

White Paper

Check 21

Controlling Image Quality at the Point of Capture

by
Harvey Spencer



Digital Check Corporation
466 Central Avenue
Northfield, IL.

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Why is it important to ensure that an acceptable image of a check is captured at the first point of entry to the check clearing process under Check 21 legislation?

The answer is simple -- if the image quality is not acceptable, the truncating bank negates the benefits of image conversion. Either the check must be re-imaged and reprocessed or the physical paper check must be submitted. If it is impossible to create a quality image and the paper check is not available, the truncating bank will have to pick up the liability.

Check 21 Image Requirements

The Check Processing for the 21st Century Act (aka Check 21) was passed by Congress in October 2003. On October 28, 2004, its provisions become active. This means that legally a bank may convert physical checks to digital image representations and pass those images through the clearing system. As a result, it is likely that the bank's customers will not be able to get their original checks back any more.

Check 21 law does not mandate use of images. All it does is permit the legal use of 'substitute checks' as legal drafts if they are created according some simple rules from an image of the original. This has the effect of increasing interest in converting a paper check to a digital image representation and then using that check image for clearing and movement instead of the paper. The benefits are major improvements in the process, that can be achieved at lower cost for all parties, than are currently possible. In the case of the collecting bank, some of the areas of saving include reduction or elimination of traditional proof/encode operations, later cut-off times, elimination or reduction of courier costs and no sort by routing numbers. In the case of clearing operations, the costs of clearing electronic images is likely to be a great deal less than processing paper.

	Paper 2004 fees	Image prop'd image fwd	Fed 10pm fees sub check fwd
City	0.5 - 8 cents	2 - 7 cents	4-13 cents
RCPC (country)	0.5 - 34 cents	2 - 7 cents	4-13 cents
Cash letter	\$2.00 - \$37	18 - 42 cents	30 - 80 cents
*Source: Federal Reserve			

In the case of the paying bank, there is no need to fine sort the items or return the physical paper.

As a result it is expected that over the next few years, all 40 billion odd checks that are written in the United States will be converted to image.

The Federal Reserve has dictated one key piece of image management -- that they will only accept bitonal (black and white) images at 200 or 240 dots-per-inch resolution compressed using a group/4 modified huffman algorithm. It makes sense as current back office check processing equipment creates these sorts of images, they are commonly used in the document imaging business and they use a small amount of bandwidth (typically 15K bytes for each side of the check). But it also means that challenging backgrounds on personal checks have the ability to wreak havoc with the image quality if the conversion (thresholding) from grayscale or color originals is not carried out sufficiently well.

Defining Image Quality

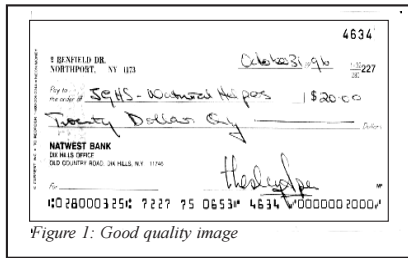


Figure 1: Good quality image

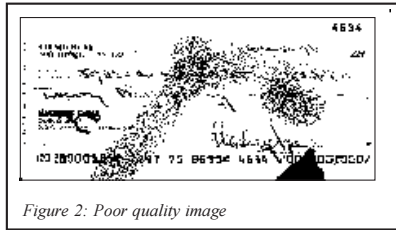


Figure 2: Poor quality image

We all know quality when we see it, but what does it mean? Often we define quality in terms of negatives -- if you cannot read it, then clearly it is not a quality image -- but what if you can read most of it, but it is not usable? Figures 1 and 2 are clear examples of a good quality and bad quality image. What is an acceptable image to one person may be unacceptable to another. The FSTC committee on image quality defined quality as "The totality of characteristics of an image that bear on its ability to satisfy stated or implied image needs" -- figure 3 shows a hierarchy of image quality needs.

Checks consist of a defined format regulated through standards developed many years ago. The format consists of a limited number of fields. On the front these include the account and bank number on which the check is drawn, date, payee, amount to be paid and approval signature. These fields are located in predefined areas so that the checks can be quickly and effectively processed -- the account number, routing code and check number are printed on the bottom of the check using

an E13B font designed to be read magnetically at high speed. The back of the check often contains endorsement information showing where the liability occurs.

Quality is a subjective matter dealing with legibility and acceptable legibility may depend on how easily automated 'reco(gnition)' systems can read the data. In order to have sufficient quality to process the check, it must be readable at minimum as well as the physical paper checks that are currently passed through the clearing process to the paying bank. But under Check 21 law, it is likely that only images will be passed through the clearing system -- so the physical paper may not be available. In this case the image must then be of sufficient readability to be used to pay the funds or the paying bank may refuse payment (see Figure 3).

