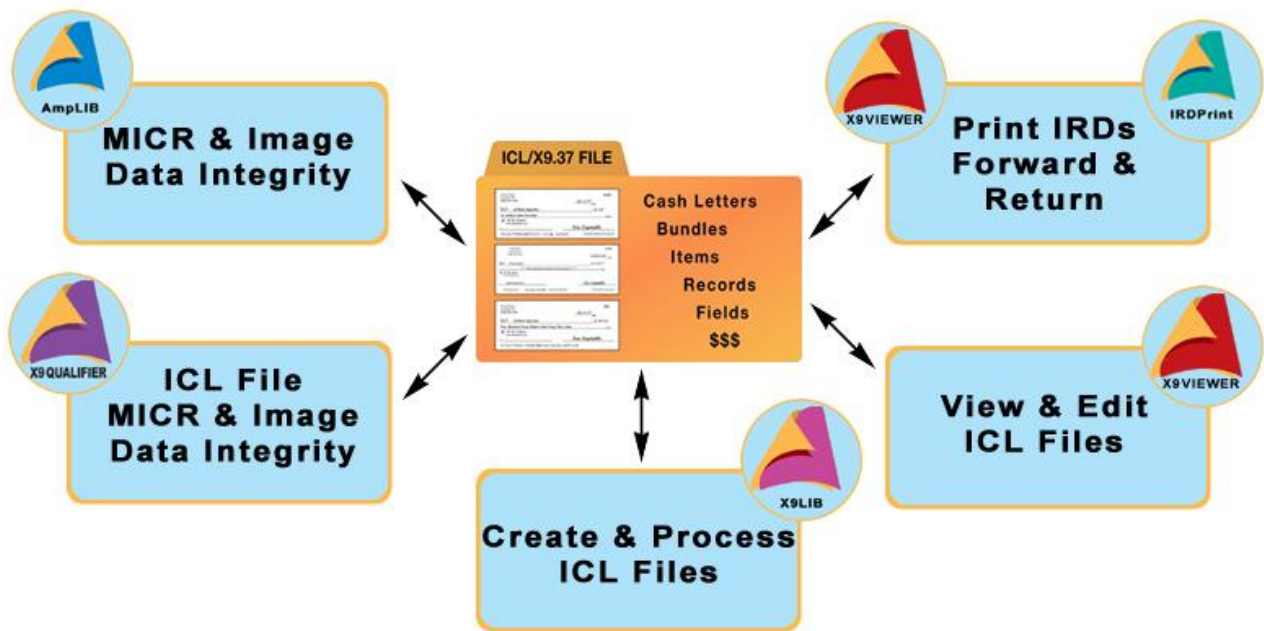




*Working with  
Image Cash Letters (ICLs)  
X9.37, 180, or 187 Files  
Ray Higgins, Bill Lange*



Software Tools for  
Check Image Exchange  
Interoperability Issues  
and Data Integrity Issues

## Contents

Executive Summary.....	1
Working with Image Cash Letters to Resolve Interoperability and Data Integrity Issues.....	3
Problem Description.....	6
Image Cash Letters Explained.....	6
ICL File Structure.....	6
Specific Details about Structure.....	7
Issues with ICL Files.....	9
Problem # 1: ICL Standard – A moving target.....	9
Problem # 2: DSTU X9.37 functionality.....	9
Problem # 3: Flexibility in a standard may not necessarily be a good thing.....	9
Problem # 4: The United States Check Clearing Process.....	9
Problem # 5: Credit Records and the Growth of Remote Deposit.....	10
Problem # 6: Improper ICL Formatting.....	10
Problem # 7: Duplicates.....	10
Problem # 8: IRD Returns Printing.....	11
Problem # 9: Generating Return ICL from Forward ICL.....	11
Data Integrity Issues.....	12
Data Integrity Issue #1 – Image Formats.....	12
Data Integrity Issue #2 – Image Quality.....	13
Data Integrity Issue #3 – MICR Read Quality.....	13
Costs associated with Bad ICL Files.....	14
Operational Costs.....	14
Investment Income Costs.....	14
Increased Risk Exposure Costs.....	14
Customer Satisfaction Costs.....	14
All My Papers – Solutions for ICL Interoperability and Data Integrity.....	15
Issues with ICL Files.....	17
X9Tools – X9LIB Command Functions with Professional Customization Service.....	18
Operations.....	18
IRD Printing.....	19
About All My Papers.....	20
All My Papers products for ICL processing applications.....	20
X9 VIEWER.....	20
X9 QUALIFIER - APPLICATION and SDK.....	22
Amplib MICR OCR Software Development Kit.....	24
X9LIB Software Development Kit.....	26
IrdLIB Software Development Kit -- IRD Printing.....	27
X9 IMAGE CLEARING.....	28
Case Studies.....	29
Remote IRD Printing.....	29
Supporting Proprietary Bank ICL Format.....	30
Viewing, Conformance Testing, and Editing ICLs.....	31
ICL Return Processing.....	32
ICL Remote Deposit Capture System.....	33
Conclusion.....	34

## Executive Summary

ICLs are used to transport check transaction data including check images between organizations and systems for the purposes of clearing the check payments electronically. Image Cash Letters have become the preferred vehicle for transporting electronic check payment transactions between organizations and systems.

This whitepaper provides information about working with or implementing a system that will process Image Cash Letters (ICLs), also known as X9.37 files, while reducing implementation costs, time, and ongoing maintenance efforts. This applies to:

- Financial Institutions (Banks, Credit Unions, FRB)
- Check Image Exchange Network providers
- Corporations, retailers and other merchants who deposit checks and/or need to reconcile check payments.
- LockBox Service providers
- IT departments that will implement or manage check clearing systems.
- System and software implementers of check payment clearing systems (capture, clearing, & exchange)

Because ICL standards, formats, and supporting technology continue to change and evolve, it is no easy task to implement a system that uses ICLs.

ICLs encapsulate image and MICR data captured from paper check transactions. The accuracy and usability of these data elements is essential to error-free clearing and processing of the transaction. This white paper explains the importance of correcting data integrity issues in these data elements.

Included is advice on how to implement your system so that it ensures interoperability with other systems and maintains data integrity throughout the process.

Errors in ICL transactions have a direct and negative impact on operational costs and potential losses for investment income through reductions in float. There are also costs associated with increased risk exposures and with loss of customer satisfaction.

Many large and small organizations have applied technology from All My Papers (AMP) for solving problems with their specific ICL systems and products. They all enjoy the competitive advantages provided by lower development costs, rapid implementation time, and the realization of efficient and well behaved systems.

All My Papers is a developer and distributor of software development toolkits and applications that provide the ability to create, view, edit, format, sort, merge, and process ICL files. All My Papers Software Development Toolkits (SDK) and applications also process, extract and qualify data from check images and print Image Replacement Documents (IRDs). Using these tools will isolate the ICL system implementer from the intricacies of ICL processing.

All My Papers offers tools for all the possible ICL interface processing points that a financial institution might have, including:

- Building ICL files from captured data
- Processing ICL files sent/received through exchange networks
- Processing ICL files sent/received directly via other banks

- Processing received ICL files from Remote Deposit customers (can include corporate, correspondent banks, and international deposits)
- Printing forward and Return IRDs from ICL files
- Internal processing of ICL data within the financial institution

Fast and accurate technology from All My Papers is available either in the form of software development kits or as applications. AMP products for ICL processing include:

**X9 VIEWER** application allows users to view, analyze, print and edit ICL files to identify and resolve interoperability and data integrity issues. **X9 VIEWER** application quickly verifies the quality, contents, and format of the textual information in X9.37 files.

**X9 QUALIFIER** application and SDK will detect and even correct the non-conforming check image components of ICL files. It tests the check images for conformance to exchange standards for TIFF formats and Image Quality. The software detects MICR mismatches and will correct for most TIFF format issues.

**AmpLIB MICR OCR SDK** performs MICR OCR and MICR verify operations to implement automatic correction of rejects and misreads in MICR information captured from check scanners and received in ICL files. AmpLIB also has automatic image repair functionality that will reduce file sizes and increase CAR/LAR read rates.

**X9 LIB SDK** is used to create, format, and edit ICL files in DSTU X9.37, UCD, ANS X9.100-187 and ANS X9.100-180 format to solve interoperability file and data integrity problems associated with check image exchange. The SDK supports conversions to popular deposit formats used by many banks.

**IrdLIB SDK** is used to provide fast, accurate, and reliable printing of valid Image Replacement Documents.

**X9 IMAGE CLEARING** is a customizable application and software system used to enable import/export, return processing and research of ICL data and features duplicate item and file detection capability.

**CASE STUDIES** - In the final section of this white paper, five case studies describe problems faced by real customers and how they applied technology from All My Papers to solve them:

- Remote Image Replacement Document (IRD) Printing
- Supporting Proprietary Bank ICL Format
- Viewing, Conformance Testing and Editing ICLs
- ICL Return Processing
- ICL Remote Deposit Capture System

## Working with Image Cash Letters to Resolve Interoperability and Data Integrity Issues

Are you planning to implement or work with a system that uses Image Cash Letters, also known as X9.37 files?

