Best Practices for Check Image Capture

Without Traditional Check Scanners

Ensuring the Best Customer Experience
**Quick Start**

The essential good practices are outlined here. The balance of this whitepaper provides more detailed information about the how's and why's of using smartphones and scanners to capture check images.

**Smartphones**

1. Use a contrasting/ non-reflective/ plain background - preferably black
2. Place the check as flat as possible
3. Position the check so it is well illuminated and evenly lit with no shadows
4. Turn off the camera flash
5. Hold the camera steady to ensure sharp focus
6. Tilt the camera slightly until the check image is horizontal and not skewed in the image frame
7. Move the camera toward or away from the check until it fills the image frame (or registration corners, if any.

**Flat Bed Scanners**

1. First clean the glass platen and clean the inside of the cover. Dirt smudges will interfere with the check image
2. Place the check in a corner flush against two edges. Note: the back side must be placed in the same corner and in the same orientation as the front side was
3. Use gray scale capture¹

**Auto Feed Scanners--Checks Only**

1. Scan the narrow edges of the checks first. Set the guides to hold the narrowest edge of the widest check. Guides prevent skew and jamming
2. Run in duplex, auto deskew, gray scale capture¹

**Auto Feed Scanners--Mixed Documents, Remittance Vouchers and Checks**

1. Scan the wide edges of the checks first. Position them that way in the stack of documents that are going to be scanned
2. Run in duplex, auto deskew, gray scale capture¹

¹ If your scanner control does not offer a gray scale option, use color.
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INTRODUCTION

The use of non-traditional image capture devices such as smartphones, desktop scanners, page scanners and multifunction devices in check image capture for payment applications is increasing rapidly. Individuals and businesses alike are embracing the convenience and efficiency of remote deposit capture of check images.

The images captured by these devices can vary immensely in quality. They often contain artifacts or characteristics that make it difficult to extract necessary data and to convert these images into the correct format for the electronic check clearing system.

This paper provides guidelines to avoid poor quality check images and to ensure the best end user experience.

CHECK IMAGE REQUIREMENTS

In order for a check image to be successfully processed by a Remote Deposit Capture software program, it must be of sufficient quality for electronic extraction of MICR data via Optical Character Recognition (OCR) methods. The image resolution must be sufficiently high that it can be converted into a 200 dots per inch, black and white tiff image. Only when a check image can meet the QA standards of the banking system can it be incorporated into an Image Cash Letter (ICL) file for exchange through the electronic clearing system.

SOFTWARE COMPENSATION & SOFTWARE IMAGE PROCESSING

Software can try to compensate for poor quality captured images. All My Papers has software that can resolve multiple issues and turn many poor quality check images into exchange ready conforming images.

By starting with the best image you can capture on your device, you will garner benefits such as:

- Faster throughput
- More accurate MICR OCR
- More reliable CAR/LAR (recognition of the numeric and written amount of the check)
- Fewer items returned for non-conformance with exchange requirements
- Fewer picture retakes
- Higher customer satisfaction

All My Papers has developed this Best Practices guide so you and your end users can capture the best check images with a variety of scanner and camera devices.

PREPARING A CHECK FOR IMAGING

Checks should be placed as flat as possible on a contrasting/ non-reflective/ plain background - preferably black
Folded checks should be smoothed flat
Corners unfolded
One check at a time
No other papers or documents in the background.
SHADOWS AND LIGHTING

Uneven illumination can cause parts of a check image to be unreadable. Be careful of shadows caused by something blocking the primary light source. Figure 1 shows not enough light on the right side of the image, probably caused by something between the check image and the primary light source.

Fig. 1—Shadows can cause all or some of the check image to be unreadable.

Too much light is as bad as too little light. Always turn off the automatic flash. Set the exposure control point for the center of the check image and get as close as you can to the check without cutting off the edges. Under-cropping a check image by moving the camera too far away from the check or by using too low of a zoom setting can also result in an over-exposed, low contrast image.

Fig. 2—Too much illumination caused by direct sunlight leads to low contrast.

CONTRAST AND BACKGROUND PATTERNS

The check image needs to be taken against a contrasting background with minimal visual noise so the software can detect the edge of the check image.

Backgrounds such as wooden or Formica desktops are particularly problematic. On such backgrounds, the check edge becomes unclear, especially if there is a glare from the reflective, polished surface.

When image processing software analyzes a check image taken against a noisy background, it must try to discern if the light to dark transitions in the wood grain are part of the check or part of the background surface. A dull black uncluttered background is best.

Capture only one check image at a time. Do not have multiple checks or other items in the image.
Flatbed Scanner Backgrounds

Be aware that flatbed scanners may create images with background issues. The underside of the scanning lid may be white or may even contain its own light source for slide scanning.

![Scanner lid with light source in the background.](image)

If the inside of the scanner lid is not solid black, placing a black sheet of paper behind the item to be scanned will provide a more appropriate background for check scanning.

Focus

Having a well-focused image is vital to providing your processing software a detailed enough image so that MICR and other data may be accurately extracted using OCR software. An out of focus MICR line will be very difficult to read reliably.

Poor focus can be caused by slow shutter speed (the shutter was open too long) and/or by movement or hand shake that makes the entire image blurry. Increasing the illumination will generally result in a faster shutter and less sensitivity to small movements. Low lighting can also reduce the contrast between the light and dark components of the image and may cause the camera to focus on objects at a different plane, such as image elements in the foreground or background, rather than the check itself. **Figure 5** below shows a MICR line with good focus (above) and poor focus (below).

