



The Skinny on.... RFID and Automated Materials Handling in Libraries

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Why we are here

- Library is planning and designing new libraries and looking at service model changes
- Can RFID or AMH help support those changes?
- And if so, what do we need to know?

Define Terms

- RFID – Radio Frequency Identification
- AMH - Automated Materials Handling
 - Smart bookdrop
 - Automated (self) check-in
 - Library sorter
 - Central sorter

Implementing RFID

- All circulating material is tagged
- Security gates are replaced
- Self-checks replaced or upgraded to RFID
- Staff workstations get RFID readers



Implementing AMH

Don't have to leap all at once:

- Put in as part of new building project or remodel, or
- Selectively roll-out at branches based on volume, space, staffing, etc, or
- Put in central sorter at Operations center only





AMH DOESN'T REQUIRE RFID

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AMH with Barcodes

- Items have to be inserted barcode up, so scanner can read them, or
- Employ top and bottom scanners, which costs more, or
- Have sorter reposition items, which costs more and takes up more space.

AMH with RFID

- Items can be inserted any which way
- Avoids problem of smudged barcodes
- Security switched at same time so a more compact system overall
- Provides benefit of verifying that right disc is inside case for single disc media items
- Provides benefit of recognizing when last disc is missing from multipart sets

Let's get a little into the weeds....