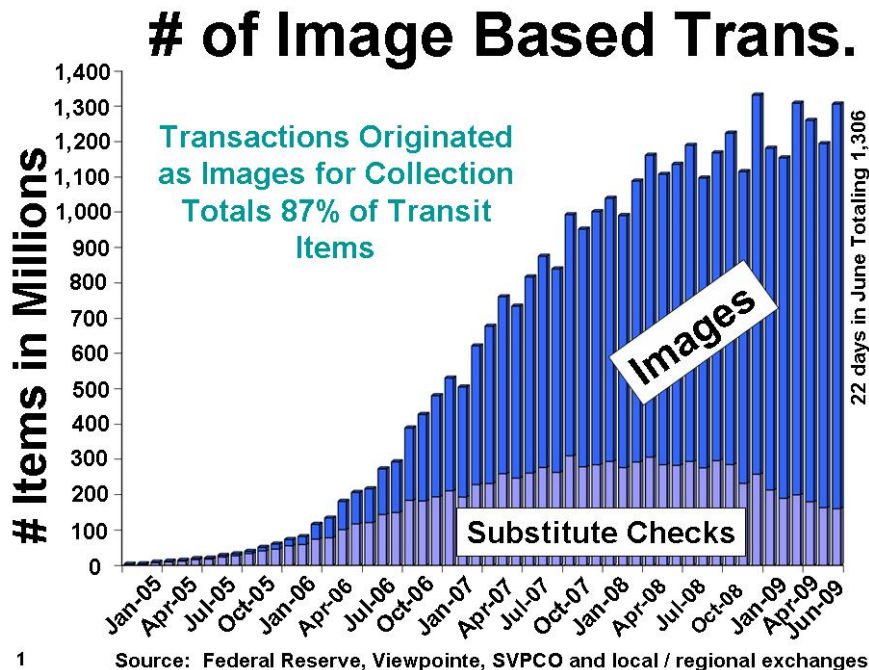
Do you know what is involved in the implementation of a well behaved system that ensures both data integrity and interoperability within a check payment system?

This white paper will fill you in on what you need to know to understand the intricacies of Image Cash Letters. Included is advice on how to implement your system so that it ensures interoperability with multiple systems and maintains data integrity throughout the process.

Image Cash Letters (ICLs) have become the preferred vehicle for transporting electronic check payment transactions between organizations and systems. Although standards were established for ICLs in the 1990s, it was the passing of Check 21 legislation that legitimized the use of substitute checks and image replacement documents. This opened the door for the use of a method to transport the electronic information instead of the original paper item.

Figure 1 shows the growth of check image exchange. At the time of this writing, approximately 89% of financial institutions have the capability to receive ICLs for the clearing of their customers' checks.

**Figure 1 - Growth of Check Image Exchange Volume**



The main objective of Check 21 legislation was to remove all roadblocks for the implementation of an efficient check clearing system that would decrease check clearing float and improve the safety of the payment system. This was precipitated by the severe economic effects of the 9/11 terrorist attacks in 2001 that caused traffic gridlock and grounded air transportation, preventing the timely clearing of \$47 billion worth of check transactions.

ICLs are used to transport check transaction data, including check images, between organizations and systems for the purposes of clearing the check payments electronically. Transmitting data electronically has the economic benefits associated with reduced transportation costs and increased velocity of transfer of funds.

Organizations that receive check payments are now able to realize the benefits of earlier access to funds, later cutoff times, reduced transportation costs and the easy convenience of using ICLs in remote deposit applications.

Banks have realized that they can now offer deposit services outside their normal geographical boundaries. Offering remote deposit services has been driven by both demand and the desire of banks to grow and increase market share.

Banks that have migrated to image processing for their check clearing operations also enjoy the benefits of reduced operational costs.

Typical uses for ICLs are:

- Presentment of check deposits to the payee bank
- Clearing of check payments through exchange networks
- Remote deposit of check payments received by a corporation, retailer, government, charitable organization, or other merchant
- Delivery and clearing of return items
- Delivery of check transaction data deposited at international branches and foreign banks
- Formatting of check transaction data for printing of substitute checks, also known as Image Replacement Documents (IRDs)
- Delivery of check transaction data to corporations for reconciliation, authentication, and cash management purposes
- Transfer of check transaction data between the institution's systems (high speed capture, remote deposit, ATM deposits, teller deposits, remittance, in-clearing, posting, signature verification, returns)

The evolution of ICL standards, formats, and supporting technology has resulted in issues with interoperability and data integrity. Although an early ICL standard was established in the 1990s, this standard was later declared unsuitable for the intended purposes.

Since then, the implementations of applications that use ICLs have been outpacing the standards organization's ability to produce the supporting ICL standards. Consequently, there are now dozens of different formats and variations of ICLs with no clear road map in place to migrate to a single stable standard.

Implementations have also outpaced the availability of supporting standards for image quality and image formats. Remote deposit and teller capture applications are seeing the use of inexpensive check scanners that have low data quality capture capabilities compared to the high speed equipment that was traditionally used in bank operational centers. This has contributed to the data integrity issues of the check data transported in ICLs.

It is no easy task to implement a system that uses ICLs. Acquiring the knowledge to be able to build an interoperable system is complicated because there is not just one specification to learn.



The builder of image enabled software systems will need to learn several format specifications, various companion documents published by clearing organizations (FRB, SVPCO, etc.) and major banks, specifications of ICL variations used for remote deposit applications, as well as acquire the knowledge of image quality standards and practices, and image format standards.

Standards are still evolving and new variations are still appearing. The cost to develop and maintain ICL processing systems will be very high, not to mention the time required to implement them.

All My Papers is the developer and distributor of software toolkits and applications that process, extract data and print check images. Our development kits provide the ability to create, view, edit, format, sort, merge and process X9.37 ICL files. Using these tools will isolate the ICL system implementer from the intricacies of ICL processing.

Data integrity issues are solved with built-in OCR and image processing and repair functions to validate and even correct for poor MICR and image quality. With support of over two dozen formats and variations, we are continually adding formats to meet market demands.

The All My Papers products will benefit anyone contemplating using or implementing a system that will process ICLs. This includes:

- Financial Institutions (banks, credit unions, FRB)
- Image Exchange Network providers
- Corporations, retailers and other merchants who deposit checks and/or need to reconcile check payments
- LockBox Service providers
- IT departments that will implement or manage check clearing systems
- System implementers of check payment clearing systems (capture, clearing, and exchange)

## Problem Description

### Image Cash Letters Explained

A traditional cash letter is an inter-bank transmittal letter that accompanies paper check items sent from one financial institution to another.

In the simplest case, the cash letter contains checks that were deposited in the sending institution (Bank of Deposit) and drawn on the receiving institution. The financial institutions would settle on the total dollar amount of the items as summarized in the accompanying cash letter.

An Image Cash Letter (ICL) is now an electronic document which includes images of the items instead of the original paper items.

At the time of the Check 21 legislation, the industry did not have a suitable ICL standard to meet the desired requirements.

As an interim solution, the financial industry adopted the use of DSTU (Draft Standard for Trial Use) X9.37–2003 until the desired specification (ANS X9.100-180) could be developed and approved. This desired standard was not approved as an ANSI standard until late in 2006. The industry then abandoned this standard and instead created a Universal Companion Document for the DSTU X9.37–2003. A compatible X9.100-187 standard has also become an approved ICL standard that is intended to replace the original 2003 DSTU Standard.

### ICL File Structure

The ICL has the following basic structure. Refer to “Specific Details about Structure” in the next section for more explanation.

X9 File (X9.37 or X9.100.180 or X9.100-187)

File Header

1st Cash Letter

1st Cash Letter Header

1st Bundle Structure

1st Bundle Header

1st Item

1st Check Detail Record

1st Check Addendum Records

1st Check Image View Records

1st Check IQA Records

2nd Item

nth Item

Credit Item Record (X9.100.180 only or versions for bank RDC)

1st Bundle Control Records

2nd Bundle

...

nth Bundle

1st Cash Letter Control Record

2nd Cash Letter

...

nth Cash Letter

File Control Record

## Specific Details about Structure

### The X9 file will contain

- **File Header** with routing origin and destination information and creation date
- **Cash Letter Records** (usually one or more)
- **File Control Record** with summary control totals of # of cash letters, # items, and value (\$)

### The Cash Letter Records will contain

**Cash Letter Header** with routing origin and destination information and creation date

- **Bundle Records** (usually one or more)
- **Cash Letter Control Record** with summary control totals of # of bundles, # items, # images, and value (\$)

### The Bundle Records will contain

- **Bundle Header** with routing origin and destination information and creation date
- **Item Records** (usually one or more)
- **Bundle Control Record** with summary control totals of # of items, # images, and value (\$)

### The Item Records will contain

**Item Detail Record** which contains ECE sequence number, amount, payer bank routing number, and the ON-US field containing unparsed account, serial number and auxiliary ON-US

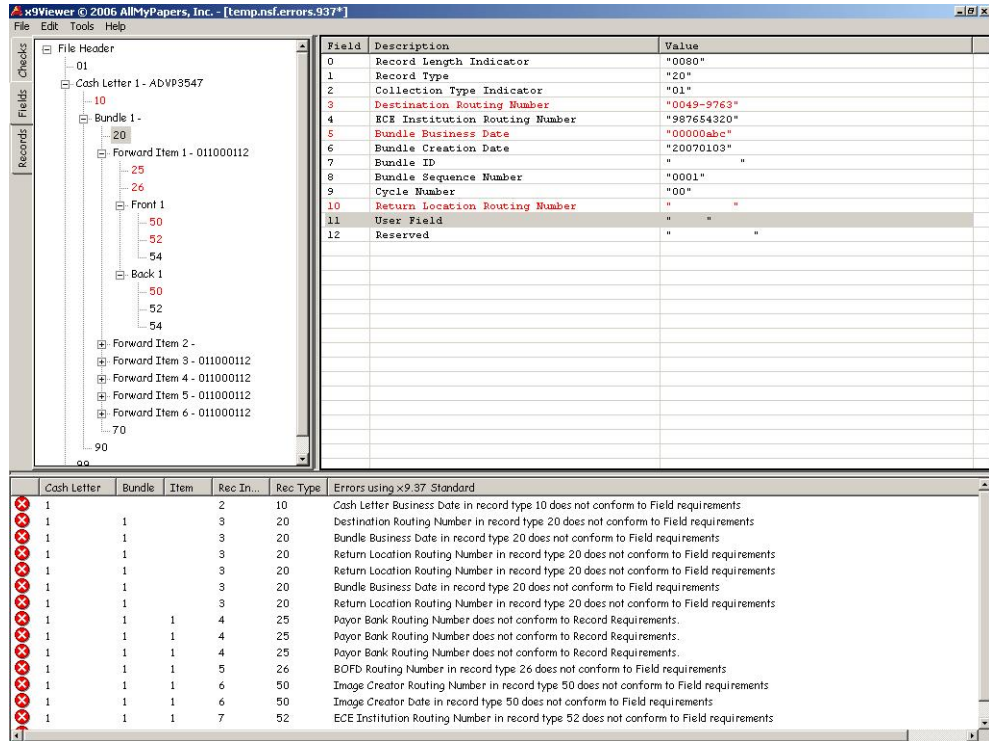
**Item Addendum Records** that are used to apply electronic endorsement information by institutions involved in the truncation, routing, IRD printing, and returning of the item

