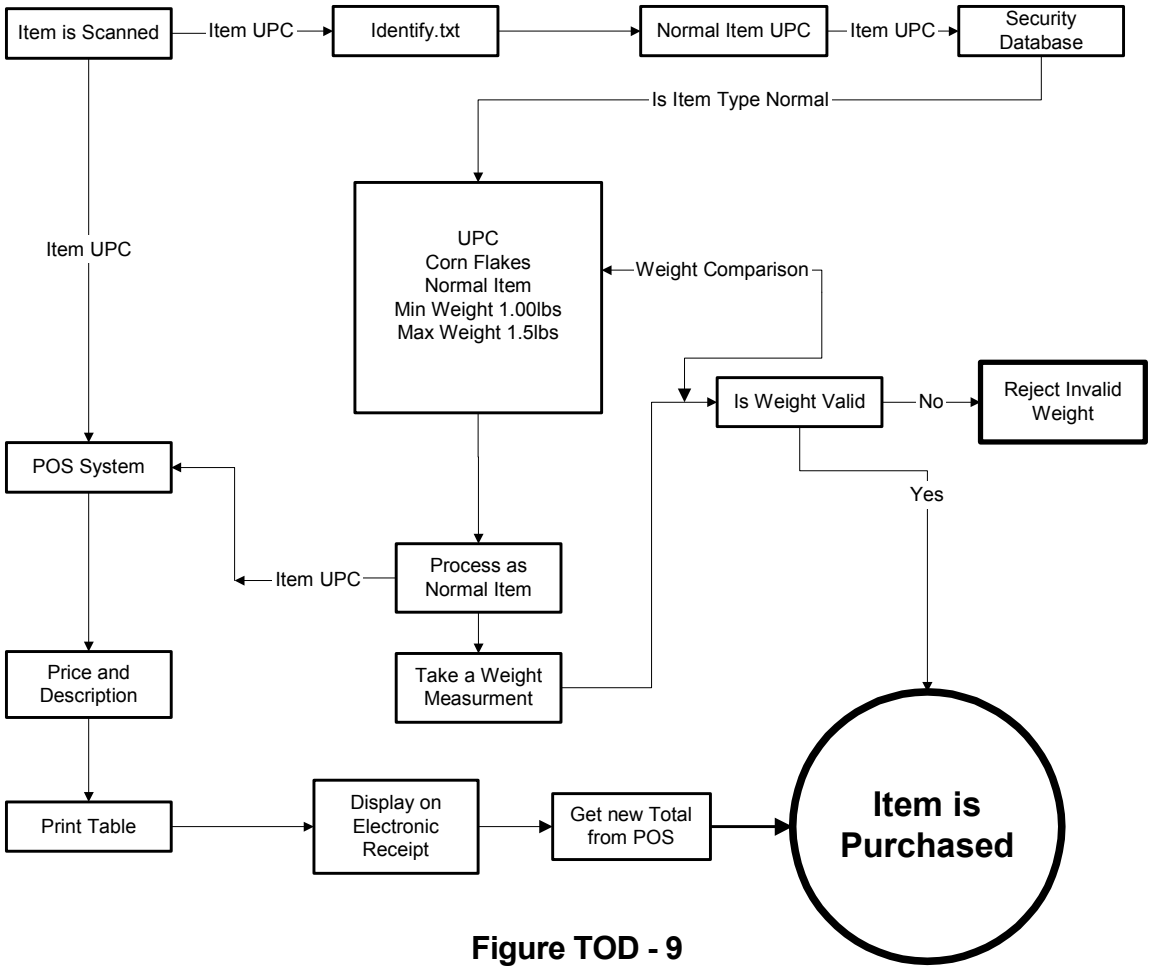


Figure TOD - 9

ACM 700/W

The S2 security section is the full security module that may be added to the C2 cash module giving the ACM lane the ability of full security. This section is where security parameters of scanned items are verified. It consists of a security curtains to take height measurements, load cell assembly(s) to take weight measurements, and a conveyor system to move the item through the section and into the bagging area.

The security section houses electronic equipment such as the lane PC, USP, security module, and POS components. By placing these components in the S2 security section we accomplish the same results as we do by placing them in the bagger of the ACM 500.

By attaching the S2 security section to the C2 cash module the ACM lane becomes what is referred to as the ACM 700. However, the ACM requires a bagging area to be attached to the S2 security section, which is called the B2.

There are several different ways of configuring the B2 bagging area based on the needs or request of the retailer. The bagging area can be short (40 inches) or long (48 inches) the bagging area does not usually house any of the ACM electronics unless absolutely required.

The bagging area is the final location for items that have been purchased and are to be bagged. Adding additional options to the bagging area such as an integrated paystation or carousel bagger can even further enhance the ACM 700 functionality.