UNDERSTANDING RFID

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Two Primary Components

1. RFID Tag

- aka “transponder”
- composed of
 - substrate
 - chip
 - antenna

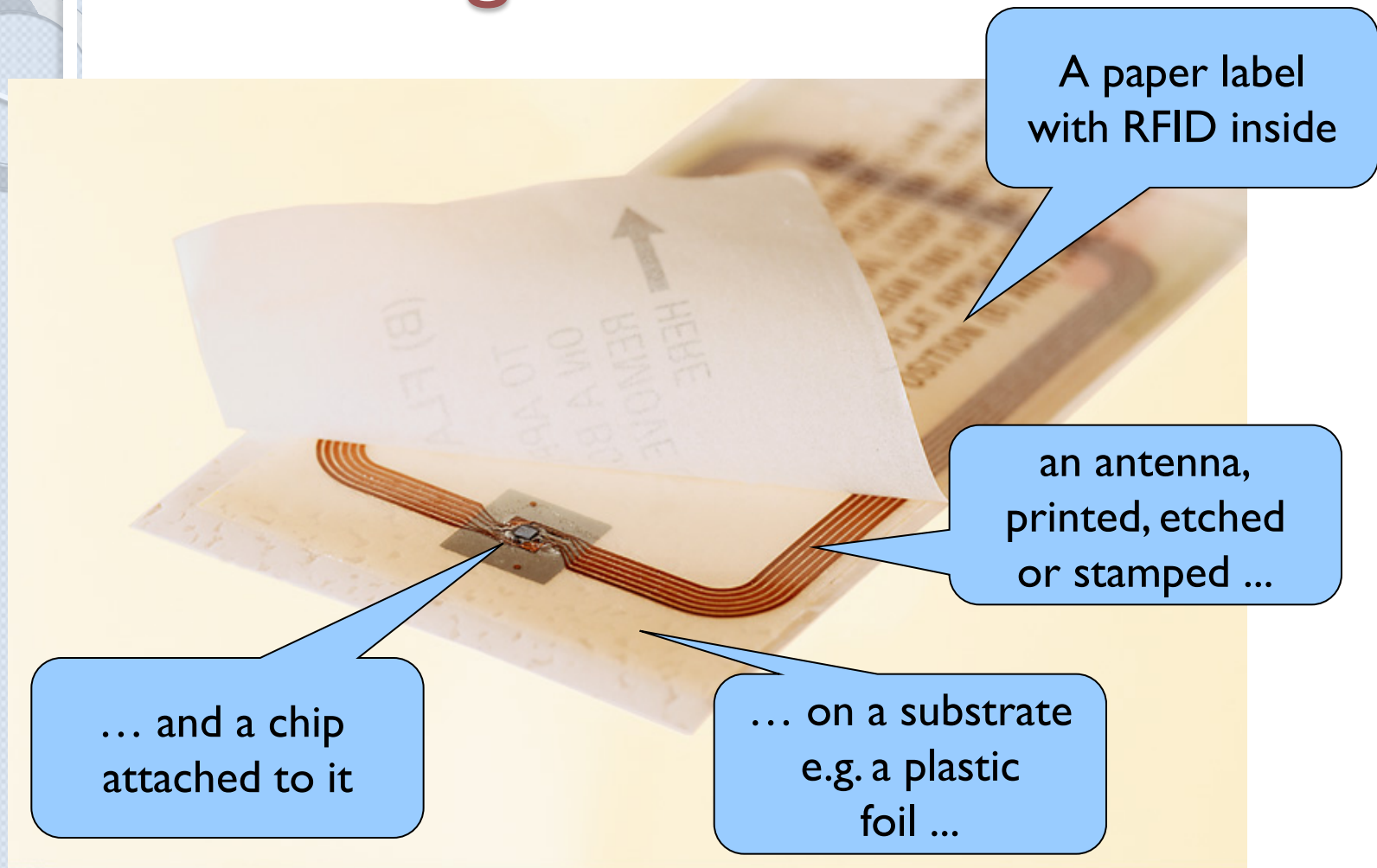


2. RFID Reader

- aka “interrogator”
- built into
 - security gates
 - staff workstation pads
 - handheld readers
 - self-checks
 - sorters
 - etc



RFID Tag



Types of Tags

RFID Tags	Low Frequency (LF)	High Frequency (HF)	Ultra High Frequency (UHF)
Frequency	125 kHz	13.56MHz	400 MHz to 1GHz
Operating Distance	30 cm to 1 meter	10 cm to 1 meter	Passive: up to 25 meters Active: up to 100 meters
Characteristics	Short read range and read range is easier to control. Handle metal and water better than UHF. Can be affected by industrial noise. Slower data transfer rate. Cannot always communicate with multiple tags.	Short read range (especially NFC tags). Read range is easier to control than UHF. Not as effective as LF in presence of metal and water but better than UHF. Unaffected by industrial noise. Can communicate with multiple tags simultaneously.	Long read range. Fast reading of multiple tags. Less tag memory than HF. Poor performance around liquids and metals. Operate in a crowded frequency.
Applications		Library materials management and security, access control, banking cards, contactless payment systems, goods control, security.	Asset tracking, supply chain, logistics, tool booths, real-time locating systems, container security, library material management and security (limited)



Libraries use Passive HF Tags

- Passive
 - Unpowered
 - Rely on the reader to generate power to transmit data on tag
- HF
 - High Frequency (13.56 MHz)
 - Current standard applies only to HF tags

Types of *Library* RFID Tags

Form Factor/Name	Used for	
Square Tags	Books, Media Cases, Periodicals, Kits	Multiple manufacturers
Credit Card Tags / 3M ISO RFID Tag	Books, Media Cases, Periodicals, Kits	Multiple manufacturers 3M has their own version with modified antenna
Donut/Hub Tags	CDs, DVDs, BluRay	Multiple manufacturers
Full Coverage Media / Stingray	CDs, DVDs, BluRay	SMARTRAC Stingray FCI Smartag X-Range
SmartLabel 500	Laptops, iPads, eReaders, etc	Bibliotheca

Storing Data on the Tag

- Some libraries store only a barcode number on tag
- Since adoption of US Data Model, many use “Set Info” and “Owner Institution”
- US Data Model supports over 25 elements



RFID AND SECURITY

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RFID Security Gates

- Security gates must be replaced since EM is based on completely different technology
- RFID-based gates read tag data to determine if items are properly checked out, three options



RFID Security Options

1. Application Family Interface (AFI)
 - ISO 28560 compliant
 - Switches between 2 (usually) statuses:
 - “circulating library material”
 - “non-circulating library material”
 - Prevents library tags from being read in non-library environments
2. Electronic Article Surveillance
3. Database look-up