**Item View Records** which includes the actual image of the check. Usually the front and rear image views are included with every item

**Image Quality Analysis Records** that can contain flags and results of any analysis of image quality of the items images

Additionally a bundle can optionally contain a **Credit Item Record**. This was only officially supported in the abandoned X9-100-180 standard but has also been used in many non-standard forms of ICLs (X9.37 files). The X9 standards committee is also currently in the process of adding credit records to a newer version of X9.100-187. The typical use of a **Credit Item Record** is for a Deposit ICL (for example, remote or merchant capture application) where the depositing bank account details are required to direct where the deposit should be posted. This **Credit Item Record** can be used to represent a deposit slip in an electronic deposit ICL file.

**Figure 2 View of an ICL file showing hierarchical structure, field level data and analysis results**



The screenshot displays the x9Viewer interface with three main sections:

- Hierarchical Structure (Left):** A tree view showing the file structure:
  - File Header (01)
  - Cash Letter 1 - ADV93547 (-10)
    - Bundle 1 - (20)
      - Forward Item 1 - 011000112 (25)
        - Front 1 (26)
          - 50
          - 52
          - 54
        - Back 1 (50)
          - 50
          - 52
          - 54
      - Forward Item 2 - (70)
      - Forward Item 3 - 011000112 (70)
      - Forward Item 4 - 011000112 (70)
      - Forward Item 5 - 011000112 (70)
      - Forward Item 6 - 011000112 (70)

- Field Level Data (Top Right):** A table with columns: Field, Description, Value.
 

Field	Description	Value
0	Record Length Indicator	"0080"
1	Record Type	"20"
2	Collection Type Indicator	"01"
3	Destination Routing Number	"0049-9763"
4	ECE Institution Routing Number	"987654320"
5	Bundle Business Date	"0000abc"
6	Bundle Creation Date	"20070103"
7	Bundle ID	" "
8	Bundle Sequence Number	"0001"
9	Cycle Number	"00"
10	Return Location Routing Number	" "
11	User Field	" "
12	Reserved	" "
- Analysis Results (Bottom):** A table titled "Errors using x9.37 Standard" with columns: Cash Letter, Bundle, Item, Rec In..., Rec Type, and Errors using x9.37 Standard.
 

Cash Letter	Bundle	Item	Rec In...	Rec Type	Errors using x9.37 Standard
1			2	10	Cash Letter Business Date in record type 10 does not conform to Field requirements
1	1		3	20	Destination Routing Number in record type 20 does not conform to Field requirements
1	1		3	20	Bundle Business Date in record type 20 does not conform to Field requirements
1	1		3	20	Return Location Routing Number in record type 20 does not conform to Field requirements
1	1		3	20	Return Location Routing Number in record type 20 does not conform to Field requirements
1	1		3	20	Bundle Business Date in record type 20 does not conform to Field requirements
1	1		3	20	Return Location Routing Number in record type 20 does not conform to Field requirements
1	1	1	4	25	Payor Bank Routing Number does not conform to Record Requirements.
1	1	1	4	25	Payor Bank Routing Number does not conform to Record Requirements.
1	1	1	4	25	Payor Bank Routing Number does not conform to Record Requirements.
1	1	1	5	26	BOFD Routing Number in record type 26 does not conform to Field requirements
1	1	1	6	50	Image Creator Routing Number in record type 50 does not conform to Field requirements
1	1	1	6	50	Image Creator Date in record type 50 does not conform to Field requirements
1	1	1	7	52	ECE Institution Routing Number in record type 52 does not conform to Field requirements

## Issues with ICL Files

This section describes the major problems typical with ICLs. The planners of a system that will process ICLs need to be aware of these issues so they can incorporate technologies and processes that will minimize the associated risks.

### Problem # 1: ICL Standard – A moving target

The Accredited Standards Committee (ASC) X9B responsible for developing standards for ICLs permitted the use of a temporary standard until the desired standard was ready. Unfortunately, the desired standard, X9.100-180, took from 2003 to 2006 for development and approval. During this time there was a rapid adoption rate of using ICLs fuelled by the demand of IRD and remote deposit services.

The temporary DSTU X9.37 2003 was widely embraced making it difficult to migrate to the replacement standard (X9.100-180) due to many incompatible differences. In 2008, a Check Image Collaborative group consisting of ECCHO, Federal Reserve, and other financial industry organizations released a Universal Companion Document (UCD) for DSTU X9.37. The purpose of the UCD is to provide a clear and consistent approach for using the DSTU X9.37 standard for all industry participants. The Federal Reserve Bank has now set up a test environment to certify customer ICL files for UCD compliance. The financial industry is planning conversion to the UCD starting in March 2010.

The X9 ASC committee also approved a new replacement standard for DSTU X9.37 in 2009. This new X9.100-187 ICL standard is intended to be fully compatible with DSTU X9.37 used with the UCD document. In 2009 X9 ASC began the process to update X9.100-187 with Credit and User Records. Expect the approval of this standard in 2010 or later.

### Problem # 2: DSTU X9.37 functionality

It was recognized that the DSTU X9.37 standard did not meet all requirements for ICL uses. To overcome these limitations, users had to allow non-standard modifications to X9.37 to support applications that required certain features.

Support for Credit Item Records is the most significant feature resulting in several X9.37 variations. We will spend some more time on this topic later.

### Problem # 3: Flexibility in a standard may not necessarily be a good thing

The ASC X9B committee for developing standards for ICLs had good intentions in developing a flexible standard. The standard contains many optional records and user defined fields. The actual use of these optional records and user defined fields is left up to agreements between exchange partners.

This flexibility has left the door open to many different variations and interpretations.

### Problem # 4: The United States Check Clearing Process

Providing check clearing services is an open competitive and very lucrative market with many players scrambling to win their market share. Each service provider will typically have their own companion document to the X9.37 file standard detailing their rules on how to format the ICL file for their own exchange networks. This has resulted in many different variations of the X9.37 ICL format. Some of these organizations have announced their intention to migrate to the use of the UCD but with some differences in implementation.

The following is a list of some of the organizations that provide ICL clearing services today

- Federal Reserve Bank
- Viewpointe
- Endpoint Exchange
- Open Solutions
- EDS
- SVPCo
- Fiserv
- OnWe (LendingTools)

#### **Problem # 5: Credit Records and the Growth of Remote Deposit**

Remote deposit applications usually require Credit Item Records which were not supported in the DSTU X9.37 2003 specification.

Financial institutions that were racing to provide remote deposit services for their customers were forced to implement non-standard and proprietary means of using credit records in the X9.37 based ICL files. Most major banks now have their own proprietary flavors of X9.37 files using Credit Item Records.

#### **Problem # 6: Improper ICL Formatting**

Possibly the biggest problem is that ICLs are just not being formatted correctly.

The X9 specifications for ICL files are complex (250+ page document), thus making it challenging to implement accurately. There is no simple way to certify that formats are accurate. It is also easy to make different interpretations or make wrong assumptions about the formats and contents of the ICL files. Common examples of ICL formatting problems:

- Missing records
- Missing fields
- Missing field contents
- Invalid data types
- Missing images
- Incorrect image formats
- Wrong images
- Incorrect record counts
- Sequencing problems

#### **Problem # 7: Duplicates**

A paper check can now be converted to electronic data (truncated) and reprinted as an IRD. This has created a new risk of creating duplicate transactions. Most of the reported incidents are accidental in nature but there is also the risk of fraudulently created duplicate transactions. Common errors leading to duplicates include:

- Item presented twice by original check, IRD, and/or ICL
- IRD duplicated
- Electronic item, bundle, or cash letter duplicated and sent in different ICL files
- ICL file duplicated and sent twice
- Item captured twice (an easy mistake in remote deposit applications that could also be intentional)

There is also the risk of a duplicate transaction if the original check is converted to an Automated Clearing House (ACH) transaction. ACH is the USA bulk electronic payment network. Under NACHA rules, checks are allowed to be converted to an electronic debit transaction and cleared through the ACH network. The ACH network does not clear image data with these transactions.

### **Problem # 8: IRD Returns Printing**

The FRB is in the process of down-sizing the operations for the physical delivery of return checks. The FRB will instead offer electronic delivery of these items in one of two forms:

- ICL files containing return items
- PDF files containing images of printed Return IRDs

The choice of whether to receive ICL or PDF files depends on the intended use of the returned items. If the returned items will be used only for customer advice letters, then PDF files may be sufficient. However, if the returned items will be re-presented or if the data relating to the returned items must be extracted for the core banking system, then ICL files are the appropriate choice.