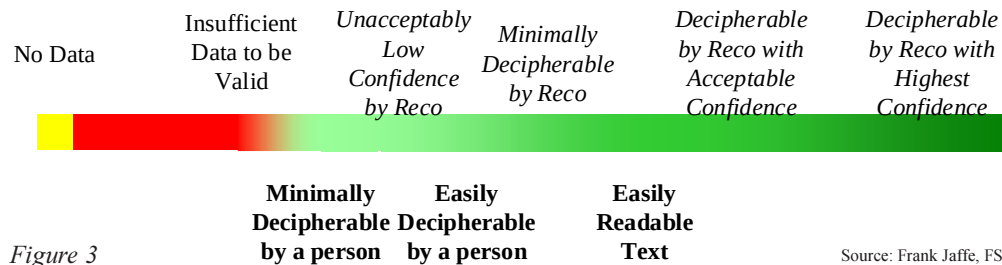


Figure 3

Source: Frank Jaffe, FSTC

Who has the liability for not delivering a legible / usable check image?

The liability for image quality of the check image lies with the truncating organization and remains there even though other liabilities shift once the correspondent or paying bank has accepted the check.

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So the truncating bank has to ensure that it creates and sends a quality image on to their correspondent or clearing house since if the paying bank cannot read the check, it will not pay it. At this stage, the truncating bank will either have to go back to the original paper (if it has it) and pass that through the system or recreate the bitonal image from a stored higher quality image (color or grayscale) and resubmit. Either way it will be expensive to manage a check image returned for poor quality reasons. To keep this cost to a manageable amount, each organization accepting a check image preferably needs to ensure that they are receiving a quality image.

The ANSI Standard

Check image interchange formats and supporting file formats have been defined by ANSI X9. The image formats are a part of X9.90 while the supporting electronic cash letter is X9.37. Contained within the X9.37 standard are a set of fields designed to tell the receiving organization whether each item is a quality image or not. These test flags essentially say you may have a problem because the image is damaged, it is too light, too dark, too noisy etc.. The problem then became what does 'too' mean.

From the bank's standpoint it mostly means unpayable. From the bank's customer's standpoint it may mean something else depending on the information they require. From other people's standpoint (e.g. check guarantee companies) it may mean something very different.

FSTC Input

A sub committee associated with FSTC (Financial Services Technology Corporation) which consists of vendors, banks and supporting organizations was set up to define measurement criteria for quality. It has just issued its Phase 1 report.

What are the elements involved?

FSTC has identified 16 metrics to ensure overall image quality. These are designed to enable 'rapid low cost measurement of image characteristics to determine the probability that a check image will be usable'. They are not designed to perform a more subjective analysis of the data elements within the check and that may effect its usability as a payment instrument. Examples are whether the MICR line could be read magnetically or whether the amount could be automatically recognized. For this type of field specific analysis, users will have to employ additional software tools beyond the FSTC recognized ones.

The 16 different defect metrics identified are as follows:-

1. *Undersized Image*
2. *Folded or Torn Document Corners*
3. *Folded or Torn Document Edges*
4. *Document Framing Error*
5. *Excessive Document Skew*
6. *Oversized Image*
7. *Piggyback Document*
8. *Image Too Light*
9. *Image Too Dark*
10. *Horizontal Streaks Present in Image*

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11. *Below Minimum Compressed Image Size*
12. *Above Maximum Compressed Image Size*
13. *Excessive Spot Noise in Image*
14. *Front-Rear Image Dimension Mismatch*
15. *Carbon Strip Detected*
16. *Image Out-of-Focus*

These are the basic measurement metrics identified to ensure that the check image may be successfully cleared, but each vendor has the ability to add more measurements.

Each metric has a definition, a measurement and units used, criteria to identify whether the defect is present or not and possible sources (the complete document may be downloaded from the FSTC site -- www.fstc.org). Pass/fail criteria are set as standard measurements to be incorporated in the ANSI X9.37 standard and FSTC is asking ANSI to expand X9.37 to allow passing of the quality values. The intent is that the accepting organization can quickly evaluate an image for acceptability, probably in conjunction with the amount of the check and other factors.

In order to assist with this, a second phase FSTC sponsored project is being planned to assess a value for each of the metrics, transforming them in combination using empirical analysis to create a single minimum usage quality flag. The intent is that this flag can then be quickly tested by each user of the images for acceptability.

Create Quality Images as Early as Possible

"To realize the full promise of Check 21, paper checks should be truncated as early as possible in the payment cycle," says Fred Herr, Senior Vice President, Retail Payments Office, Federal Reserve Bank of Atlanta. "Everyone will benefit as organizations expand their use of image technology and more institutions are able to receive electronic image files rather than paper checks."

Capturing at the Point of First Presentation.

"To realize the full promise of Check 21, paper checks should be truncated as early as possible in the payment cycle," says Fred Herr, Senior Vice President, Retail Payments Office, Federal Reserve Bank of Atlanta.