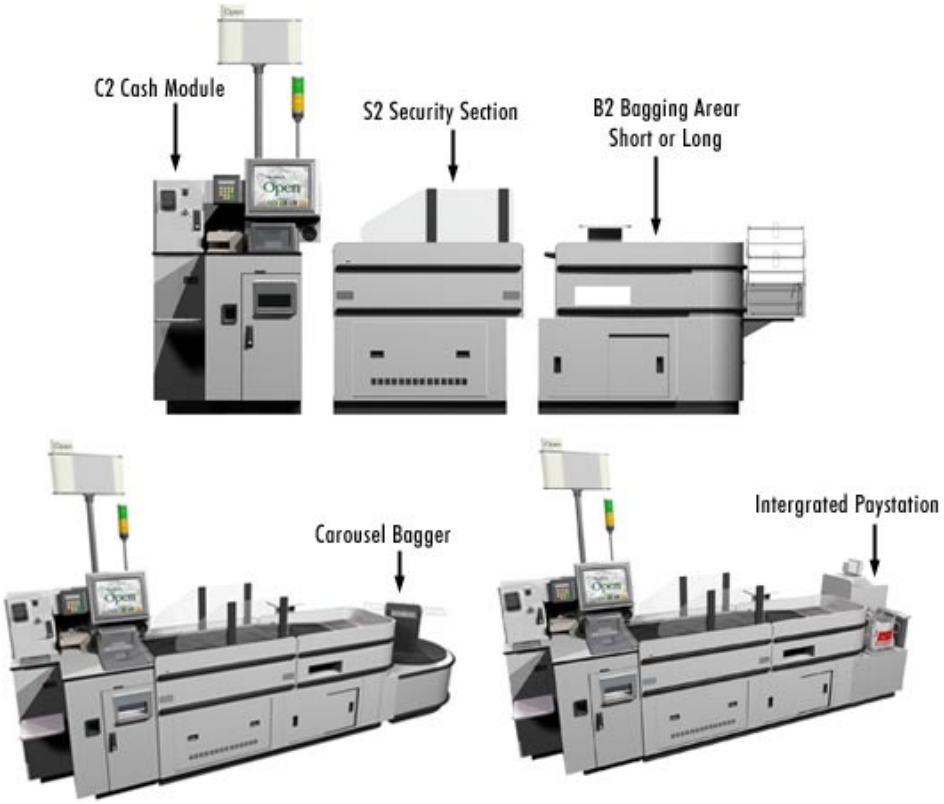


Figure TOD – 10

ACM 700/W Series Data Flow

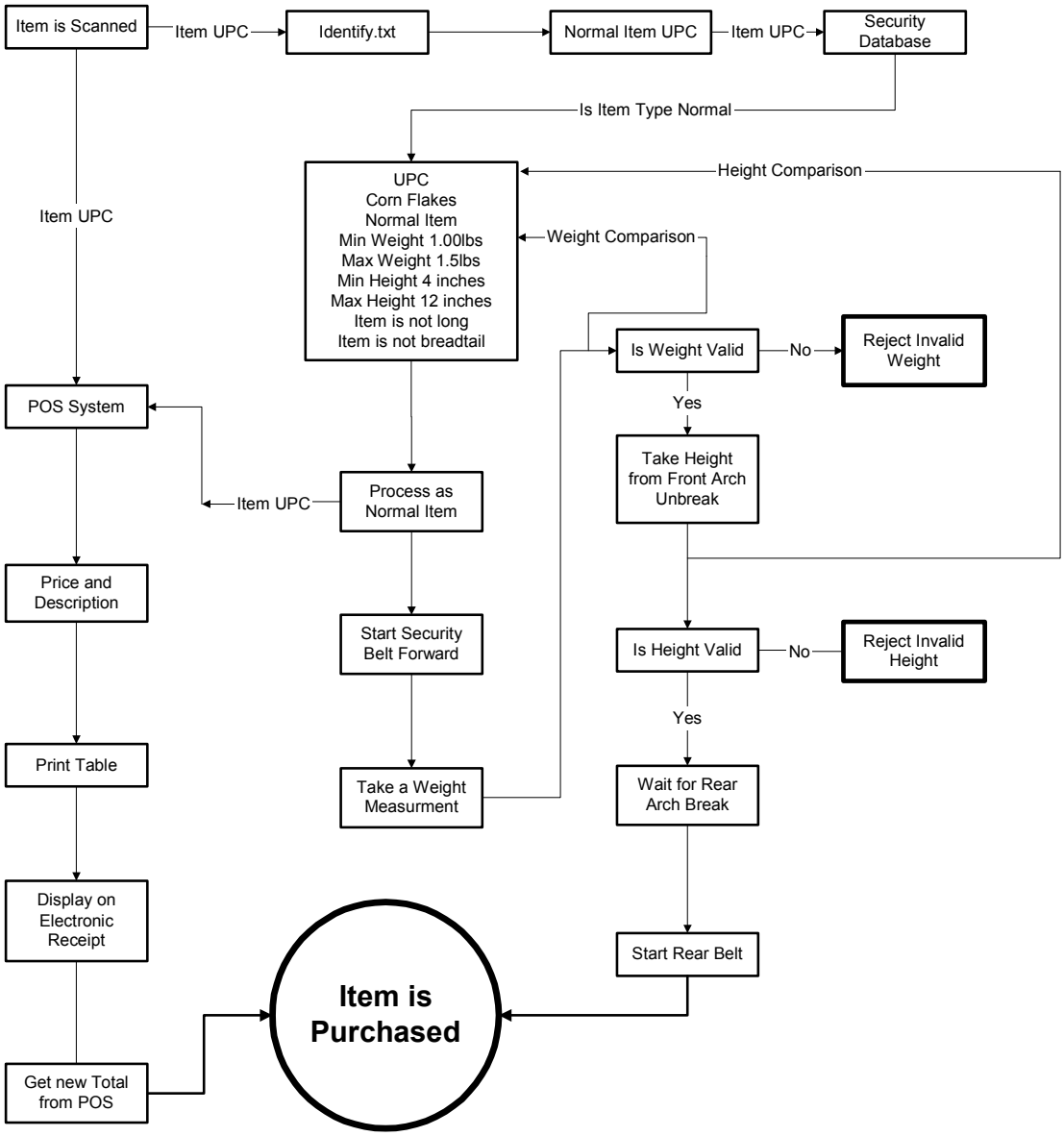


Figure TOD - 11

ACM Software

Configuration Files and Architecture of 4x Software

CAUTION: 4x Software is not compatible with 3x version and prior.

There are many changes to the configuration files used by the Lane and BOSS. These changes were an attempt to make the configuration files more intuitive and easier to maintain. These configuration files at the lane can be found in the directory of (at the Lane) **C:\Acm Lane\Config** or (at the Boss) **C:\Acm Boss\System Configuration\Lanes\Lane1** (lane 1 folder is shown as and example. Each file is located in the folder of its respective lane)

LaneConfig.ini –

Contains all the same information, which was contained for 2X and 3X Software versions. However, Shopper Assistant and Mobile Terminal data have been removed and placed in the StoreConfg.ini. Added to the LaneConfg.ini is the LaneType field. This field determines the type of lane (700, 500, 300, or 750) the software is being installed. Other information contained in this file is information such as, Lane IP Address, Boss IP Address, Computer Name, Workgroup, Boss Port IP, and Scanner/Scale Type. In general, this file contains information for the configuration of the lane that is associated with or unique to the individual lane. These settings may change from lane to lane.

StoreConfig.ini –

Shopper Assistant and Mobile Terminal data are now located in the configuration file. The **StoreConfig.ini** is stored at the lane in the directory of **C:\Acm Lane\Config**. This stored file is an exact replica of the **StoreConfig.ini** stored on the BOSS. The BOSS pushes this file down to the lane each time it synchronizes with the lane. Changes to the Shopper Assistant information and Mobile Terminal settings require you to Open and Close the lanes in order for the new setting to take place at the lane. In general, this file contains information associated with or unique to the individual store for the configuration of the each lane. These settings do not change from lane to lane.

ChainConfig.ini –

ChainConfig.ini is stored at the lane in the directory of **C:\Acm Lane\Config**. This stored file is an exact replica of the **ChainConfig.ini** stored on the BOSS in the directory of **C:\Acm Boss\System Configuration\Lanes**. The BOSS pushes this file to the lane each time it synchronizes with the lane. Information associated with or unique to a complete chain of store (i.e. all Winn-Dixies, all Stop and Shops) is stored in this file. This information such as Department Names and Coupon Handling does not change from lane to lane.

BannerConfig.ini –

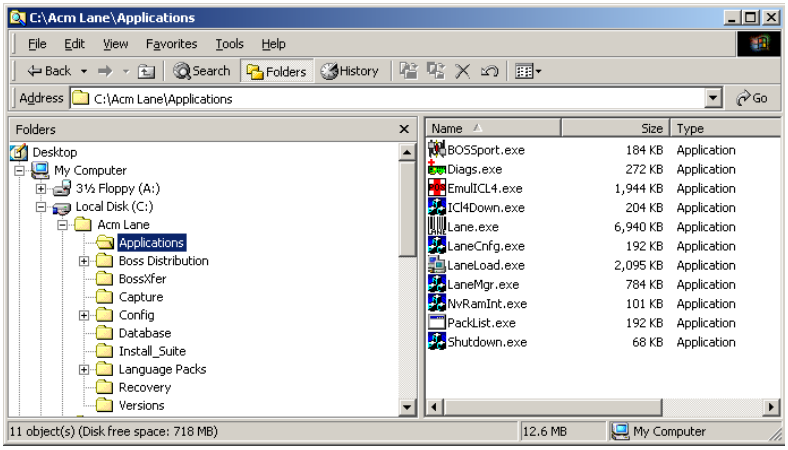
This file was created to override the settings in the **ChainConfig.ini** file. This distinction between the different banners, i.e. Weis, Mr. Z's and Kings, requires us to maintain totally separate configuration files for each. This new functionality allows us to maintain one **ChainConfig.ini** file for the Chain (Weis), and only create the **BannerConfig.ini** file

when it is necessary to distinguish between the different Banners (Mr. Z's and Kings). The **BannerConfig.ini** is the same as the **ChainConfig.ini** containing the differences required. The **BannerConfig.ini** is handled by the ACM System just like the **ChainConfig.ini** and can be found in the same directories of the lane and BOSS. If the store does not need the **BannerConfig.ini** file, then it is on neither the lane nor the BOSS.

Multilingual Options

The completion of 4x software allows the ACM to operate in multilingual function. This is done by the addition of Language Packs installed on the BOSS PC. The lane functions in any language as a default language and allow the consumer to choose from multiple languages that may be installed. This software does not force the option of multiple languages, but allows operation with one or more.

ACM® Lane Applications



All ACM Lane Applications reside in one directory: **C:\Acm Lane\Applications.** This directory contains the following Applications:

BOSSport.exe - When the lane is brought online, Lane Manager starts a program called BOSS Support. BOSS Support is the funnel for all communications between the lane and BOSS. It reads the Acmconfig.ini and determines the lane's IP Port and sends a "ready to communicate message" to the BOSS letting the BOSS know that the lane is now online. Once the BOSS receives this message, it opens a socket connection between BOSS Support and the BOSS. The lane then uses this connection to communicate to the BOSS. If for some reason the socket connection is broken, BOSS support sends a "ready to receive message" every ten seconds until the communication is reestablished. It also stores all information that would normally be sent to the BOSS until that time. The BOSS manager and the BOSS support programs work closely together.

Diags.exe - This application is a diagnostic tool used by PSI personnel to view hardware and software and to troubleshoot the Lane hardware.

Icl4Down.exe -

Lane.exe - Lane.exe controls all lane functions and enables the shopper to interface with the ACM® system. Lane.exe is responsible for coordinating the operation of all

hardware including belts, cash components, lights, sensors, etc. Additionally the program plays a pivotal role in validating item security. Lane.exe also collects information for every item scanned at the lane and sends them to the BOSS via the BOSS Support program where it is used to update or create item security records.

Lane.exe is opened when a shopper assistant card is scanned at the lane and the OPEN icon is touched in the menu. The first process in opening a lane is an attempt to open a line of communication called a “Named Pipe” with the POS system. Once the pipe has been opened and the lane is communicating with the POS system, it then starts requesting status information from each device that is present on the lane. If all devices are ready and operating correctly, Lane.exe then begins to monitor the messages that are being sent by the POS system.

There are two types of messages received by Lane.exe from the POS system during operation, display messages and print messages. A display message is information that would normally be seen on the monitor at a conventional lane. They include simple information lines, for example “Welcome to Our Store” or Price and Description lines like “Apples $1.25.” Other types of display messages are total lines, for instance “Total $12.50” and Error/Input required messages like “B077 Enter Password.”

A print message is information that would normally be printed on the customer’s receipt as items are scanned at the lane. They are similar to display messages, except in certain cases the system uses display and print messages that are sent from the POS to determine where the shopper is in the order process. For example, if the system receives a display line that says “Verify Customers Age or Press Clear” it knows that the customer has scanned an item that can only be purchased if she meets the age restricted requirements indicated within the received POS information. An example would be alcohol and tobacco age restricted products.

It is imperative that the system identifies what type of display and print lines it might receive during a transaction and that it responds correctly to the information it is receiving. For this reason, two files are located on each lane called display and print tables. Each table has a list of all known display and print messages and the appropriate response for the message. In order for the lane to open to allow customers to begin using the system, Lane.exe must receive a display message that matches to the “ready for first item” response in the display table.