#### Issues Related to Printing Return IRDs

If the returned items will be re-presented then they must be derived from an ICL file and printed as a completely conformant negotiable instrument, a Return IRD. Such a fully formed document can then be run through standard check sorters as if it were an original check. The requirements for printing a conformant IRD include:

1. IRD Paper – in one, two or three up configurations
2. A MICR line using a MICR font tailored to the print engine as well as the use of magnetic ink/toner. The MICR line must be printed using magnetic toner and properly formed and spaced MICR characters. Lacking these characteristics, a printed IRD will not be read properly in check sorters.

### **Problem # 9: Generating Return ICL from Forward ICL**

If everything was perfect then Return ICL files could be automatically created from the received Forward ICL files. A perfectly formed Forward ICL file will contain the routing number of the BOFD that will allow for automatic identification and routing. Often the BOFD is not identified in the Forward ICL data. This is caused when a different institution truncated the check and cannot automatically identify the BOFD in the process. In this case an operator will need to research the back of the check image to identify the BOFD from the physical endorsements. If the physical endorsement is not present or legible, the item can then be returned to the endorsing institution indicated by the first electronic endorsement record for that item. The process for generating Return ICLs from Forward ICLs is then a mixture of both automatic and manual processes.

## Data Integrity Issues

ICLs electronically transport the image and MICR data captured from paper check transactions. The accuracy and usability of these data elements is essential to the clearing and processing of the transaction. Users need to be aware of data integrity issues when planning the implementation of a system that uses ICLs.

### Data Integrity Issue #1 – Image Formats

An image file contains a bit map or raster format of the image, but also includes important information about the image in a header that allows viewers and systems that will process the image to interpret the image data correctly. Included in the header will be information about the size, resolution, compression, orientation and other details. There are several types of image file formats used that include TIFF, JPEG, GIF, BMP and others.

The financial industry has adopted TIFF 6.0 as the preferred image format for check images. This standard was established in 1992 and used extensively. Unfortunately this standard also suffers from having a lot of flexibility that has resulted in different interpretations. There are many real examples of interoperability problems where systems that process images are incompatible with the TIFF variation produced by capture platforms.

To mitigate these issues, X9 ASC approved a new standard that specifies the rules for using TIFF 6.0. ANS X9.100-181 Specification for TIFF Image Format for Image Exchange was approved in 2007. There has not been any industry enforcement of this standard so it will take some time to totally eradicate the non-compliant image formats that can only be fixed with system upgrades. The Federal Reserve Bank intends to enforce this standard with the implementation of the UCD In 2010.

Examples of non-compliant image format variations that commonly exist in ICLs today include:

- Non-TIFF format
- Not using CCITT G4 compression
- Color or Grayscale JPEG image instead of required black/white image
- Incorrect resolution
- Stripped TIFF (image stored in multiple memory blocks instead of only one)
- Multi-page TIFF (multiple views in one file instead of only one)
- Incorrect orientation
- Incorrect photometric (0-white, 1- Black)
- Incorrect bit/byte order

## Data Integrity Issue #2 – Image Quality

There are many challenges in capturing high quality usable images of checks, and it requires a well designed capture system that incorporates best practices to ensure high quality results. The financial industry is still in a learning curve about image quality so there are few examples of well designed capture systems. A substantial number of poor quality images are being captured and attempted to be exchanged via ICLs.

Exchange networks may implement some form of Image QA, with the best example being the Federal Reserve Banks. They have implemented a system that analyzes incoming images using a variety of IQA tests. Any item that fails the automated inspection process is rejected. The originator either needs to recapture a better image or clear the paper item. This can be challenging, as many times the original item was captured at a remote location.

It also must be understood that automated IQA analysis technology is not perfect and will make mistakes by rejecting good items and letting bad items pass. Users of ICL systems need to be aware that they will receive some unusable poor quality images in ICLs, and that there is a risk of having items rejected in sent ICLs if the images did not meet quality thresholds.

There are also risks if the users of an ICL system need to produce IRD documents from poor quality images contained in ICL files.

Examples of common image defects that cause usability problems:

- Partial Image
- Image too dark or light
- Excessive skew
- Excessive noise
- Piggy-back
- Wrong image

The cause of these types of defects can be related to the source document (non-compliant to design standards, light printing from worn ribbon or use of gel pen, document torn, folded or mutilated). The capture hardware can also cause image defects especially with the migration to low cost check scanners in remote deposit and branch teller capture.

## Data Integrity Issue #3 – MICR Read Quality

The migration from using high speed reader sorters for capturing checks to inexpensive low speed desktop check scanners is causing another data integrity issue: poor MICR read quality. Traditionally the financial industry has lived with 1-2% reject rates, with below 0.1% misread rates, in capturing the check's MICR information.

Users of low cost, low speed check scanners are now experiencing misread rates of greater than 1%, with reject rates that range from 5% to 15% and sometimes even higher. A 2006 "Small Check Scanner MICR Read Performance Benchmark Study" report confirms this poor MICR read performance.

MICR data may also have been captured or corrected by manual keying, which can introduce errors in the MICR field data captured.

## **Costs associated with Bad ICL Files**

The use of ICLs will have a direct impact on operational costs. There are also costs associated with increased risk exposures, and costs associated with loss of customer satisfaction.

### **Operational Costs**

ICLs with issues create additional operational costs. A bad ICL requires exception handling procedures to correct the file, or requires alternate clearing procedures such as locating and clearing the original paper checks.

High rejects and misreads in MICR field data increase operational costs by requiring manual correction or processing exceptions resulting from wrong postings and misroutings.

Poor image quality increases operational costs by requiring inspection, recapture, paper archiving, and processing exceptions resulting from returns for unusable quality.

### **Investment Income Costs**

A bad ICL can cause a clearing deadline to be missed. As volume in image exchange continues to increase, the potential for very high value ICLs is also increasing. Missing the deadline on a high value ICL impacts float and will cause a loss in investment income.

### **Increased Risk Exposure Costs**

A missed clearing deadline also means increased risk for non-payable items that can no longer be collected. Data integrity issues with the item's MICR and image data can cause processing delays in clearing, resulting in increased risk exposure.

### **Customer Satisfaction Costs**

The costs associated with dissatisfied customers are hard to measure but are very high. Customer Service processing is expensive and time consuming.

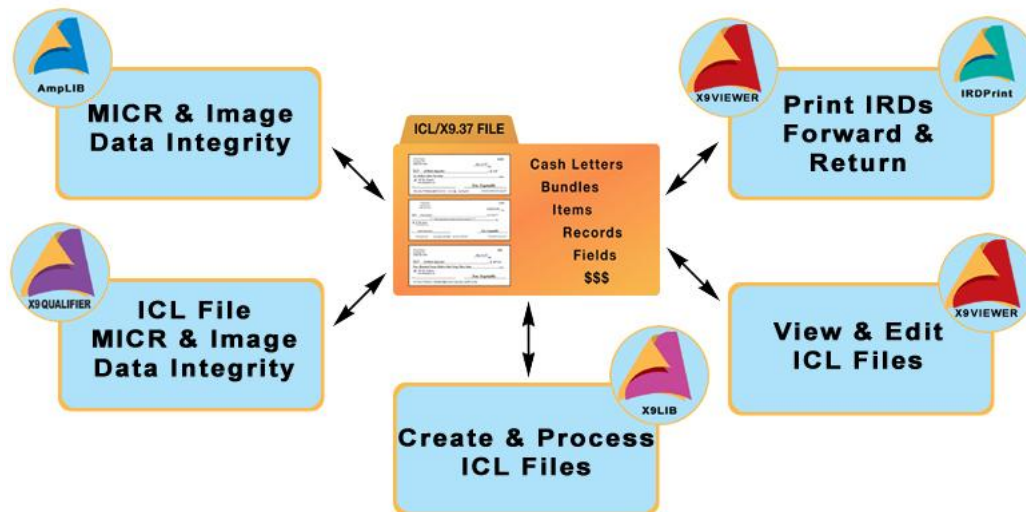
Higher rates of misreads in MICR fields, particularly the Account field, will result in checks being posted to a wrong account. This leads to very dissatisfied customers, and even potential liabilities to the financial institutions.

Customer dissatisfaction will also result if the images of their cleared checks printed on IRDs are not legible due to poor image quality.

A double posting resulting from receiving a duplicate item is another risk that leads to customer dissatisfaction.

## All My Papers – Solutions for ICL Interoperability and Data Integrity

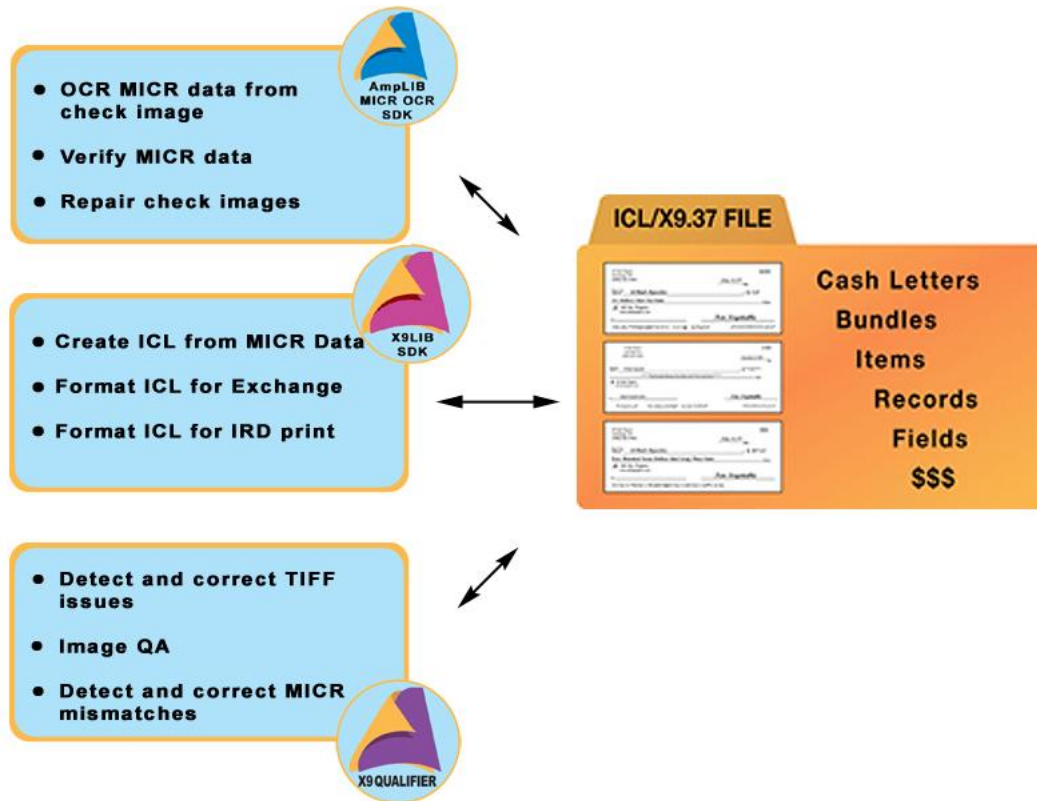
This diagram shows the architecture of ICL processing using technologies from All My Papers.