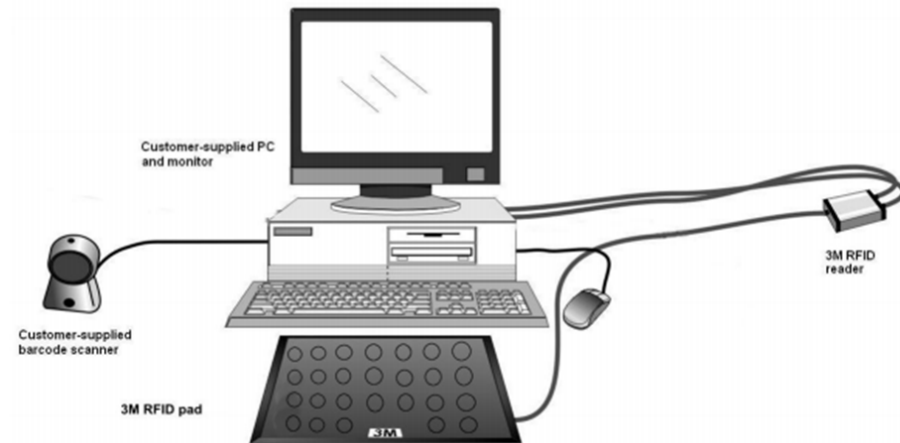
RFID STAFF WORKSTATIONS

How Many Staff Workstations?

- Only need to retrofit workstations that change security status of items:
 - Circulation desk
 - Technical Services
- Barcodes and barcode scanner can still be used to pull up items in ILS
- Typically need only 3-5 staff workstations converted to RFID per location

RFID Staff Workstation Components

- RFID pad (antenn
- RFID reader
- Software



Staff Workstation Software

- Two options not ideal
 - RFID Reader acts like Barcode Scanner, or
 - RFID / ILS provide proprietary solution
- Very important to demo during procurement

RFID and Self Service

RFID rarely implemented without making bigger commitment to self-service





RFID AND SELF CHECK-OUT

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RFID Can Increase Self-Check if Implemented Properly

- Patrons need help transitioning to RFID
 - check-out and security are two steps, but
 - easy for patrons to skip second step
- Must tag **EVERYTHING** that circulates

Converting Self-Check Out Machines

- Most self-check machines can be easily converted to RFID
- Just a matter of adding an RFID pad to existing system
- 3M's V-Series might need a wedgie



The standard: 3M V-Series



Self Check Table Tops



Self Check Kiosks



Bibliotheca SmartServe 400



Bibliotheca SmartServe 400 Payment

- *Attached* to their new self check-out machine
- Accepts credit cards, debit cards, and cash



Tech-Logic CircIT Combo Station

- Option for 2 screens
- Designed for use at service desk
- Touch screen for patrons
- Staff can quickly resolve issues