Once the lane is open, consumers start using the system by scanning item UPC codes on the scanner/scale. Purchased items are not the only things in a store that have UPC code. Coupons, frequent shopper cards and shopper assistant cards, to name a few, all have UPCs. The lane uses a file call the Identify.txt table to determine the difference between various item types. When a UPC is scanned, the lane.exe looks at the identify.txt table, determines the item’s information, and responds accordingly.

LaneCnfg.exe - The initial configuration program with a user interface to guide the installer through the process of setting up an individual Lane with all network and lane specific information. This information is then stored in the **AcmConfg.ini** file.

LaneLoad.exe -

LaneMgr.exe - The Lane manager’s job is to manage every aspect of the functioning ACM® lane. It is the first program started when the lane is brought online. The shopper assistant menu and closed screens are both part of the Lane Manager Program. It also monitors for power events at the lane and system reset conditions. As Lane Manager is

initializing it reads the StoreCnfg.ini and the ACMCnfg.ini to determine how the lane is configured and starts a program called BOSS Support.

NvRamInt.exe – NVRamInt.exe initializes the NVRam on the ISIB to a default state and produces an output file for information stored on NVRam.

PackList.exe - A utility program that verifies the files that were installed from the CD are on the Lane and are correct by comparing the file name, size, date and CRC. The Lane runs **Packlist.exe** every time **LaneMgr.exe** executes. It verifies any changes to any file on the Lane since the last time **LaneMgr.exe** started.

Shutdown.exe - This application safely shuts the PC down in case of a power event or when the shopper assistant manually closes the ACM Lane.

The ACM® Back Office System Server (BOSS)

The ACM® BOSS computer is typically located in the store's back office and is connected to each lane via an Ethernet network.

The following section covers high-level primary BOSS functions including:

- Security database record learning
- System log information collection
- Security databases replication
- History information collection
- Diagnostic information collection and display
- System status
- Managing configuration information
- Quick lookup screen creation
- Software distribution
- Scale file updates

Databases

As stated above, the BOSS is the keeper of the master databases comprising of the Security Database, History Database, Log Database, and the Scheduler Database.

The Security Database

The Security Database maintains a file of every item that is stocked in the store called a Security Record. The Security Record consists of attributes that identify a particular item. The table below shows the Security Record for Kellogg's Rice Krispies and describes what each attribute means. Remember this is the Security Record for this item only.

Item Security Record Field Defiinitions	
ItemId	Item Code (UPC, PLU, EAN, etc.)
ItemIndex	Index to 1 or the 10 records allowed for an item
ItemDescription	The POS description for the item.
TransportFull	Place on belt or don't place on belt or optional for 750
TransportMini	Place on platter or passaround for Mini-Lane
ItemType	Normal, Quantity Req, Prompt Qty, Weight Req, Type 2
ItemQuantity	The maximum quantity allowed. 0 = Allow whatever POS system accepts
PreservePromptForQty	Indicator to preserve prompt for quantity status if item type changes
NumActiveHeights	Number of active heights
Height1Min	Minimum value for height 1
Height1Max	Maximum value for height 1
Height2Min	Minimum value for height 2
Height2Max	Maximum value for height 2
Height3Min	Minimum value for height 3
Height3Max	Minimum value for height 3
NumActiveWeights	Number of active weights
Weight1Min	Minimum value for weight
Weight1Max	Maximum value for weight
SecurityAlert	Additional security indicator other than weight and height
WgtReqTare	Tare key or tare weight that can be sent with a weight required entry
ScaleLoookUp	SLU (Type 2 PLU) value 0 = not active, -1 = override, >0 = Valid SLU (primary
NumActiveType2Prices	Number of active type 2 prices
Type2Price_1	First type 2 price

Type2Price_2	Second type 2 price
Type2ByCnt_1	First by count quantity for Type2Price_1
Type2ByCnt_2	Second by count quantity for Type2Price_2
Type2Tare_1	First type 2 tare for Type2Price_1
Type2Tare_2	Second type 2 tare for Type2Price_2
Type2ForcedTare_1	Use first type 2 tare as range
Type2ForcedTare_2	Use second type 2 tare as range
PosTolerance	Positive tolerance for by weight items
NegTolerance	Negative tolerance for by weight items
NofInformationActive	Not on file department active
NofDept	Not on file department
NofPrice	Not on file price
NofTaxMod1	Tax modifier 1 for not on file price
NofTaxMod2	Tax modifier 2 for not on file price
NofTaxMod3	Tax modifier 3 for not on file price
NofTaxMod4	Tax modifier 4 for not on file price
MaintenanceRequired	Indicator for history Analyzer that the record needs to be fixed
LongItem	Long Item flag
BreadTail	Multi-Break status
AudioFileName	Audio WAV file name
RecordStatus	Add, Update, or delete status
UpdateSource	Program that updated the record
RecLock	Determines if record can be changed by batch update or automatic learning
TimeStamp	Time t value when the record was last updated

Every item in the store has a security record like the one shown above. While the attributes and values may change, the information recorded in this file is the same. This helps determine the way the item is to be handled at the lane and the security parameters for the item.

The customer can use a program called Security Database Maintenance to manually change or maintain these records. Figure 1-10 illustrates this program.

Figure TOD - 13

The attributes listed in the security record table from above are identical to the fields shown in the security database maintenance program. The Item ID is the UPC, the description is Kel Rice Krispies and the height and weight values are identical.

Every field that is shown in the security database maintenance program matches an attribute that can be found in the security record for that that Item.

A copy of the Security Database is distributed to each ACM® lane computer. When an item is scanned at the lane, it reads the database and compares the current attributes with the record ones to determine if the item being processed is valid.

As discussed in the lane section of this document, every time an item is scanned an item information packet is created and sent to the BOSS. When the BOSS receives this packet it looks to see if the new item, security override or the old security record flags are selected. If so, it then retrieves the item's security record and updates it with the new information. The updated record is then sent to the security database record on each lane. It is important to remember that the only time an item's security record is modified is when one of these flags is sent in the item information packet.

History Database

The history database collects the history of each item that has been scanned at the lane. The first time an item is scanned, the item's UPC is recorded in the history database along with the measured height and weight. It also records the item handling attributes, such as item type, if the item has a breadtail, and if it is a long item (breaks both security curtains at the same time because of length).

Dimensional security information is gathered for every item that is scanned at the ACM® Lanes. The reason for collecting this information is to allow a program known as History Analyzer to maintain security records. The program compares all the recorded records for an item, determines security settings to be placed on the item and updates the item's security record based on recorded attributes in the history database.

Understanding what information is collected each time someone scans an item at the lane is essential to comprehending the operation parameters of the ACM® system. Table 1-1 lists the fields contained within an Item Information Packet.

Item Information Packets are processed at the BOSS to:

1. Log information for Reporting
2. Log Item history (weight, height, etc.)
3. Perform overrides and security learning, and security record maintenance.

The lane cannot modify or create item security records. Therefore, the Lane.exe must send the item packets to the BOSS where the data is processed. The lane.exe program never writes to the security database located at the lane. Lane.exe mirrors item information so it can be validated at the BOSS.

The item is placed on the security conveyor where load cells take a weight measurement and compare it to the weight measurement from the security record for item validation. Next, the item travels through the lane's security system where attributes are collected and compared with the Lanes Security Records. The information about each scan is also sent to the BOSS in the form of an item information packet. (Defined in the Table below)

Item Information Packet Field Definitions	
PacketId	Item Information Packet token
Lane Number	The Lane where the item was processed.
Lane Type	Acm750 or Mini
AcmTransactionId	Transaction Identification number
Timestamp	Time Record was created
ItemId	UPC, PLU, EAN, etc.
ExtendedBarCode	Barcode extension (Books)
ItemDescription	The POS description for the item.
ItemPrice	The POS price for the item.
ItemType	Normal, Quantity Req, Prompt Qty, Weight Req, Type 2, Price Dept,
ItemQuantity	The number of items purchased with one entry.
MeasuredWeight	The item weight measured on the *Conveyor Scale*.
ScannerScaleWgt	Weight measured on scanner scale for wgt required items
MeasuredHeight	The item height measured by the *Security Arches*.
BreadTail	The number of Break/Unbreak conditions detected by the *Security Arches*.
ValidationStatus	Item was V*alidated*, *Returned*, or *Not On File.*
OldInformationInSecRecord	Lane detected *Item Type* or *Item Description* is out of date.
PassAround	Item was not set on belt.
LongItem	Item is longer than the distance between the two arches.
NewItem	No Security Record found for this item.
SecurityOverride	Security has been overridden.
UsedNof Information	Item was processed using *NOF Learn* information.
New Nof Information	A NOF Learn was performed.
Assistant Id	Assistant card UPC.
Nof Department	Department if item processed using NOF Learn or Price/Dept.