All My Papers has technology for all the possible ICL interface processing points that a financial institution might have, including:

- Testing and correcting image and MICR data prior to building ICL files
- Building ICL files from captured data.
- Processing ICL files sent/received through exchange networks
- Processing ICL files sent/received directly with other banks
- Processing received ICL files from Remote Deposit customers (can include: Corporate, Correspondent Banks, and International Deposits)
- Printing Forward and Return IRDs from ICL files.
- Internal processing of ICL data within the bank
- Generating Return ICL files from Forward ICL files

Here is how All My Papers technology can be applied to all these interface points to solve your interoperability and data integrity issues.



If your intention is to truncate checks and create ICLs, then your considerations for data integrity need to start in your capture system. To ensure your system is capturing good MICR data (particularly if you are using desktop check scanners) your system needs to employ technology that will automatically correct rejects and misreads at the time of check image capture and scanning, before formatting the data into ICL files.

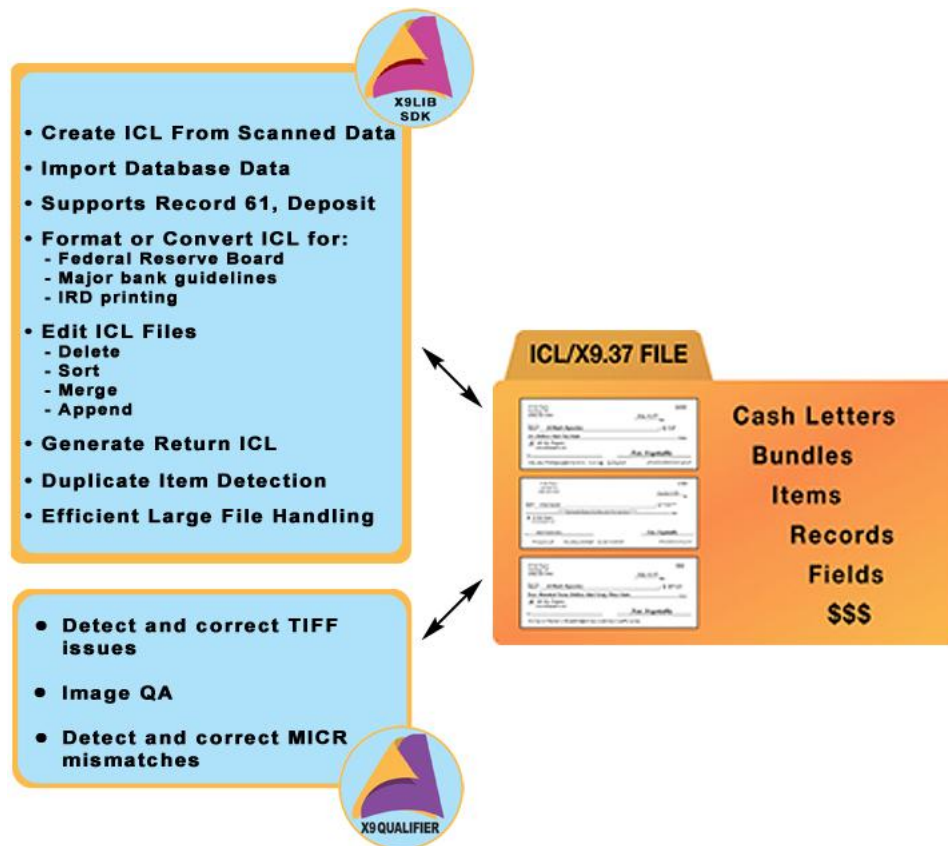
Point of capture is the best time to ensure high quality images are being captured. Detecting image quality problems early in the process also provides the best opportunity to access an original item to capture a better image or clear paper item.

MICR Read Quality data integrity problems are solved using All My Papers MICR OCR and Verify technology that will read the MICR line from the captured image using multiple OCR engines. These results will be combined with the MICR line captured by the hardware device and will use voting technology and code line syntax rules to produce accurate MICR reads. MICR Verify also applies OCR read retries with image enhancement and image repair techniques to produce highly accurate results in even the most difficult situations. All My Papers MICR Verify will significantly reduce reject and misread levels in high speed capture environments.

Image Format and Image Quality data integrity is ensured with All My Papers “Exchange Ready” technology that tests every image for conformance to exchange standards. AMP ensures image formats are in compliance with the new X9 TIFF standards, and tests every image for the common forms of image defects. All My Papers also provides automatic image processing functions that can correct many common types of image defects.

Data Integrity issues of image and MICR data received in ICL files, regardless of their source, can also be solved by All My Papers MICR Verify and Exchange Ready technology. These functions can be applied to incoming ICL files to detect and correct for data integrity issues for received MICR and image data. These functions are available in both our X9 QUALIFIER application and X9 QUALIFIER Software Development Toolkit.

### Issues with ICL Files



Consideration also needs to be given to your application that will build the ICL files to ensure proper formatting and compatibility to the specific format required by the endpoint or exchange network. Your system that imports data from received ICLs also needs to have consideration for the variation in formats that are possible to receive, and also have tolerance built in for processing ICL files that are not perfectly formed.

All My Papers X9LIB is another AMP SDK that isolates the user from the intricacies of the ICL formats. It provides supports for dozens of popular X9.37 ICL format variations. Building ICLs or importing data from ICLs is simplified to basic programming functions. The programmer does not need to have detailed knowledge of the specifications, companion documents, or rules associated with the endpoint or exchange network. The SDK enables a rapid time to market and greatly reduces ongoing support efforts by including demo programs with source code. This SDK

also includes functions that simplify the conversion of Forward ICL files to Return ICL files. This process is performed automatically and will flag the items that need to be inspected to determine BOFD.

### X9Tools – X9LIB Command Functions with Professional Customization Service

All My Papers provides professional services to perform the ICL processing/conversions you require for your ICL system. Typical implementation times are only a few days.

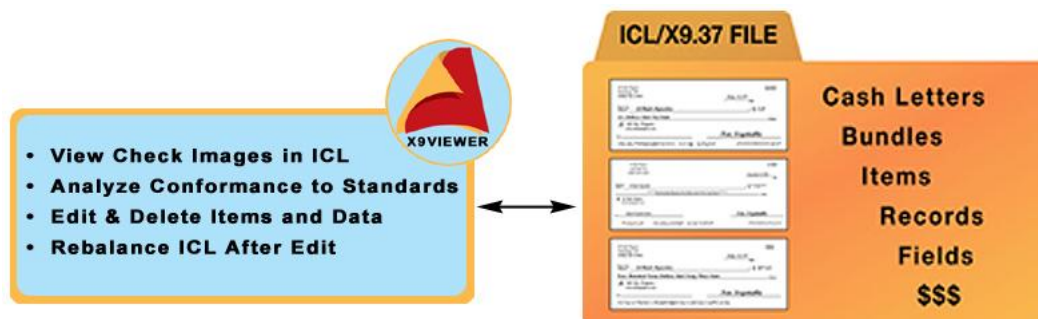
All the functionality of X9LIB is provided by command functions that can be used in a batch process to perform processing on ICL files. ICL processing applications can be prototyped, demonstrated, developed, and tested very quickly without the need for any special development resources.

Your ICL processing requirements may also need to perform clearing of ICL files. You may be receiving ICL files and need to extract, sort, and merge items, bundles and/or cash letters to create output files for input into your item processing system, exchange clearing, exception processing, or IRD printing. All My Papers X9LIB SDK provides a feature-rich set of functions for performing all these editing functions on ICL files.

If your ICL application is used for clearing, you need to plan defense measures for duplicate detection. All My Papers “Fingerprint” technology calculates a unique digital context message which is like a fingerprint for ICL files, cash letters, bundles, items, and images. Duplicates of files, cash letter bundles, items, and images can be detected.

Your ICL application may be processing hundreds of thousands of ICL letters. How will you be able to manage all this data coming and going? All My Papers X9 IMAGE CLEARING supports X9.37 ICL file import and export capabilities on top of a SQL database. All data elements of an X9 file can be exported to the database. A feature-rich set of web pages provides web research services to search and view data sent and received in X9.37 files. X9 IMAGE CLEARING incorporates the All My Papers Fingerprint technology to detect duplicates in received data. Alerts of detected duplicates can be forwarded in emails to users of the system.