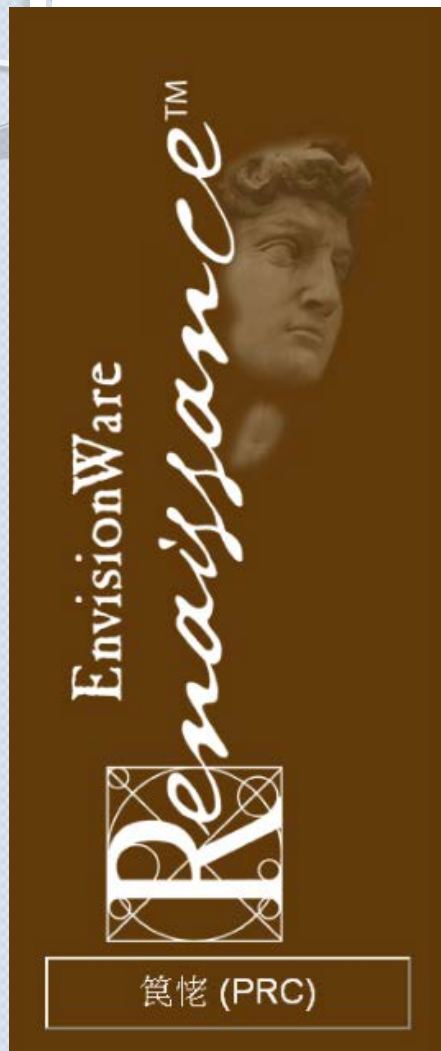


Tech-Logic In-Desk Credit Card Swiper and Receipt Printer



Envisionware Print Station Becomes Full Service Self-Check

Self-Service Station



Main Menu



Check Out Materials



View and Pay My Fines



Release My Print Jobs



Reserve a Computer



RFID AND SELF CHECK-IN

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RFID-Enabled Return Shelves

- Bibliotheca Smartblade 210
- Demco Intelligent Trolley



Multipurpose Kiosks

- Lyngsoe Reservation Garage
 - Holds go in lockbox
 - Returns to shelf
- D-Tech Kiosk
 - Holds to slot
 - Returns to shelf



RFID Portable Wands and Handhelds

- PDA style handhelds can do check-in and check-out
- Wand style are for shelf-checking and inventory
- None are great....yet





MEDIA DISPENSERS

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Bibliotheca SmartDispenser 200

- 500 discs per tower
- RFID or Barcode



Can Add Multiple Towers





VENDING MACHINES

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Envisionware 24-Hour Library

- RFID or Barcode
- Pick up holds, search & borrow, return
- Not self-loading



mk LibDispenser

- RFID Only
- Books and media
- Based unit holds 796 items
- Expansion modules store 378 items
- Walk-up use or full OPAC access



Bokomaten

- RFID Only
- Books and media
- Borrow from and return to machine
- Holds 400 items
- Makes returned items available at kiosk



PIKInc Lending Library



- Barcode or RFID
- Books and Media
- Doesn't accept returns
- Staff must handle check-in and restocking
- Most popular of book vending machines



NEW RFID PRODUCTS

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Bibliotheca SmartStock 500

- Read up to 50 tags at once
- Bulk receive items
- “RFID Tunnel”



D-Tech Air Self-Check with MultiTouch Screen



Bibliotheca SmartStock 600

- Detects items on the shelf in real-time
- Can search for items and find out where they actually are
- Utilizes cover-flow display to assist in searching



Tech Logic MyMobileLibrary



- Mobile self-check-out application
- Uses Boopsie
- Check-out with smartphone
- Requires security kiosk to turn off security



OTHER RFID CONSIDERATIONS

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Potential Benefits of RFID

- Higher self-check rates
- Better A-V handling
- Recover lost material
- More accurate catalog
- Pull holds faster
- Inventory more likely
- Ergonomic benefits for staff



Privacy Concerns

- *Hot listing*: build a database of bar code numbers of interest and see who's carrying those books
- *Tracking*: keep track of someone based on multiple reads of a book they are carrying



Health Concerns

- Electromagnetic radiation (EMR)
- Interfering with medical devices
 - Pacemakers
 - Hearing aids
 - Cochlear Implants



San Francisco Public Library 2005 Report on EMR

“... currently available research and studies on radio frequency exposure to devices in the frequency range at which an RFID system for libraries operates do not suggest any health risks from radiofrequency (RF) exposures below guideline levels.”

Medical Devices

- No known issues with pacemakers or hearing aids
- Issues with cochlear implants:
 - “There is no risk of damage to the implant or equipment from these detectors but some users prefer to switch off their speech processor because they may hear a sound as they pass through. Occasionally the security system may be activated by the implant so so it is a good idea to have the ID card to hand.”*
 - Source: British Cochlear Implant Group (2012)