Nof Price	Price if item processed using NOF Learn or Price/Dept.
NofMod1	Modifier if item processed using NOF Learn or Price/Dept.
NofMod2	Modifier if item processed using NOF Learn or Price/Dept.
NofMod3	Modifier if item processed using NOF Learn or Price/Dept.
NofMod4	Modifier if item processed using NOF Learn or Price/Dept.
PricePerUnitUsed	Type 2 price used
ByCountQuantityUsed	Type 2 *By Count Quantity* if it is a type 2 item.
Type2SluUsed	Type 2 *SLU* used it is a type 2 item.
PriceOverrideReason	Type 2 price used to validate if it is a type 2 item.

Log Database

The log database records all the events that take place at the lane and BOSS supplying system-reporting information. This information can range from item rejects to the number of times a shopper assistant card is used at each lane to sale information. All reports are generated from information contained in the log database. The log database uses information from the item information packet to record how many times an item rejects and the nature of the reject.

Scheduler Database

The scheduler database works in conjunction with the schedule program. The program allows the customer to automatically schedule functions such as printing a particular report every Thursday. The scheduler database also can perform routine system maintenance like the history analyzer program that was previously discussed during off peak hours which does not impact system performance.

Scale File Processing

Scale file processing, also called automated pricing, is a simple process and is used primarily with pre-labeled type 2 items like meat or deli items.

Example: Last week 1 lb. of ground beef cost $1.00 per pound. This week the price has increased to $1.25 per pound. The customer's corporate office changes the price in their system to $1.25 per pound and distributes this to each store's scale system and to the BOSS so that it can update Type 2 item security.

The figure below illustrates the scale file format that the BOSS needs.

20088800000,0888,005.59,000,0.08,0,1.00,1

There are eight sets of numbers in this line; a comma separates each. We explain the function of each set below:

20088800000	**Items UPC**
0888	**Items SLU**
005.59	**Unit price**
000	**By Count Quantity – if 000 then item is sold by pound, If 002 then two items make up the unit price** **Example: If 002 was entered for lemons then you can buy 2 lemons for $5.59 or 1 for $2.78**
0.08	**Tare Weight – weight subtracted before pricing for packaging**
0	**Force Tare**
1.00	**Price Modifier**

1	**Retain Current Price – Only use for ACM® System – Tells the BOSS to keep the old price as an alternate record**

The scale file is critical for successful ACM® operations. When a scale file is received at the BOSS, a program called BOSS Manager processes it. BOSS Manager looks in the file for the item's UPC. It then opens the security record and sets the attributes to reflect the information listed in the scale file. After this is done it distributes this information to all the ACM® Lanes.

An incorrect scale file causes Type 2 items to be rejected at the ACM® lanes because the scale file uses the item price divided by the item's weight from the load cells to calculate the unit price. This calculated unit price must match the unit price recorded in the security database or lane rejects the item for invalid weight.

$$\text{Type 2 Validation formula: } \frac{\text{Item Price}}{\text{Item Weight}} = \text{Unit Price}$$

Example: The item price on a 1-lbs. package of ground beef is $1.00. When the item is scanned at the ACM® Lane the lane gets a weight of 1 lbs. and divides the item price of $1.00 and determines that the unit price is $1.00. The calculated unit price is then compared to the unit price from the security database.

In this example, let's say that the scale file was incorrect and set a unit price of $1.25 for ground beef. This causes the item to reject when the two unit prices are compared because the calculated unit price ($1.00) is lower then the security record unit price ($1.25).

ACM® Interaction with POS

The store's point of sale (POS) system provides item pricing and descriptions while the ACM® proprietary equipment and software provides item security. The two systems work together, making it easier to manage the front end of the store while ensuring integrity of the items being purchased.

The system also provides an assortment of reports from its back office system allowing store personnel with the ability to monitor and enhance the system's performance.

ACM® Lane and IBM Supermarket User Exit Code Functionality Overview

PSI ACM® 750 TPS is designed to be an automated self-checkout system requiring minimal manual intervention to operate. The entire process required for handling a shopper's checkout transaction utilizing the ACM® can be completed without the need for operator assistance. Exceptions to this process include the authorization for shoppers to purchase age-restricted items. Visual verification of a shopper's ID by qualified store cashier is required to complete a transaction that includes restricted items. This is the same process required by a conventional lane transaction. Recognizing the need to minimize shopper inconvenience, PSI User Exits have been coded to optimize handling of this and the other requirements.

Additional enhancements to the ACM 750 TPS functionality include; 1) Force total functionality; 2) Bar-code on receipts; 3) Open Suspended Transaction Report.

Force total functionality ensures that accurate on-screen running totals are displayed to the shopper at the user interface.

- Placing a bar code on receipts printed at the lane for suspended transactions to be retrieved at the pay station allows for quick retrieval of suspended transactions.
- The Open Suspended Transaction Report displays and/or prints a report of all currently suspended transactions.

PSI has found the implementation of these functions to be more efficient if implemented by user exit code. Detailed descriptions have been provided below for each enhancement.

Overview of User Exit Functionality

1) Open Transaction Report Display

The Open Suspended Transaction Report reads from the standard IBM Suspend/Retrieve file (EAMSRKYC.DAT) and displays a report of suspended transactions that have not been retrieved. The report is displayed on the full screen video display and is refreshed at a configurable interval.

The Open Suspended Transaction Report is designed for a full-screen Terminal Sales video display. The report supports the following screen resolutions:

- 12 X 40
- 16 X 60
- 16 X 80
- 25 X 80

If the full screen video display is not configured for one of the above resolutions, the Open Transaction Report does not display.

[If a video display is not configured, the CR may be configured to receive the report upon the entrance of a 100 sign-on key sequence.]

The Open Suspended Transaction Report consists of several User Exit functions. The implementation of each function requires that action be performed in distinct User Exits of the IBM Supermarket Terminal Sales application.

The action for a specific Open Suspended Transaction Report function in a specific Terminal Sales User Exit is invoked by placing a call to the appropriate function inside the User Exit. The Open Suspended Transaction Report functions are distributed as two object files (ACM_CODE.LBJ) and (ACM_AGE.LBJ).

The function calls are inserted into the Terminal Sales User Exits by using %include statements placed in the body of the User Exit routine. This effectively places the appropriate call in the User Exit when the User Exit module is compiled. The resulting Object files must be linked with the Terminal Sales application as well as the ACM_CODE.LBJ and ACM_AGE.LBJ object file.

2) Age Restricted Item Handling

The ACM 750 System supports the age-restricted handling from the POS. A shopper starts an order by selecting a payment choice (at lane or at paystation). For the shopper who chooses to pay the cashier, age verification is done at the paystation after the order is suspended using the Customers native Age Restricted processing. For the shopper who chooses to pay at the lane, a shopper assistant performs age verification at the lane. When age verification is performed at the lane, a dialog box appears and gives the shopper assistant the option to enter the shopper's birth date or press an 'over 21' button if the shopper is over the age of 21 or an 'over 18' button if the shopper is over the age of 18.

The age-restricted item handling process begins when the shopper scans an age-restricted item. The lane processes the item and then flashes the lane light to summon for a shopper assistant.

The shopper continues scanning each item in their order until the Shopper Assistant arrives. The Shopper Assistant can verify and approve age-restricted items at any time during the customer's transaction (card permissions are user-defined). The Shopper Assistant scans his or her Shopper Assistant Card. The system then prompts the shopper assistant to verify the shopper'' age in a manner consistent with the age validation procedure used at conventional registers.

If an age restricted item is processed at the lane and a shopper assistant does not arrive to verify ID by the time the shopper reaches the "choose/confirm a payment method" screen, the shopper cannot proceed past this point until performing age verification. At this time, a screen appears and asks the shopper to wait for assistance. Shoppers may either wait or choose to pay the cashier. If the event the age check fails (the shopper is under age), the order immediately suspends. The shopper must proceed to the paystation to remove the items from his or her order.

3) Bar-code Functionality

The documentation detailing the implementation and code for bar-code printing and retrieval is detailed at the end of this document. The bar-code specifications describe the technical methods used to scan the bar code from a receipt of an ACM 750 lane suspended transaction. The purpose of the scan is to retrieve the order for tender. Transactions are suspended using standard IBM POS Suspend / Retrieve. The bar code gets printed on the customer receipt at the ACM 750 self check out lane when the transaction is suspended. The customer takes the receipt to a paystation for tender. Then a cashier scans the bar code to retrieve the order. The documentation below describes the layout of the data within the bar code. The data within it is used to identify the scan as an ACM suspended transaction, the terminal ID and the transaction number of the order suspended.

4) Force Total Functionality

The Force Total function was introduced to provide on-screen running totals to the lane. The User Exits always provide a total when one is requested by the lane, this ensures the accuracy of running totals by removing the requirement to simulate/calculate the running total manually from the display or Print lines. The function is also used by the ACM lanes to force a balance due line to be printed when the total key is pressed, even if the total has not changed since the last total request.

IBM 4680 Supermarket Application Suspend/Retrieve

Most retailers currently utilize the standard IBM suspend/retrieve functionality. The use of IBM Supermarket Suspend/Retrieve is essential to the efficient operation of the ACM 750.