The earliest stage in the payment cycle is at the point of first presentation and the key to reducing liability and realizing substantial cost savings is to assure a high quality image is sent on to the next stage.

This means that the best place to create a quality image is while you still have access to the paper (i.e. the teller station if practicable, the corporate AR department or the retail store). This way, each check image (item by item quality assurance) can be analyzed and improved while the paper is available -- even while a customer is depositing a payment or paying a bill. Any problems involving the physical paper can be identified and fixed immediately. The key is to maintain levels of customer service and not to keep the customer

waiting any longer than normal.

An alternative is to scan batches of items at the back counter or in the back office. Batches are most effective when used for capturing large numbers of check items in a deposit or where multiple deposits are grouped together. Traditionally batch scanning has been carried out in the back office on high speed scanners. A high speed back office sorter has approximately 20 milliseconds to make a quality decision and, if the check image is poor, will outsort it into a reject pocket for exception

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processing. This only allows for basic global quality checks to be performed. The outsourced exception items, which usually represent a small minority of the total, are then handled manually and scanned separately. Although the time scale and the batch volumes may vary, this is the way that any batch processing operation must work -- whether at the counter, at back counter or in the back office.

In small volume environments such as at the teller, a batch operation is not an efficient way to work. Batch processing involves analyzing each check within the batch and attempting to fix it or out sorting the offending items and re-imaging. If the image has already been converted into black and white (thresholding), then the possibilities of fixing it electronically are very limited. Even if the user has access to the grayscale or color, it will probably have been compressed using a lossy compression such as JPEG which can make fixing it difficult. Using higher level intelligence such as CAR/LAR automated handwritten amount recognition, or segmented analysis and intelligent thresholding becomes difficult because of the times involved.

Front counter scanning with an item by item QC process solves the problem. But it works best when the total number of deposited items is low -- usually 5 or less items. Commercial deposits with a much higher volume of items are better handled at the back counter or the back office.

Analyzing the Image at the Point of Capture

Truncating at the teller allows 20x more time for analysis, optimal image quality adjustment, and fraud detection.

At the front counter the teller can accept the items and convert them without significant time impact. The teller's scanner can output a raw grayscale or color image (see figure 4) to the PC and work on it from there. Using today's PC's connected directly to the teller scanners, allows over 500 milliseconds to be available for work on *each check item* without impacting on performance or causing the bank's customer to wait longer in line -- over 20 times more time than a back office sorter has. The processor power available today on a PC at the counter or in a commercial environment allows for reiterative multiple thresholding (conversion from color or grayscale into black and white -- see figure 5) with reference to recognition engine results in order to produce the best quality image and minimize teller

keying amounts. It also has reference to files such as positive pay in order to detect fraud while the customer is in front of the teller. And if the truncating bank wants it, the original grayscale or color image can be maintained for reference -- available in case of queries as well as the black and white image.

Exception items that cannot be truncated, such as checks in carriers can be caught immediately. In the case of corporate truncation, the receiving bank can be assured of a quality image that will clear without problems.



Figure 4: Original Color Image

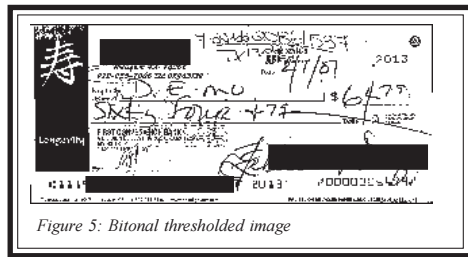


Figure 5: Bitonal thresholded image

Conclusions

The truncating organization has responsibility for image quality and:-

- The liability for creating a poor quality image lies with the truncating bank.
- Poor quality images will result in slower payment and higher costs and the depositor or depositing bank may have to find and submit the original paper check.
- Truncating the checks at the point of first presentation in many cases keeps the size of each transaction low. Low item transaction volumes allows time for the creation of a guaranteed good quality image at the time of truncation. This eliminates the need for outsourcing and exception handling as a separate process.
- Higher volumes need a batch type operation, which will require a separate exception management activity.
- Under Check 21, successful scanning systems will be able to handle both image-by-image QC for front office and low volume operations in conjunction with batch type processes for higher volume operations.

About Digital Check Corporation

Digital Check Corporation is the leading manufacturer of countertop check scanners in the world today and has the largest range of scanners for this market. Digital Check's 'TellerScan' brand check scanners, which are manufactured in the US and Europe, are used in the world's largest teller scanner automation systems and have been used by many of the world's top banks. Digital Check Corporation is a privately owned corporation located in Northfield, IL (tel: 847-446-2285).

Digital Check's scanners are interfaced through a common API which supports item by item quality assurance as well as high speed batch scanning using the same software. For more information please visit www.digitalcheck.com.