TWO COMPLICATING ISSUES FOR RFID IN LIBRARIES

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Smartphones and RFID

- Potential threat of vandalism to RFID tags with NFC-enabled smartphones

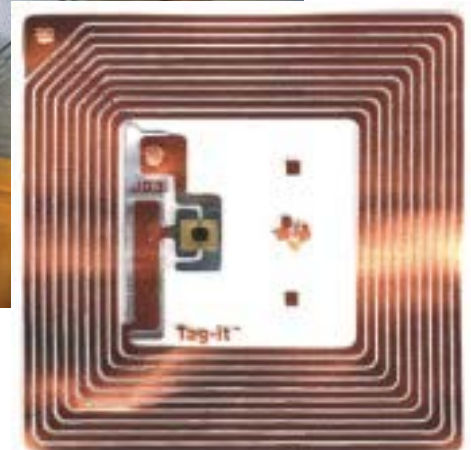




If UHF RFID a better choice than HF?

- US Standard based on HF but modifying it to support UHF
- All but two libraries in the US use HF RFID tags – maybe three soon
- UHF used in supply chain – evolving fast

Maybe, if libraries used UHF tags.....



Central Sorters
Library Sorters



SORTERS

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CENTRAL SORTERS FOR INTERLIBRARY DELIVERY

Functionality to Look For

- **Multiple Sort Plans**
 - handle more locations without increasing size of sorter
 - more granular sort
- **Flexible sort discharge options**
 - switch from totes to bins
 - useful with multiple sort plans
- **Labeling**
 - apply Hold slip? (vaporware still)
- **Support for batch check-in**
 - track items sorted to a bin or tote (manifest)
 - receiving library scans bin or tote to check-in all items

Variations in Induction on Central Sorters

Three options:

- One-at-a-time induction (most common)
- Place on conveyor (TechLogic)
- Unloaders (TechLogic)



Footprint and Space Issues

- Some inexpensive sorters can't handle tricky spaces, e.g.
 - around corners
 - through rooms
 - level changes
- Some sorters take up more space than others



Efficiency of Central Sorters

Factors contributing to efficiency

- Staffing required to “man” the sorter
- How much sorting time will be reduced
- How accurate the sorter is
- How well you’ve configured it for your needs

Lyngsoe High Volume Circular Sorter



http://www.youtube.com/watch?v=etz_eejYZM

Tech-Logic High Volume Sorter



Envisionware/P.V. Supa Linear Central Sorter



EnvisionWare Modular Sorter - Central Sorter at Las Vegas-Clark County Library District

Lyngsoe 3-in-1 Sorter

- 17-34 sort destinations
- Library and central sort plan



Automated Check-in



LIBRARY SORTERS

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Differences Between Library Sorters

- Functionality of conveyor and sorter
- Induction
 - Drop and Go or One-At-a-Time Induction
 - For interior or exterior use
 - For patron or staff use
 - Interface
- Flexibility in configuration
- Curb appeal
- Footprint

Simple Internal One-at-a-Time Patron Inductions

- Doesn't get simpler than this:
- Red / Green Light
- No Touch Screen
- No Access Door
- No Reject Option



External Check-ins

What to look for:

- Can you see the screen?
- Access door
- Ease of use
- Touch screen
- Clear instructions



Don't
forget the
shelf!