BOSS – Lane Communication

Physical Connection

Communication between the BOSS and each Lane is accomplished through the use of Transmission-Control Protocol/Internet Protocol also know as TCP/IP. To use this type of communication there must be a Network Interface Card (NIC Card) at each computer, a cable connecting the two NIC Cards (CAT5 Cable) and a series of numbers that distinguishes one computer from another (TCP/IP Address). There are more elements to the equation, but these three are the basics of network communication.

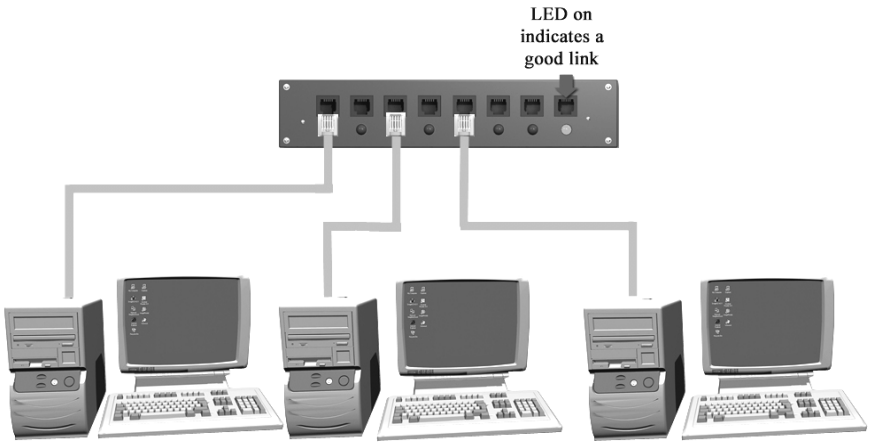


Figure TOD - 14

In most cases, the CAT5 cable mentioned above is connected to a computer on one end and a Hub on the other. A Hub allows multiple devices to be connected to one source. When two Hubs are connected together, the term “Linking” is used. Linking means that the Hubs are linked together on the same Network. This allows you to connect twice as many devices to one source.

It is important to note that the Industry Standard as set by ANSI and TIA/EIA for the maximum length of CAT5 cable is not to exceed 100 meters.

BOSS Manager

As mentioned in the Scale File Processing section, the BOSS Manager program is used to process scale files that are sent to the BOSS. That is only a small portion of what the BOSS Manager does. BOSS Manager is the controller of all BOSS – lane communication. When the BOSS Manager program is running, it is in constant communication through BOSS port with each ACM® Lane using TCP/IP.

There are two levels of BOSS and Lane communications – Socket and FTP. Two text files play a major role in establishing both forms of communication. The first of these text files is called the BOSSConfig.ini file. It contains information needed by BOSS Manager to communicate to each lane. This information includes the number of lanes installed at the location and what the assigned IP Port is for each lane. The second text file is a copy of a file that is located on each lane called the ACM®Config.ini file. Like the

BOSSConfig.ini file, the ACM®Config.ini file contains information that is needed by the lane to communicate to the BOSS including the BOSS' TCP/IP address, the lane TCP/IP address, and the IP port assigned to the lane.

When the BOSS Manager Program is started, it reads the BOSSConfig.ini file to determine how many lanes are installed at the location and what the assigned IP Port is for each lane. It then opens a Listening Port waiting for a response from the lane. When a response is received from a lane, connecting the assigned IP Ports together forms a socket connection.

Example: Three lanes are installed at a location; Lane 1's IP Port is 4001, Lane 2 is 4002, and Lane 3 is 4003. When BOSS Manager is opened, it opens ports 4001, 4002 and 4003 for communication. When Lane One comes online, port 4001 becomes active and a socket is formed for direct communication.

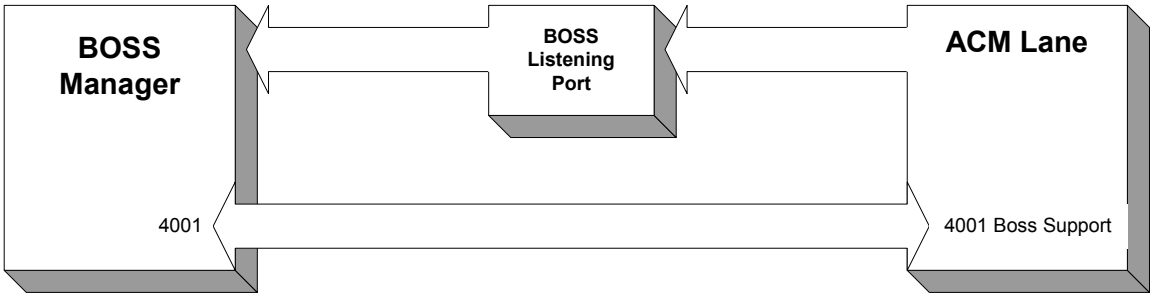


Figure TOD - 15

Sockets allow for constant communication between the BOSS and each lane that is installed. There are three types of information sent via the socket connection:

Transaction Information – Every time an item is scanned an item record is created and sent to the BOSS. As discussed in the database section, this record is sent to both the history and security databases for updating.

System Messaging – Various types of messages like "Shutdown on Reset Button Pressed" and cash system errors. This also includes any time an extract is taken at the lane.

Configuration Information – Changes to the shopper assistant cards and Quick Look-up Screens

In the event that the socket connection is broken, the lane stores this information locally in a pending file. The stored information is called "Pending" because it is waiting to be sent. When the lane is brought to a closed state it tries to synchronize with the BOSS and send the pending information. Synchronization ensures that the information on the BOSS and all the lanes is identical.

Item Processing

When discussing the use and application of the lane functionality, lane software, and POS including security processing remember that it is based on the operation of the ACM 700 full security lane. Height security, and conveyor movement does not apply to the ACM 500. Height, weight and conveyor movement does not apply to the ACM 500.

Now that we have discussed the components of the ACM® system we can start to show you how they work together to accomplish their main goal – process items. Later we

examine the flow of the item process, but first let's process a normal item like a box of corn flakes.

To process an item, the first thing that must take place is the scanning of an item's UPC on the scanner scale. The lane then reads the identify.txt table to determine what type of UPC has been scanned. In our example, the UPC for a box of corn flakes is a normal item UPC. The UPC is next used to query the security database for the item's security record. Once the record is retrieved, the lane uses the item type entry in the security record to determine how to continue processing the item. The item type is normal in our example.

Normal Item Processing

Once the lane determines that the item is normal, the UPC is sent to the POS system requesting the price and description for the item. At the same time, the security conveyor begins moving the item forward and the consumer is asked by the lane to place the item on the belt. As the item travels down the security conveyor toward the front security arch the lane's load cells take a weight measurement for the item. This measurement is compared against the minimum and maximum weight rages in the security record. If the measured weight falls within range, the item's weight is validated.

While weight validation is taking place, the lane has received the item's price and description message sent from the POS. The lane receives this message and filters it through the display and print tables to determine how to process the message information. It matches to the price and description entries and the response is added to the price and description on the electronic and printed receipts.

After the price and description is received and the weight of the item is validated, the item then is allowed to pass through the front arch. When the item first enters the front arch area, it breaks a series of light emitting diodes (LED), which are comprised of an emitter on one side of the arch and a detector on the other. The emitter sends an infrared beam across the arch area that is received by the detector. The lane interprets this condition as an UNBREAK meaning the Inferred beam between the emitter and detector is not broken. When the detectors do not detect the infrared beam from the emitter, the lane interprets this condition as a BREAK. As the item enters the arch area it BREAKS the LED's in the front arch and as it leaves the arch area the LED's that were in the BREAK condition then toggles back to the UNBREAK condition. The lane takes a height measurement from the highest LED that toggled from BREAK to UNBREAK and compare this measurement with the minimum and maximum heights that are recorded in the security record. If the measured height matches a recorded height in the database, the item's height is validated.

Once the item's height is valid, the item continues to travel down the security conveyor toward the rear security arch area. As it passes through the rear arch area, the BREAK – UNBREAK condition is recreated for the rear arch. Unlike the front arch, when the lane receives a BREAK message from the rear arch area the rear conveyor is started and the item is transported to the bagging area and becomes a purchased item.

Figure 1-13 illustrates Normal Item Processing flow.