### Operations

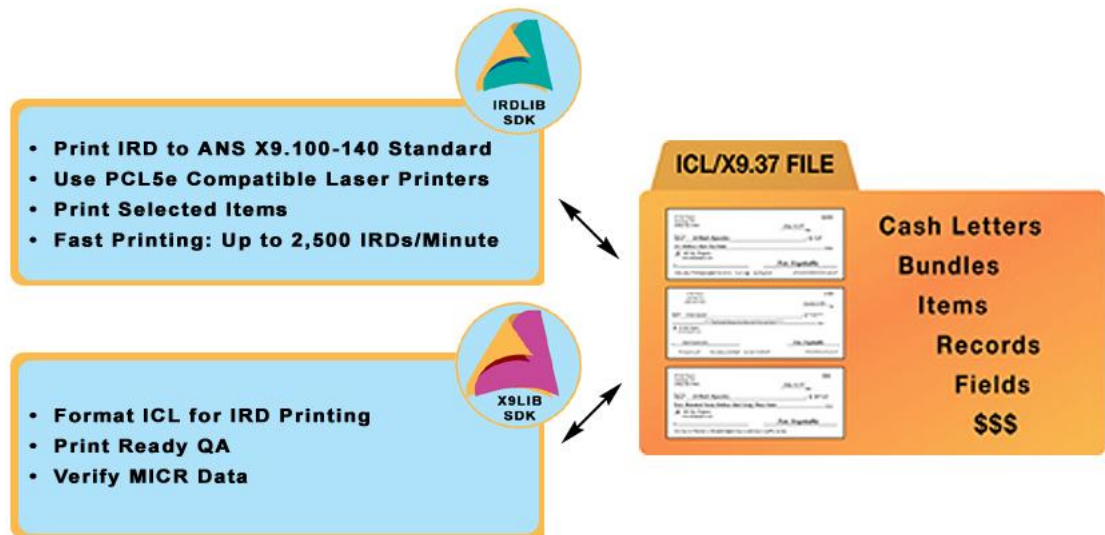


All My Papers X9 VIEWER is a standalone application that can open, analyze, view, edit, and even convert X9 ICL files. ICLs are getting larger, representing millions of dollars, containing more check items (sometimes more than 40,000) and reaching multiple gigabytes in file size. One “bad” item can stop a transmission or reception.

This tool can be used to ensure files are compliant to the various formats supported, and to identify formatting or data type problems. The All My Papers X9 VIEWER has an additional feature that can be used to edit data contents of X9 format ICL files and correct problematic format and data problems. The viewer can also be used to print IRDs. X9 VIEWER supports the following formats:

- DSTU X9.37 with multiple exchange companion documents
- Universal Companion Document (UCD) based on X9.100-187
  - The four Exchange validation variations are supported
- Multiple Bank deposit ICL formats including variations of Record 61
- X9.100-180

## IRD Printing



Will your system be printing IRDs from ICL files that are received or created internally? Data integrity is crucial for IRD printing. Bad ICL data can cause an IRD to be printed inaccurately or not at all. More severe ICL format problems can cause the entire IRD printing batch job to fail, leading to processing delays and missed deadlines. Consideration also needs to be given to volume, clearing deadlines, which IRD compatible printers need to be supported, and location of the printers. To minimize transportation time and costs it may be preferred to have the printers locally situated in the region that receives the IRDs.

Will you be printing Return IRDs? If these items need to be cleared it is important to use a proper IRD printing system to insure that properly formatted Return IRDs are created with accurately formed MICR lines. The FRB is sending out Return IRDs in PDF files. These items if printed will suffice for customer notifications but if intended for clearing will cause increased exception handling due to errors in MICR reading of the poorly formed MICR lines.

The All My Papers IrdLIB Software Development Kit for IRD Printing incorporates multiple technologies to ensure reliable, fast, and accurate printing of IRDs. All My Papers "Print Ready" technology is used to identify and filter out items that cannot be printed due to data integrity or formatting issues. This ensures IRD batch printing jobs can be processed without delay and interruption. Exceptions can then be treated separately without affecting the main processing flow. IrdLIB SDK supports a wide range of popular compatible printers. These can be network connected printers allowing centralized management and control of IRD printing processes with locally situated printers.

## About All My Papers

All My Papers is the developer and distributor of software toolkits and applications that process, extract data, and print check images.

All My Papers develops and distributes products for high accuracy and fast:

- Printing of Image Replacement Documents (IRDs)
- Data extraction of the MICR line data on check images
- Testing and correcting of data integrity issues with ICL files

All My Papers products are used by hundreds to read millions of images every day.

## All My Papers products for ICL processing applications



### **X9 VIEWER**

A Windows™ .NET application to identify and resolve interoperability and data integrity issues in check Image Cash Letter files.

Receiving and sending multiple ICLs is now a daily occurrence at financial institutions. The X9 VIEWER can be used in each of these departments:

#### **Operations**

- Fix errors in ICL Files and auto-rebalance
- Validate conformance to check image exchange guidelines
- View BOFD Information
- Certify files to and from exchange partners
- Print IRDs for all or selected items

#### **Development**

- Highlight non-conforming errors to standards and guidelines
- Compare check images to Record and Field data
- Disassemble ICLs to CSV components
- View Record 61 deposit information testing

#### **Testing**

- View files before IRD print
- Conformance testing to exchange guidelines for ICLs
- Quality Assurance Testing to compare check images to data
- Create test files

There are three functional versions of the product that support the following feature sets:

<b>Feature</b>	<b>X9 VIEWER Free</b>	<b>X9 VIEWER w/Analyzer</b>	<b>X9 VIEWER w/analyzer, editor, printer</b>
View front of check images	√	√	√
View back of check images		√	√
View ICL file contents such as item detail, bundle information, structure, control records		√	√
Test conformance with DSTU X9.37-2003		√	√
Test conformance with Canadian Payment Association ANS X9.100-180-2006 and Universal Companion Document with FRB, Viewpointe, Endpoint and SVPCO variations		Opt	Opt
Highlight errors in red		√	√
Search and Find by routing number, account number, date, dollar amounts, etc.		√	√
Deposit Record 61--Multiple Formats		√	√
ECP (pre 937 Electronic Check Presentment) Format		√	√
Change or delete record fields including payor bank routing, BOFD information, immediate destination name			√
Manual correction of errors			√
Automatic correction of standards validation errors			√
Automatic recalculation of batch totals when editing or deleting records			√
Load/Save as Comma Separated Values (CSV) file. 1. Export to legacy applications 2. Use Text editor on CSV and reload 3. Save checks as individual image files			√
Print Image Replacement Documents (IRDs) by item, bundle, cash letter			√

A data sheet for the X9 VIEWER may be downloaded from:

[http://allmypapers.com/downloads/datasheets/X9\\_VIEWER.pdf](http://allmypapers.com/downloads/datasheets/X9_VIEWER.pdf)



## X9 QUALIFIER - APPLICATION and SDK

A Windows™ .NET application also available as an SDK that tests the data integrity of X9.37 Image Cash Letters to ensure their interoperability in check image exchange. The X9 QUALIFIER complements the X9 VIEWER:

- Use X9 VIEWER to view, edit, and analyze the data contents of an ICL file
- Use X9 QUALIFIER to detect and correct data quality problems in the MICR and image data with an integrity check of the ICL file

### Applications

**Operations - Check Image Exchange** – Use X9 QUALIFIER to ensure that items in exchange ICL files conform to exchange standards and will not be rejected or returned for quality issues. Ensure that incoming ICL files will be compatible with your in-clearing system and will not cause any system failures

**Developers - Certification of Capture Systems** - Use X9 QUALIFIER to ensure that capture hardware and capture software are outputting both accurate and conforming MICR and image data

**Financial Institutions – Certify Remote Deposit Customers** - Use X9 QUALIFIER to ensure that customers’ systems which are creating deposit ICL files are both accurate and conforming

**ICL Analysis** - Use X9 QUALIFIER to troubleshoot issues with X9.37 ICL files, and use the linked X9 VIEWER to research non-conforming items

**Performance Analysis** - Use X9 QUALIFIER to measure the performance and accuracy of the capture systems used to create MICR and image data contained in the ICL

**IRD Printing** - Use X9 QUALIFIER to ensure that the image and MICR data in ICL files is accurate and can be used to print conforming Image Replacement Documents

**Exception Processing** - Use X9 QUALIFIER to detect and repair items with data integrity issues. Enables removal of non-conforming items for exception processing

### Features

There are three functional versions of X9 QUALIFIER:

Feature	TIFF QA Free Version	TIFF & Image QA	TIFF, Image & MICR QA
TIFF QA	Pass/Fail	Detailed	Detailed
X9.100-181 14 Required Tags	√	√	√
X9.100-181 4 Variation Tags	√	√	√
Compression Size		√	√
Image Dimensions		√	√
Decompression		√	√
Darkness		√	√
Spot Noise		√	√
Skew		√	√
Turned Corners		√	√

MICR Match			√
X9.37 Balance	√	√	√
X9.37 Type ASCII/EBCDIC	√	√	√
X9.37 Byte Order Intel/Motorola	√	√	√
Integration with AMP X9 VIEWER	√	√	√
XML, Summary, Pick List	√	√	√
Non-conforming Items Reports	√	√	√
Log	√	√	√
Presets: FRB, ECCHO, IRD Print	√	√	√
TIFF QA Error Correction	Optional	Optional	Optional
Image QA Error Correction	No	Optional	Optional
Items per file license options	<10,000	<10,000	<10,000

A data sheet for the X9 QUALIFIER may be downloaded from:

[http://allmypapers.com/downloads/datasheets/X9\\_QUALIFIER\\_datasheet.pdf](http://allmypapers.com/downloads/datasheets/X9_QUALIFIER_datasheet.pdf)



## **AmpLIB MICR OCR Software Development Kit**

The AmpLIB SDK contains all the functions necessary to perform the MICR OCR and MICR Verify operations that are required to autocorrect rejects and misreads in MICR information captured on check scanners and received in ICL files. It also can be used to solve image quality and TIFF issues with captured image data.