SMALL SELF- CHECK-INS WITH SORTERS

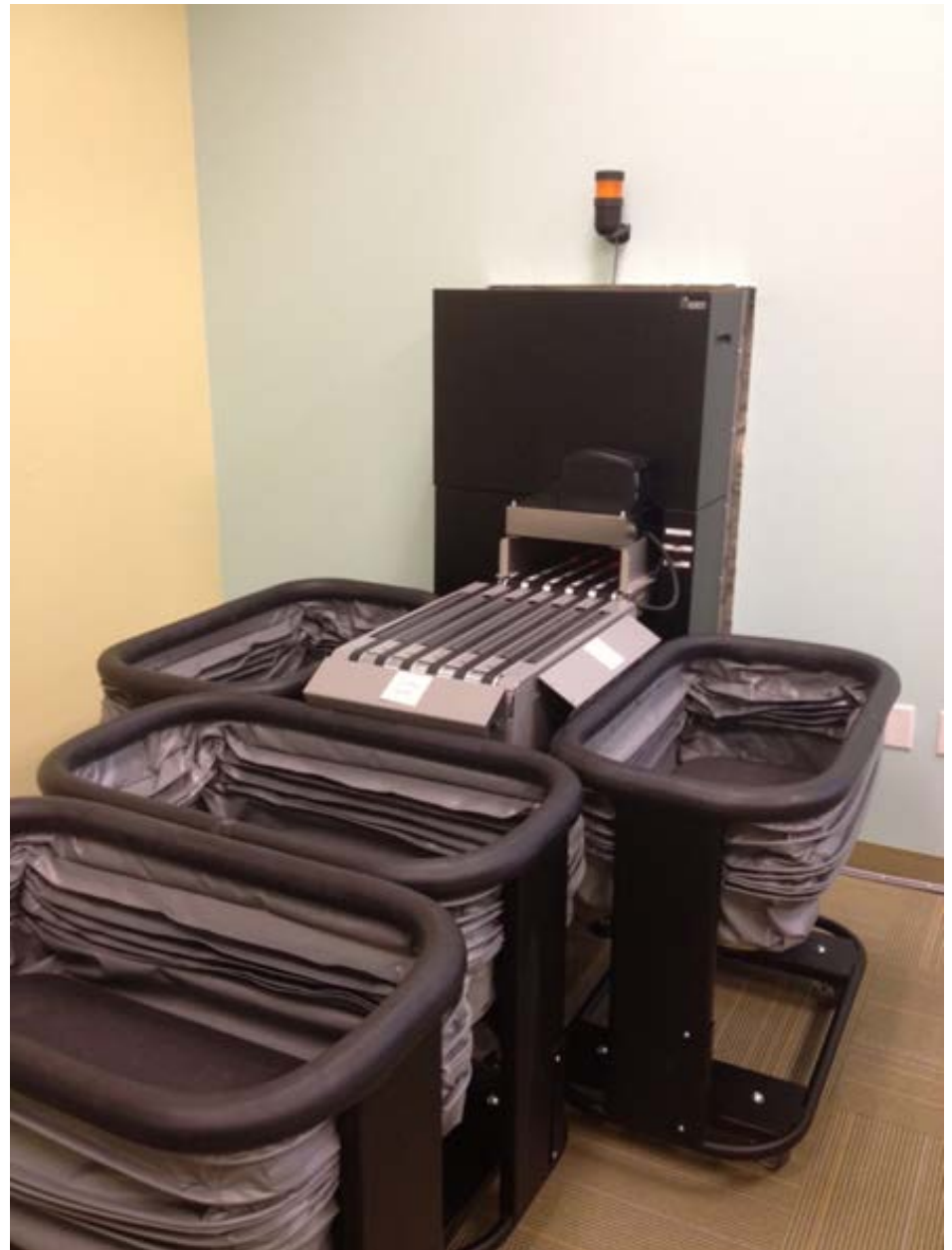
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Benefits of Check-in with 3-bin Sort

1. Immediate check-in for patrons
2. Eliminates check-in from staff workflow
3. Separates ready-to-shelve returns from items requiring additional handling
4. Can be used to separate media or items for delivery

Lyngsoe – 3 bin with patron induction



Another
Lyngsoe
3-bin
Sorter
with
patron
induction



Envisionware WhisperSort



3M Intelligent Return Plus



For Patron and Staff Induction



MEDIUM SIZED SORTERS

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Bibliotheca 7-bin with two Patron Inductions



3M 7-bin with Two Patron Inductions



Lyngsoe I I-bin Sorter with Patron and Staff Induction



Bibliotheca 7-bin, 3-induction





LARGE LIBRARY SORTERS WITH MULTIPLE INDUCTIONS

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Tech-Logic on Speed



This video is not real-time. It has been sped up a bit.

Lyngsoe 28-bin, 3-Inductions



How to Get More Info:

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More resources:

www.galecia.com

<http://www.pinterest.com/galecia/>