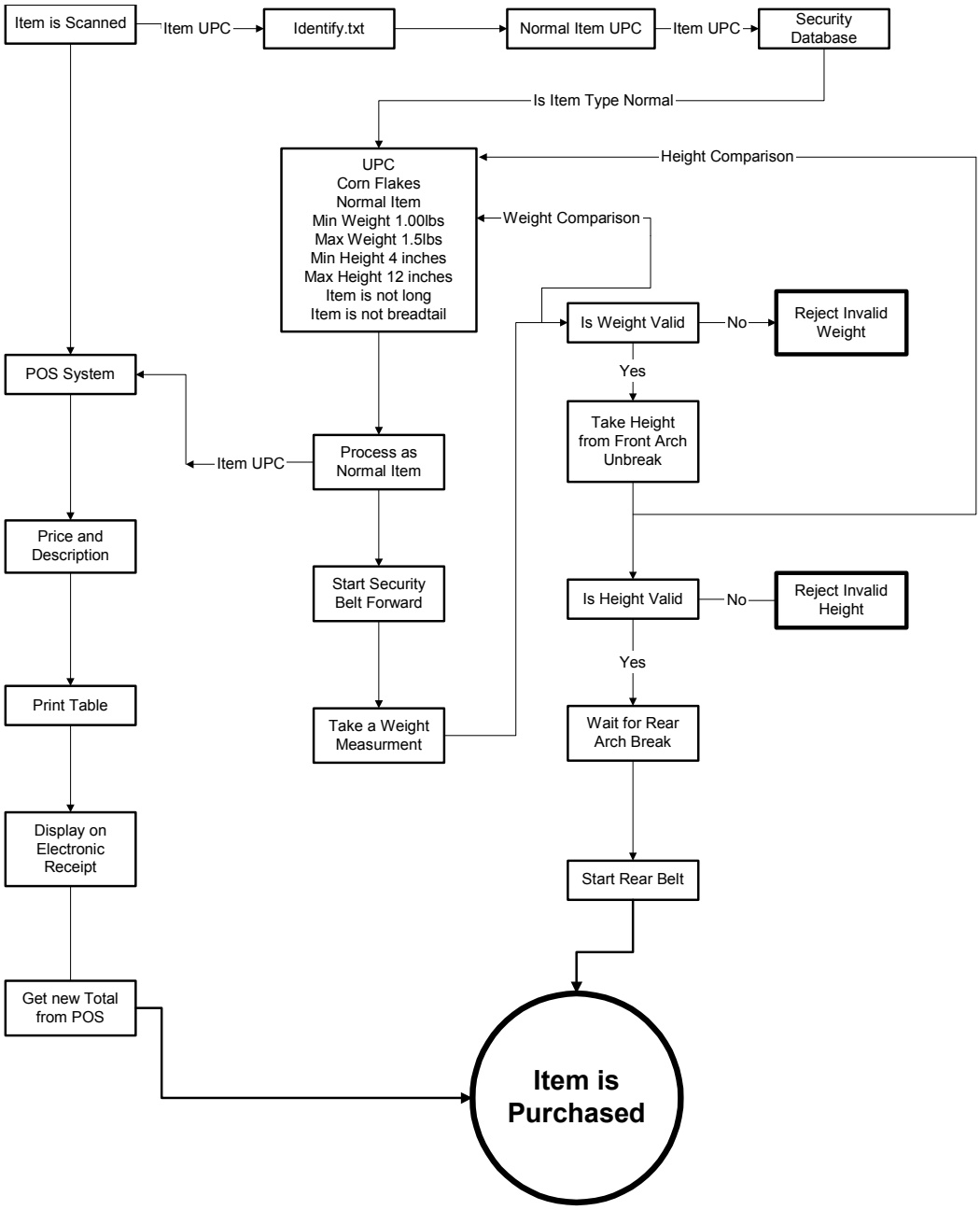


Figure TOD - 16

Keys to Item Processing

There are 5 pieces of information that are required for the item to be processed. They include an item's:

1. UPC
2. Price and Description from the POS
3. Security Record
4. Valid Weight
5. Valid Height

You may have noticed that the first four are needed before the item is allowed to pass through the front arch. If the lane is not able to obtain a stable weight from the load cells, it stops the item at the front arch until a stable weight is received. In the event that a stable weight cannot be obtained lane rejects the item. If the lane does not receive a response from the POS system after the UPC has been sent the lane holds the item at the front arch until a response is received.

The lane always looks at the security record to determine how to handle an item. If the item is new or does not have a security record the lane assumes the item is normal unless identified by the POS as a weight or quantity required item. The height measurement is taken when the item leaves the front arch area. Rear conveyor movement is activated when the item BREAKS the rear arch. While the lane processes an item it creates an item information packet and sends it to the BOSS once the item is purchased.

ACM Handheld Operation

This section discusses how shoppers use the ACM® Handheld to process lane functions. Also included are topics on common issues and tips for easier order processing.

Figure TOD - 17

Overview

The ACM® mobile terminal is a Handheld device used by store personnel to assist customers at the ACM® Lanes while in remote locations of the store. The use of the mobile terminal increases the effectiveness of quick response to ACM® problems.

With the use of the mobile terminal, the shopper assistant can monitor ACM® Lanes and assist customers in a timelier manner while being labor effective in other locations of the store. The mobile terminal was not designed to remove the personal touch of assistance to customers nor to correct every problem that may occur, but merely to enhance productivity of the shopper assistant and front end of the store.

The mobile terminal is one of the first of its kind in the world of wireless communication. Although hundreds of devices exist in today's world for wireless communication, the ACM® Mobile Terminal is the first of its kind and the only mobile device that can be used to control ACM® functionality.

Since wireless communication has been around for so long there are several different ways to configure and design a wireless network. The ACM® Handheld can be utilized with two basic types of wireless communication: Frequency Hopping and Direct Sequence sometimes referred to as 802.11(Frequency Hopping) and 802.11b (Direct Sequence).

WLAN (Wireless Local Area Networks)

A wireless local area network (LAN) is a flexible data communications system implemented as an extension to, or as an alternative for, a wired LAN. Using radio frequency (RF) technology, wireless LANs transmit and receive data over the air, minimizing the need for wired connections. Thus, wireless LANs combine data connectivity with user mobility.

Wireless local area networks (WLANs) are the same as the traditional LAN but they have a wireless interface. With the introduction of small portable devices such as PDAs (personal digital assistants), the WLAN technology is becoming very popular. WLANs provide high-speed data communication in small areas such as a building or an office. It allows users to move around in a confined area while they are still connected to the network. Examples of wireless LAN that are available today are NCR's wave LAN and Motorola's ALTAIR.

WLANs use electromagnetic airwaves (radio or infrared) to communicate information from one point to another with out relying on any physical connection. Radio waves are often referred to as radio carriers because they simply perform the function of delivering

energy to a remote receiver. The data being transmitted is superimposed on the radio carrier so that it can be accurately extracted at the receiving end. This is generally referred to as modulation of the carrier by the information being transmitted. Once data is superimposed (modulated) onto the radio carrier, the radio signal occupies more than a single frequency, since the frequency or bit rate of the modulating information adds to the carrier.

Multiple radio carriers can exist in the same space at the same time without interfering with each other if the radio waves are transmitted on different radio frequencies. To extract data, a radio receiver tunes in one radio frequency while rejecting all other frequencies.

In a typical wireless LAN configuration, a transmitter/receiver (transceiver) device, called an access point, connects to the wired network from a fixed location using standard cabling. At a minimum, the access point receives, buffers, and transmits data between the wireless LAN and the wired network infrastructure. A single access point can support a small group of users and can function within a range of less than one hundred to several hundred feet. The access point (or the antenna attached to the access point) is usually mounted high but may be mounted essentially anywhere that is practical as long as the desired radio coverage is obtained.

End users access the wireless LAN through wireless-LAN adapters, which are implemented as PC cards in notebook or palmtop computers, as cards in desktop computers, or integrated within hand-held computers, or in our case as the remote Shopper Assistant. Wireless LAN adapters provide an interface between the client network operating system (NOS) and the airwaves via an antenna. The nature of the wireless connection is transparent to the NOS.

Access Points (AP)

Access points are network HUBS used to connect wireless components to a LAN. Access points must have a physical (wired) connection to the network. There is no requirement on where an access point has to be located for purposes of connecting it to the network. The wired connection to the network must follow the standard requirements of CAT5 cabling as in wired networks. Access points are responsible for receiving and transmitting modulated data to and from wireless clients. A typical access point has a range of less than 100 feet up to 300 feet indoors. Access points do require some level of configuration for networks. An access point (in ACM® mobile terminal usage) is assigned an IP address just as other components connected to the network.

Access points also require a source of power input for operation. There are two ways to power an access point, depending on the type of access point being used. One way is using an external power supply. External power supplies connect directly to a 110 VAC outlet and provide 48 VDC to the access point for operation. The other way is to have the 48 VDC provided through the CAT5 Ethernet cable. However, when power is supplied through the Ethernet, NO other network components should be connected to the Access point.

Access points have a finite range, on the order of 500 feet indoor and 1000 feet outdoor. In a very large facility such as a warehouse, or a college campus it may be necessary to install more than one access point. Access point positioning is accomplished by means of a site survey. The goal is to blanket the coverage area with overlapping coverage cells so that clients might roam throughout the area without ever losing network contact.

The ability of clients to move seamlessly among a cluster of access points is called roaming. Access points hand the client off from one to another in a way that is invisible to the client, ensuring unbroken connectivity.

Extension Points (EP)

Extension points can be referred to, what we call in the wired network, as a repeater. Extension points look just like access points but are not physically connected to the LAN. An extension point's job is to relay data from WLAN clients and other extension points to and from access points. Extension points require the same 48 VDC for operation; however, it is provided only from an external power supply since the extension point has no physical connection to the LAN.