### **Functions**

- Finds, reads, parses, extracts, verifies and saves the MICR data from the check image at rates up to 20 images per second per CPU core, with low reject rates
- Delivers accurate and fast Optical Character Recognition (OCR) of MICR line data from check images
- Provides a complete SDK consisting of everything you need to reliably extract MICR data and produce images compliant to image exchange standards
- Searches a check image automatically for the MICR line and rapidly outputs the results with accuracy and reliability using its dual pass OCR voting algorithm
- Generates confidence values which can flag questionable images and maintain low error rates
- Invokes ABA or local banking rules when considering rejecting a character
- Generates high quality black and white TIFF images from grayscale images even for problematic items such as travelers checks and money orders
- Corrects for non-compliant TIFF images
- Saves significant time and provides maximum flexibility to customize solutions, because we've already done the complex programming
- Delivers automated image check processing with low reject rates

### **Features**

#### **MICR OCR Process**

- Automatic detection of MICR line
- Control of voting algorithm
- Control of confidence level
- Upside-down image reads
- Optional enforcement of ABA banking rules in the OCR process

#### **Image Pre-processing**

- Automatic skew correction
- Automatic image rotation
- Skew detection by text or black edge
- Border cropping
- Automatic image lighten or darken
- Overwrite suppression
- Background pattern suppression

- Line removal

**Verification**

- Voting algorithm to compare external MICR result and Amplib MICR OCR results

**Input Format and File Compatibility**

- Bitonal, grayscale and color image formats
- BMP, JPEG (JFIF), JBIG, G4 no header
- PCX, DCX, RLC
- TIFF (Uncompressed, LZW, Packbits, G3 Fax, G3-2D, G4, JPEG, Type 2, Multi-image)

**Output File Compatibility**

- BMP, JPEG (JFIF), PDF (bilevel multi-image)
- TIFF (Uncompressed, G3 Fax, G3-2D, G4)

**Output Contents**

- ASCII characters for MICR line
- Confidence value per character
- Best character found even if not at an acceptable confidence level

**Output Controls**

- Translation table for character set
- Blank suppression



## **X9LIB Software Development Kit**

The X9LIB SDK uses a Windows™ suite of software tools to create, format, and edit Image Cash Letter (ICL) files in X9.37 and ANS X9.100-180 format to solve interoperability file and data integrity problems associated with check image exchange. X9LIB also supports dozens of formats used for remote deposit capture.

### **Create**

- Use data from remote deposit check scanners to create X9.37 files with a single function call
- Convert check image database data (CSV format) to valid X9.37 files
- Create check image exchange files with Record 61 deposit items
- Create files conforming to ASC and X9B standards
- Convert X9.37 to CSV database data
- Balance files
- Repair images too large to be accepted for exchange
- Create Record 61 items on either a bundle or cash letter basis
- Automatic update of control records
- Fast performance of large files 2 gigabytes containing 40,000 items

### **Format**

- Format & validate files to the Federal Reserve Board, SVPCO, ECCHO and other check image exchange guidelines
- Convert from standard X9.37 files to various bank and exchange formats
- Convert ASCII to EBCDIC and Motorola to INTEL
- Automatic format of Forward X9.37 to Return X9.37 files
- Generate an XML “payload” file with a summary of file contents
- Recalculate the Return File
- File testing for IRD print compliance or exchange compliance
- Convert X9.37 format files to X9.100-180 format files
- Sort for different IRD printing cutters and bursters
- Record 61 – creation, insertion, conversion and balancing

### **Edit**

- Delete cash letters, bundles, or items and automatic rebalance of control records in check Image Cash Letters
- Generate a “Pick List” of items for exception, forward or return processing
- Sort, merge, append and pre-pend large ICLs quickly and efficiently
- Detect duplicate check items, bundles and ICLs
- Edit field data in a X9.37 record
- Add records to an existing file
- Create a Destination file and/or Report for various functions
- Split Files into separate bundles or cash letters with item limits
- Detect and patch corrupt or truncated files so that most of the data can still be extracted
- Merge lists, items, bundle and cash letters

The SDK allows the rapid development and deployment of applications for dealing with Image Cash Letters in a virtual way, just as banks are used to working with paper checks, bundles and cash letters.

X9LIB consists of Microsoft Windows™ compatible Dynamic Link Libraries, an associated import library, header files, and other support files that can be used by a wide variety of programming languages and systems.

DLL Based API X9LIB is built as a set of Dynamic Link Libraries (DLLs). This provides a degree of language independence between X9LIB and a user-written application.

X9LIB Software Development Kit includes a COM object for the X9LIB DLL. The COM object puts a “friendly face” on the X9LIB Application Program Interface (API) making it more convenient to use in programming environments such as C#, C++, Visual Basic, and Java that support COM objects.

A data sheet for the AmpLIB MICR OCR SDK may be downloaded from:

[http://allmypapers.com/downloads/datasheets/AmpLIB\\_MICR\\_OCR\\_SDK.pdf](http://allmypapers.com/downloads/datasheets/AmpLIB_MICR_OCR_SDK.pdf)



### **IrdLIB Software Development Kit – IRD Printing**

IrdLIB SDK delivers accurate and fast conversion of check image data from X9.37 or CSV files into valid Image Replacement Documents. IrdLIB SDK reflects the latest implementations and rules by the Federal Reserve Board of the ANSI Standard. IrdLIB SDK is X9.100-140 compliant.

IrdLIB SDK has two major components.

- Composition of valid IRDs from records in X9.37 files. This can be done on a number of PCs using our COM Object based functions that would be incorporated into your custom application
- Printing from the workstation or server that has logical control of the IRD printer(s)

A number of networked PCs can produce the IRDs and a centrally located and secure PC can print the IRDs. Network traffic is minimized because the check image data is compressed until it arrives at the printer.

#### **Convert & Print**

- Converts X9.37 files to valid printed IRDs
- Converts CSV file to valid printed IRDs

#### **Verification**

- Control voting algorithm to compare external MICR result and IRDLIB OCR results
- Dual pass MICR OCR
- Conforms to ANSI Standard
- X9.100-140 (9.90) Compliant
- Supports all IRD types- Forward Original- Return Original- Forward Subsequent- Return Subsequent- Qualified Return Original- Qualified Return Subsequent
- Generates IRD creator routing number and creation date from user input parameters

#### **Print Functions**

- Keeps the check image files in their compressed state until delivered to the printer
- Drives printers at rated speed and has been field tested at rates of over 270 IRDs per minute
- Compatible with a wide variety of duplex laser printers such as HP, Lexmark, Ricoh/Hitachi, Troy, Source Technology
- Operates on standard duplex laser printers
- Local, networked or remote printing
- 1, 2, 3, or 4 IRDs per page
- Supports batch separator pages
- Supports reverse printing front and back for working with bursters and sorters

**Security**

- MICR font unloaded after printing
- Generates a CSV value for each IRD produced
- Supports security barcode on IRD

A data sheet for the IrdLIB SDK may be downloaded from:

[http://allmypapers.com/downloads/datasheets/IrdLIB\\_SDK.pdf](http://allmypapers.com/downloads/datasheets/IrdLIB_SDK.pdf)

**X9 IMAGE CLEARING**

X9 IMAGE CLEARING is a Windows™ server-based application to upgrade legacy payment systems for Check 21 clearing processing. X9 IMAGE CLEARING enables posting archiving and returns processing of X9.37 Image Cash Letter (ICL) files.

**Benefits**

- Enables Check 21 processing for legacy item processing and payment systems
- Leverages investment in legacy core payment systems
- Minimizes non-imaging processing fees
- Automates outgoing return processing
- Reduces operational costs
- Enables Check 21 exchange with complete record of each ICL file
- Provides efficient research of check images and data
- Prevents posting of duplicate check items and check images
- Reduces costs through one-time license fee

X9 IMAGE CLEARING will receive and store X9.37 Image Cash Letter (ICL) files received from image exchanges such as the Federal Reserve Bank. MICR and other ICL transactional data is extracted from the files and populated into a SQL database. Data can then be formatted for interface to core banking systems and legacy image archives. Incoming files are checked for duplicates.

## Case Studies

This section describes problems faced by real customers and how they applied technology from All My Papers to overcome these problems.

### Remote IRD Printing

**Customer** A large national bank

**Opportunity** IRDs provide the opportunity to save on transportation costs and to speed clearing if the data is transmitted for local printing at the location where the IRD is required. To take advantage of this opportunity, this customer decided to establish remote IRD print locations distributed across the nation. These would all be controlled from centralized operations processing centers.

**Problem** Data integrity issues with ICL files used for the purposes of IRD printing can cause IRDs to be printed incorrectly or not at all. More serious issues have the potential to cause the entire IRD batch printing process to fail. This can result in missed clearing deadlines and can increase operational expense to process the exceptions created.

This customer was receiving ICL files from multiple sources both internal and external to the bank, including international branches. Data integrity issues with the ICL files received created challenges for reliable and accurate printing of IRDs at remote locations. Data integrity problems included incorrectly formatted ICL files, high MICR misreads, wrong image formats, and image quality problems.

**Solution** An All My Papers business partner chose All My Papers IrdLIB SDK to provide the tools to print IRDs from ICL files. The custom application allows the ICL file to be loaded at the centralized operational center and creates a print spool job that can be sent to a variety of networked connected printers at the remote locations across the nation.

The customer also uses All My Papers X9LIB SDK to pre-process ICLs before they are sent to the printers. The tools include a function called “Print Ready” that checks the ICL file for any issues that might cause an IRD to not be printed, to be printed incorrectly, or to cause a total print job failure.

The “Print Ready” function signals if there are major issues with the ICL or generates a list of items that fail the “Print Ready” criteria. This customer then uses the list to remove the exception items, allowing the IRD printing process to continue trouble free. Exception items are built into exception ICLs for exception processes.

In many cases, All My Papers X9LIB functions allow for automated repair of the data integrity issues. MICR Verify is used to detect and correct for MICR misreads. Non-repairable items are assembled into return or other exception ICL files for further processing.

Detecting and removing bad items early in the process enables an efficient and reliable IRD printing process. Exception processing also is controlled and initiated early in the process and totally managed at the centralized operations center. Exceptions are detected and removed promptly, preventing any delays in clearing caused by problems in the bulk IRD printing process.

With the tools provided by AMP, the national bank can repair data integrity issues before files are sent to the remote IRD locations.

## Supporting Proprietary Bank ICL Format

- Customer** A small correspondent bank
- Opportunity** This correspondent bank wants to take advantage of the opportunities afforded in using ICLs by transmitting its check deposits electronically to its check clearing service provider.
- Transmitting the deposits electronically shortens the clearing cycle and allows a later cutoff time.
- Transportation and operational costs also go down as paper processing is reduced.
- Problem** The large financial institution that provides deposit services to this correspondent bank had adopted a proprietary format extension of X9.37 that supported deposit tickets in the transactional data.
- The correspondent bank was using the standard X9.37 ICL file formatted to the rules provided in the Federal Reserve Bank's X9.37 companion document.
- The correspondent bank needed a way to convert to the proprietary format so it could take advantage of the opportunities provided by Check 21.
- This bank's solution provider did not have support for the proprietary Remote Deposit ICL format, and did not have the programming resources required to make the necessary conversion within the constraints of the bank's schedule and budget.
- In addition, the service fee schedule of the large financial institution provided for savings if the total number of bundles could be reduced. The customer wanted a way to merge items in different bundles into single bundles while still adhering to a maximum bundle count.
- Solution** The correspondent bank and its solution provider contracted the professional services of All My Papers to develop a custom process using the All My Papers X9Tools command functions to convert from the FRB X9.37 format version to the large financial institution's proprietary format.
- This batch process automatically calculates the credit amounts for the bundles, then formats and inserts a credit record for the deposit transaction using account information configured in the initialization files. This same batch process is able to both merge and split bundles, creating deposit ICLs that minimize the service fees payable.
- The large financial institution's proprietary format is one of the many variations supported in All My Papers tools. The customization cost to the correspondent bank was very low, with an implementation time of less than one week, including definition, parameterization, system and acceptance testing.
- By using the technology and professional services of All My Papers, the correspondent bank was able to quickly implement and use the remote ICL deposit services provided to them by their service provider and immediately take advantage of the savings this provided.

## Viewing, Conformance Testing, and Editing ICLs

- Customer** A large national service provider of check clearing services
- Opportunity** The benefits of using ICLs for check clearing are numerous and the financial industry is scrambling to implement the services.
- Users of ICLs will need to clear ICL files between financial services and will need to use exchange services. Several organizations have established ICL clearing services. This customer is one of these organizations.
- Problem** With so many sources of ICL files, the risks of receiving ICL files with interoperability and data integrity issues are a certainty.
- This customer needed to build in safeguards to ensure problematic ICL data was prevented from being cleared and would not create any catastrophic failures of the entire clearing system.
- It also needed to be sure that the output formats it created to send to financial institutions conformed to the X9.37 standard and its own rules.
- To minimize the risks associated with interoperability and data integrity issues, this customer needed to be able to certify that the ICL files created by its own customers conformed to the required standards and companion documents.
- To assist its customers in implementing their ICL processing systems, it needed to be able to diagnose problems that their ICL files produced. In addition, this customer needed to be able to test that the safeguards built into the clearing system did indeed work, and required test case samples for its system testing.
- Solution** This customer chose to use the All My Papers X9 VIEWER application to certify that ICL formats conform to the X9.37 standard and supporting companion documents for its exchange system. In addition, X9 QUALIFIER proved useful as a front-end to X9 VIEWER to accelerate the locating of non-conforming items.
- To certify that a customer's system is producing compatible ICL formats, this institution inspects ICL samples provided by using the X9 VIEWER and analyzer capabilities.
- This application analyzes the ICL formats immediately upon opening and highlights any issues discovered. The institution is able to quickly confirm conformance and also provide a diagnosis of any issues discovered during the certification process. It is able to certify its own output formats using the same tool.
- This customer has built many safeguards into its clearing system to ensure that ICLs with interoperability and data integrity issues are detected and prevented from entering the clearing system. To test these safeguards, the customer uses the X9 VIEWER Edit capability.
- The edit functions allow creation of test files that do not conform. Records can be deleted, fields can be erased, or incorrect data entered. It is even possible to create test ICL files using a simple text editor and some sample images. Using this tool, the customer is able to create test cases to ensure that its system is able to detect and reject problematic ICL files.
- In addition, when its system does detect and reject a non-conforming ICL file, it is able to diagnose what is wrong with the file and provide feedback to its own

customers to enable them to make the necessary corrections to their ICL processing systems.

The AMP X9 VIEWER minimizes the risks of interoperability and data integrity issues for this customer, and provides valuable tools for testing and analysis.

## ICL Return Processing

**Customer** A Midsize National Bank

**Opportunity** Using ICLs for sending returns increases the benefits gained by implementing an end-to-end electronic check system in a financial institution.

This customer wanted to increase its competitiveness in the marketplace by realizing these opportunities and by implementing an ICL return clearing system.

**Problem** A financial institution has three options to implement a return clearing system when forward items are received in an ICL:

1. Print up a Return IRD and send it for return clearing
2. Print up a Return IRD, then image it in the capture system and create a Return ICL
3. Create a Return ICL using the item records from the Forward ICL

Clearly the third option maximizes the benefits of electronic clearing as it eliminates the need for any further paper processing.

But the customer had no existing system that could be used or modified to perform this function.

Also this customer did not have an image-enabled return processing system that allowed it to perform research on the images of the exception items.

**Solution** This customer was able to implement an image-enabled Return ICL processing system very simply and quickly using technology from All My Papers. The bank already had developed an inclearing system using an application built using the All My Papers X9LIB SDK product.

With a list of the posted exceptions, this customer used the All My Papers X9 VIEWER to research the items, and generate a list of returns.

The customer now uses a simple but efficient Return ICL generation application using the functions provided in the X9LIB SDK.

The Return ICL generation function only requires the Forward ICL with a return list. The function copies the return item records from the Forward ICL, builds a new ICL, then creates and adds the required return records for the item to process.

Using the tools and applications from All My Papers, this bank was able to quickly (less than 30 days) implement a complete end-to-end ICL clearing system that maximized the benefits provided by image exchange.

This customer does not have to concern itself with the intricacies of ICL formats. The All My Papers tools produce simple comma separated text file input and outputs to its ICL processing systems, making it easy to interface to its existing posting account system.

Return ICLs are easily generated, needing only a text file containing the list of returns with reason codes.

The X9 VIEWER provides a simple but effective research tool for inspecting image and transaction data received in ICL files.

## ICL Remote Deposit Capture System

**Customer** Remote Deposit Solution Provider

**Opportunity** Providing remote deposit services became the first priority for this financial institution.

This application provided the most benefits to the bank's corporate clients.

This service removes geographic boundaries, giving banks a new growth area, and giving opportunity to the solution providers that can provide remote deposit products to these financial institutions.

This customer saw an opportunity to establish a third party remote deposit clearing service via the internet.

Using a web based client, customers could provide the images and MICR of their deposits. This data would be formatted and then sent to the customers' desired banks for deposit. Customers would have the option of using their own scanners and capture applications.

**Problem** This type of solution created challenges for both data integrity and interoperability.

The provider had no control over the capture environment, yet was responsible to ensure the data integrity of the MICR and image data.

Its customers also had the flexibility to choose to which bank the deposit ICL was to be sent. This meant the customer needed to be sure the ICL formats produced met the remote deposit format requirements of the respective institutions, requiring support for multiple format variations.

**Solution** All My Papers technology was used to solve both the data integrity and interoperability issue challenges for this type of solution.

The MICR Verify technology provided in the AmPLIB SDK is used to automatically correct rejects and misreads in the MICR data captured, solving MICR data integrity problems.

The "Exchange Ready" functions provided in the X9LIB SDK ensure images are captured in correct formats and without image quality issues.

The X9LIB SDK provides the means to produce the required ICL formats required by the different financial institutions.

Using All My Papers toolkits, this customer is able to dedicate its scarce programming resources to the features of the application.

It does not have to concern itself with the intricacies of ICL processing because the toolkits already support the formats they need.



This enabled a quick time to market for its solution, giving it a superior competitive advantage over solution providers who try to implement their own ICL file processing technology.

## Conclusion

After reading this whitepaper, you now have a good understanding of the issues as you take the steps toward your own implementation. We would appreciate hearing from you if you have any questions or comments related to this whitepaper or about any of the All My Papers ICL processing products.

Please contact us at:

All My Papers, 13750 Serra Oaks, Saratoga, CA 95070

Phone: (408) 366-6400 Fax: (408) 366-6406 E-mail us: [sales@allmypapers.com](mailto:sales@allmypapers.com)

We hope you will choose All My Papers technology for your implementation. We know you will appreciate how easy our tools are to use.

We are able to rapidly implement an efficient system that will isolate you from all the interoperability and data integrity problems that are out there, saving you time, aggravation, and money.