Extension points are used in a WLAN when the range of the network needs to be extended beyond the means of the access point. The number and placement of extension points is determined by performing a site survey. The survey assists the network designer in determining the best placement of the access and extension points to achieve the goal of providing the best coverage needed for the application. Just like an access point, an extension point's range is based on the type of extension point used.

Extension points may be used to augment the network of access points in large areas. Extension point's look and function like access points, but they are not tethered to the wired network, as are APs. EPs function just as their name implies; they extend the range of the network by relaying signals from a client to an AP or another EP. EPs may be strung together in order to pass along messaging from an AP to far-flung clients, just as humans in a bucket brigade pass pails of water hand-to-hand from a water source to a fire.

The greatest disadvantage to using extension points is the loss of throughput. Throughput, meaning the number of remote devices that the extension point can transmit to or receive from at one time, is cut by one half for every extension point in stalled. For example, lets assume an access point has a throughput of 20, with one extension point added the throughput is now 10, with two extension points added the throughput is now 5 and so on.

Range and Coverage

The distance over which RF (Radio Frequency) can communicate is a function of product design (including transmitted power and receiver design) and the propagation path, especially in indoor environments. Interactions with typical building objects, including walls, metal, and even people, can affect how energy is propagated, and thus what range and coverage a particular system achieves. Solid objects block infrared signals, which imposes additional limitations. Most wireless LAN systems use RF because radio waves can penetrate most indoor walls and obstacles. The range (or radius of coverage) for typical wireless LAN systems varies from under 100 feet to more than 300 feet. Coverage can be extended using extension points.

Another key aspect to remember when determining a range, is the speed at which the WLAN communicates; the faster the communication, the shorter the range. WLANs can communicate at 4 different speeds, 1bps, 2bps, 5.5bps, or 100bps. Therefore, a 1bps WLAN has a greater range than a 100bps WLAN.

Frequency Hopping Spread Spectrum Technology

Frequency-hopping spread-spectrum (FHSS) uses a narrowband carrier that changes frequency in a pattern known to both transmitter and receiver. Properly synchronized, the net effect is to maintain a single logical channel. To an unintended receiver, FHSS appears to be short-duration impulse noise.

Direct Sequence

Direct-sequence spread-spectrum (DSSS) generates a redundant bit pattern for each bit to be transmitted. This bit pattern is called a chip (or chipping code). The longer the chip, the greater the probability that the original data can be recovered (and, of course, the more bandwidth required). When one or more bits in the chip are damaged during transmission, statistical techniques embedded in the radio can recover the original data without the need for retransmission. To an unintended receiver, DSSS appears as low-power wideband noise and is rejected (ignored) by most narrowband receivers.

Note: It is important to remember that components of FHSS and components of DSSS are not compatible with each other.

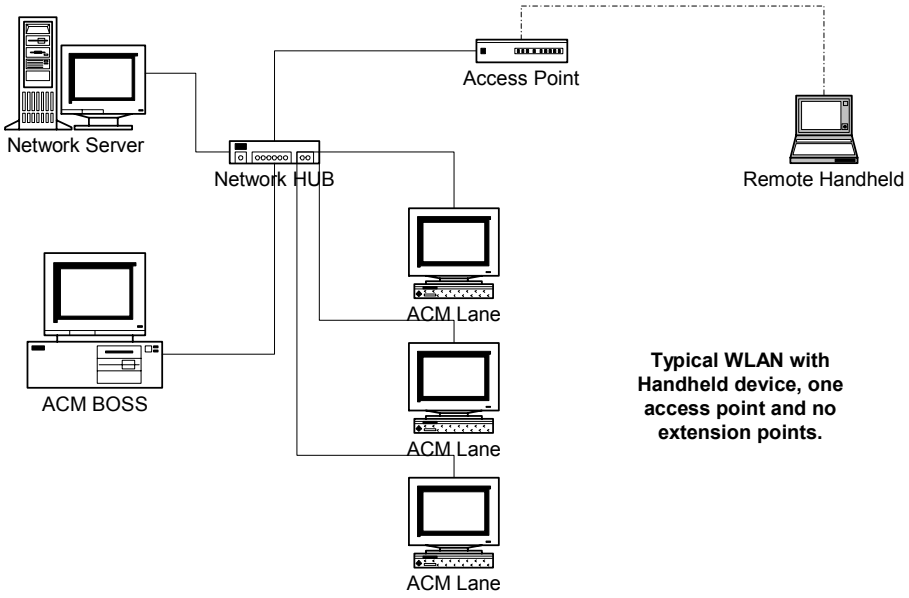


Figure TOD - 18

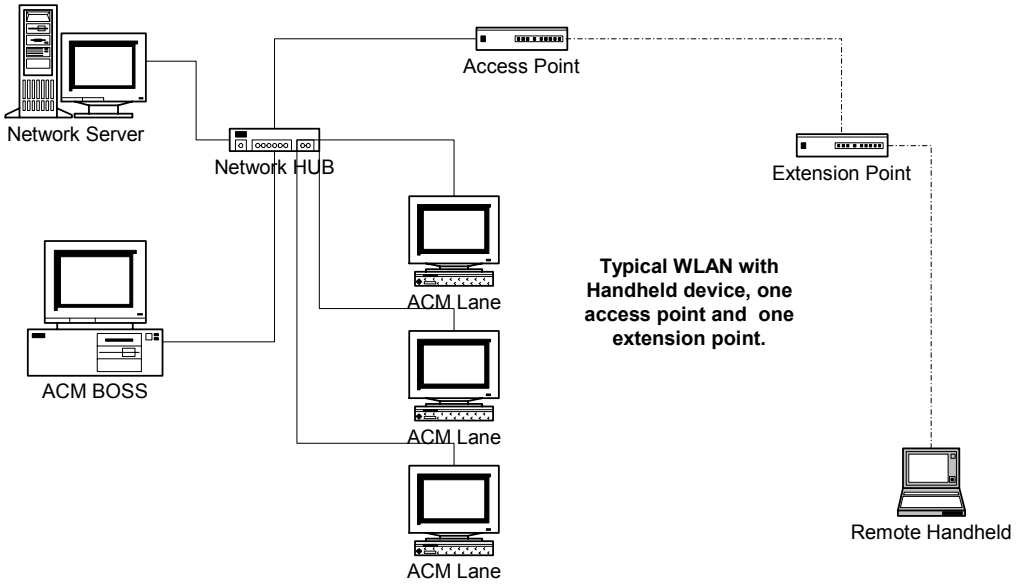


Figure TOD - 19

The above diagram depicts the connections in two typical scenarios of WLAN connections using access points and extension points. This diagram does not simulate the coverage range of access or extension points.

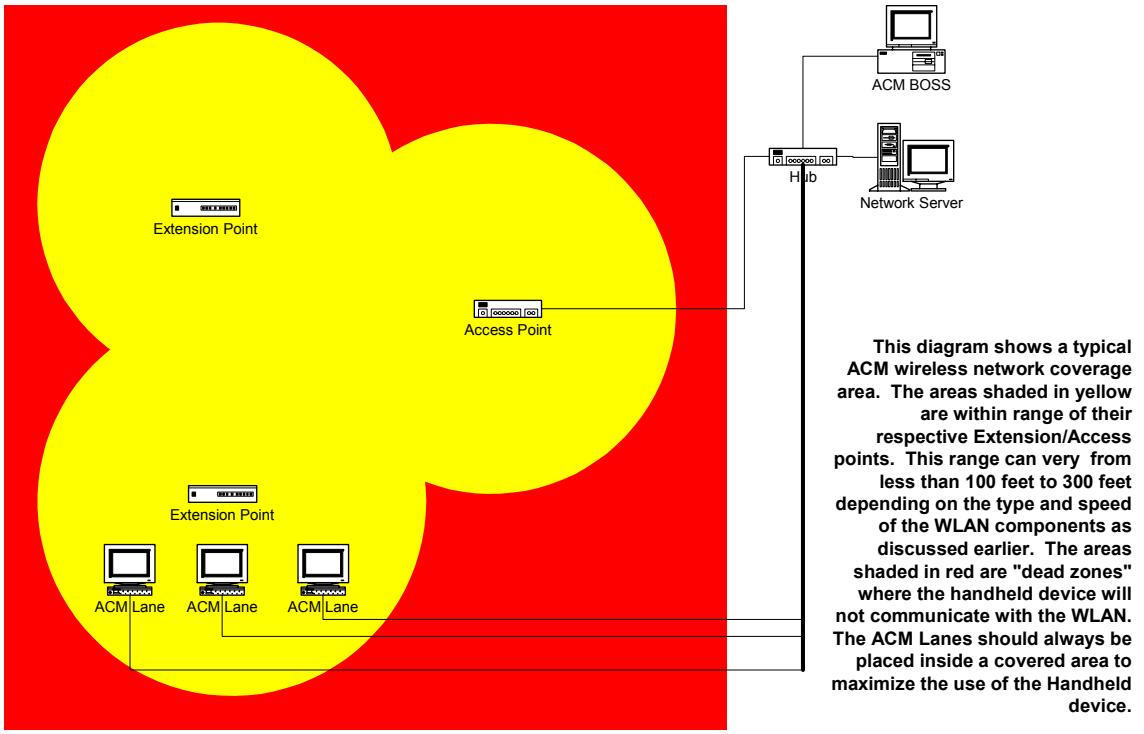


Figure TOD - 20

ACM® BOSS

The mobile terminal server component consists of an application that is to be executed on the BOSS PC. The mobile terminal server application runs in the system tray. The operating system is configured to start this application when the Operating System is booted. A user can access this application by double-clicking the icon in the system tray or by clicking a quick launch button on the BOSS Application Bar. The intended users of this application are technical support personnel and/or store personnel who are responsible for the overall operation of the ACM® system. The key functions of this application include:

- Provides the ability to specify the number and identification of each Handheld device present in the ACM® system.

Providing the ability to assign specific ACM®s to be monitored by specific mobile terminal clients. This configuration would determine which mobile terminal clients would receive status information from a given ACM®.

Providing the ability to define “security levels” for each user in the system using the existing user definitions already present in the base ACM®-750 system. These security levels define what functionality is available to each user who signs-on to a mobile terminal client.

- Communicating/updating ACM® Mobile Terminal configuration and shopper assistant security information to all connected mobile terminals.

Providing the ability to set up and configure the operating system on a new/un-configured Handheld device for operation as an ACM® Mobile Terminal to the extent allowed by the operating system. This includes network configuration.

- Providing the ability to install, update and/or configure the mobile terminal client software on the handheld device.
- Providing the ability to define how mobile terminal clients handle ACM® mobile terminal agent notifications based on a "pre-set time option".

ACM® Lane

The ACM® mobile terminal agent is comprised of several software modules that are to be integrated into the Lane and BOSS support applications that currently execute on the physical ACM® lane. The key requirements of this component include:

- Ability to communicate wirelessly with all mobile terminal handheld devices. The ACM® mobile terminal agent uses the TCP/IP protocol to communicate with the mobile terminal client application running on each Handheld device.
- Collecting and communicating ACM® lane application state information and transmitting this information to each connected mobile terminal client.
- Receiving problem resolution response and status acknowledgement messages from all connected mobile terminal clients.
- Resolving contention between multiple Handheld devices in an ACM® system to ensure that only one given Handheld is permitted to respond, resolve, or acknowledge a given issue present on an ACM® lane.
- Resolving contention between Handheld devices in an ACM® system and the user-interface of the ACM® lane to ensure that either a shopper assistant present at an ACM® lane or a given Handheld is permitted to respond, resolve, or acknowledge a given issue present on an ACM® lane.
- Enforcing user-level security to ensure that users of the mobile terminal client are authorized to perform various operations on the ACM® lane.

Handheld Device

The mobile terminal client is the application that runs on the actual handheld device. This application is deployed on a wireless, handheld device capable of running a Microsoft 32-bit Windows operating system, such as Windows CE (Pocket PC) or Windows 2000. This device must communicate with an 802.11 (FHSS) or 802.11b (DSSS) (Wi-Fi) wireless local area network (WLAN). **The retailer is responsible for the overall security of the WLAN including safeguarding against electronic eavesdropping.** In order to fully support the ability to add items to a transaction on an assigned ACM®, the device must also have an integrated or attached barcode scanner.

The intended user of the mobile terminal client is the ACM® shopper assistant who uses the device to resolve issues requiring his/her attention and/or intervention and to monitor the operation of the ACM®s "assigned" to the mobile terminal client. The key requirements of the mobile terminal client include:

Connecting and communicating wirelessly with the ACM® mobile terminal agents executing on all assigned ACM®s using the wireless LAN adapter installed on the Handheld device. The mobile terminal client application communicates with the mobile terminal agent using the TCP/IP network protocol.

Providing application-level, user-based security to allow only authorized users to access the functionality of the mobile terminal client application. This user-based security also determines the functionality available to the shopper assistant who signs-on to a given mobile terminal client.

Providing a user-interface to display all relevant status information for all connected ACM®s (i.e. system summary) to which the mobile terminal client is "assigned". The user-interface must display this information in a format that is consistent, easy to read and easy to understand.

- Providing a user-interface to allow the user to acknowledge various informational messages pertaining to a specific ACM® and resolve various issues, problems and errors that occur on a specific ACM®.
- Providing a user-interface to allow the user to add single or multiple items to a new or open transaction on an "assigned" ACM®, utilizing a barcode scanner that is connected to or integrated with the Handheld device.
- Providing a user-interface to allow the user to request an ACM® to close.

Typical WLAN communication flow with ACM® Mobile Terminal

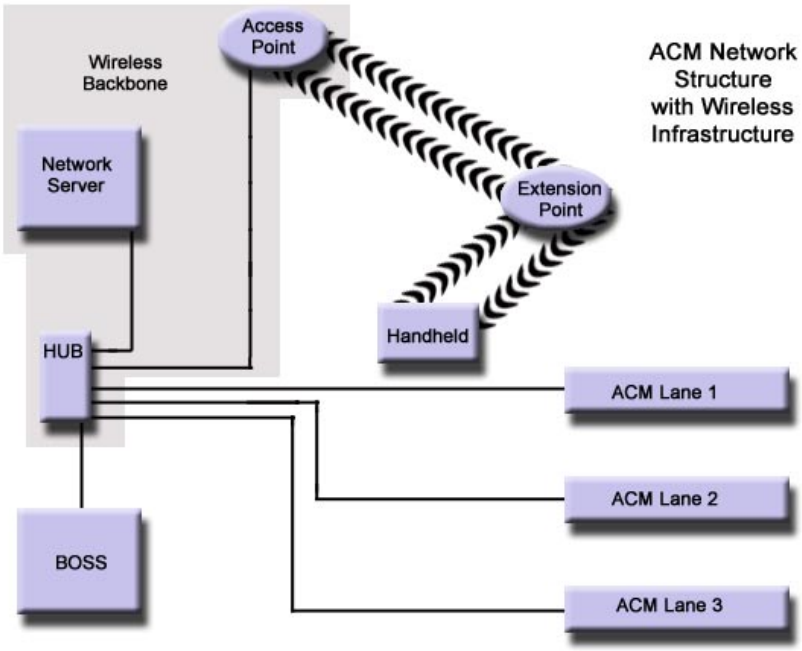


Figure TOD - 21

ACM® Handheld Software Interface

The Handheld consists of 3 major software components:

- A Handheld application executed on all handheld units.
- ACM® Lane application executed on all ACM® Lanes.
- A Handheld Server application executed on the ACM® BOSS.

The ACM® Handheld

The intended user of the Handheld is the ACM® Shopper Assistant, who uses the device to resolve order issues requiring attention and/or intervention, and to monitor the operation of the ACM® Lanes "assigned" to the Handheld. The key requirements of the Handheld include:

- Connects and communicates wirelessly with the ACM®
- Provides individual security to allow only authorized users to sign on to a Handheld.
- Displays all relevant status information (i.e. system summary) for connected ACM® 's that are "assigned" to that Handheld.
- Allows the user to acknowledge various informational messages pertaining to a specific ACM® and resolve various problems and errors that occur.
- Allows the user to add single or multiple items to a new or open transaction on an "assigned" ACM®, utilizing the barcode scanner integrated with the Handheld device.
- Allows the user to request an ACM® to close from a remote location.

The Handheld can add items to an order using an internal scanner before the order has been suspended in the POS or before the order has been completed using any one of the "Pay at the Lane" options. To add items to an order, the order must be open on the ACM® Lane. Items cannot be added to orders with the Handheld after the order has been retrieved at the paystation.

ACM® Lane

The key requirements of the ACM® Lane include:

- Ability to communicate wirelessly with all handheld devices.
- Collecting and communicating ACM® Lane status and notifications then transmitting this information to each connected Handheld it is assigned to.
- Receiving problem resolution response and status acknowledgement messages from connected Handhelds.
- Resolving confusion between multiple, logged on, Handheld devices in an ACM® system to ensure that only one given Handheld is permitted to respond, resolve, or acknowledge a given issue reported.
- Resolving confusion between Handhelds and the ACM® Lane to ensure that either a shopper assistant present at an ACM® Lane or a given Handheld is permitted to respond, resolve, or acknowledge a given issue reported.
- Enforcing user-level security to ensure that users of the Handheld are authorized to perform various operations on the ACM® Lane.

Back Office System server (Boss)

The key requirements of this application include:

- Provides the ability to specify the number and identification of each Handheld.
- Provides the ability to assign specific ACM®s to be monitored by specific Handhelds. This configuration determines which Handheld receives status information from a given ACM®

- Provides the ability to define “security levels” for each user in the system using the information already contained in the Shopper Assistant Database of the BOSS.
- Communicating/updating ACM® Handheld configuration and shopper assistant security information to all connected Handhelds.
- Provides the ability to setup and configure the operating system on a new/unconfigured Handheld device for operation as an ACM® Handheld to the extent allowed by the operating system, including network configuration.
- Provides the ability to install, update and/or configure the handheld software on the handheld device.
- Provides the ability to define how Handhelds display ACM® Lane notifications based on a “pre-set time option”.

Index