![Acceptable and Unacceptable Focus on MICR Line](image)
Poor focus can also result in a loss of detail when the image is converted from grayscale to black and white as shown in Figure 6 below.

![Figure 6](image1.png)

Fig. 6--Good focus is needed for good conversion of image to black and white for image exchange.

To minimize focus issues, smartphone photos need to be taken with adequate light but no flash.

**SKEW**

Skew refers to rotation of the check image. Skew can happen with any type of capture device and must be controlled. Check images taken with a scanner or camera can be successfully rotated in increments of 90 degrees. However, deskewing from other angles will cause loss of image detail and effective resolution. The images below illustrate "good" and "bad" skew angles:

![Skew Images](image2.png)

Fig. 7--Image Skew - Horizontal (good), Vertical (good), Angled (Bad)
While software processing of the image can de-skew an image from almost any angle, the process of de-skewing reduces the effective resolution of the image, and therefore reduces the reliability of the OCR process for MICR and other data. This is shown in Figure 8 below. Notice the blocky characters of the de-skewed (lower) image.

![Figure 8: Effect of skew on MICR line resolution - Top no skew, bottom corrected from ~12° skew](image)

**Resolution**

Check images destined for inclusion into RDC files and then subsequently exchanged in the Check 21 clearing process must have a resolution of at least 200 dots per inch (dpi).

A 200 dpi resolution is well within the capabilities of most scanners and smartphones. In the case of flatbed and multi-function devices, image resolution is generally selectable from the scanning software or as a default setting on the device.

In the case of check images from smartphone cameras, in addition to device capabilities, you need to consider distance and frame filling factors when thinking about achieving a 200 dpi resolution.

Let's take an example:

Suppose you are taking a picture of a business check that is 8.5” wide by 3.5” high. In order to achieve a 200 dots per inch image, you would need a check image that is at least 8.5 inches times 200 pixels (1,700 pixels) wide and 3.5 inches times 200 pixels (700 pixels) high. Here are some examples of the same check taken with the same camera but from 2 different distances.

The image in Figure 9 was taken with an Apple iPhone 4 and yielded an image 2,592 pixels wide by 1,936 pixels high. See that the image of the 8.5” x 3.5” business check occupies approximately 2,420 by 995 pixels which is most of the image. 2,420 divided by 8.5 is about 285 dpi and 995 divided by 3.5 is also about 285 dpi, yielding more than enough resolution for both OCR-based data extraction and for exchange processing.

![Figure 9: Smartphone image of a business check with sufficient resolution for check image processing.](image)
Compare this with Figure 10 below which contains an image of the same check taken with the same camera but from farther away. In this case, the check image occupies only 1,530 x 648 pixels which yields horizontal and vertical resolutions in the 180 dpi range. This is too low for reliable data extraction and exchange processing.

![Fig. 10--Smartphone image of a business check with insufficient resolution for check image processing.](image)

Most RDC smartphone applications take care of ensuring adequate image resolution by providing crop marks to guide the user in framing the check images. This helps with cropping, resolution and skew control.

Frame the check image so that so that it nearly fills the frame bounded by the crop marks as shown below in Figure 11.

![Fig. 11--Capturing a check image with a typical smartphone RDC application.](image)

![Fig. 12--Smartphone capture application with user instructions about backgrounds, lighting and framing.](image)
NON-RECTANGULAR CHECK IMAGES

The camera should be perpendicular to the check when taking a photo. Check images taken at an angle will cause the rectangular check image to be captured as a trapezoid, where one edge of the check is longer or shorter than the opposite edge.

Fig. 13—Approximately rectangular image (good) on left, image with trapezoidal distortion (poor) on right.

CROPPING

Don’t get too close and cut off the check boundaries. Processing software needs 4 clearly distinguishable check boundaries to find check edges and to properly process check data.

Fig. 14 - Properly cropped check image (left) and improperly cropped check image (right).

MAINTENANCE ISSUES

All capture devices require some level of maintenance, even if it is just lens cleaning. Properly maintain your capture device to avoid image artifacts that can reduce the reliability of OCR data extraction.
SUMMARY

Following the practices outlined here will help you obtain the best end user experience. Check images should be:

- Taken against a contrasting and non-reflective background
- Flat and not curled, creased, crumpled or folded
- Well illuminated
- Evenly lit with no shadows
- Taken without flash
- Obtained with a fast shutter speed and held steady to sharpen focus
- Horizontal and not skewed at an angle (camera), horizontal or vertical (scanner)
- Well framed so check fills most of the image frame
- Not clipped or improperly cropped
- Taken with only one check in the field of view

CONCLUSION

The use of smartphones and scanners to capture check images is increasing. Those developing and deploying solutions that include check image capture will need to pay significant attention to helping their users capture the best possible quality check images. Failing to do this will cause user errors in capture that make it difficult for processing software to do the necessary OCR-based data extraction and conversion of these raw check images into exchange-ready images.
ABOUT ALL MY PAPERS

All My Papers (AMP) is a developer and distributor of software toolkits and applications. AMP’s core competency is check Image Cash Letter (ICL) processing software. Products include the technologies required to perform interoperability and data integrity processes such as the extraction of MICR data from check images, validation of check data and standards conformance for ICL files. In addition, AMP provides tools for viewing, editing and reformatting of ICLs and the printing of Image Replacement Documents (IRDs).

All My Papers (AMP) is a supplier of technology for the processing of check images for Remote Deposit Capture vendors and the internal development teams of financial institutions. AMP’s technology is field proven and has successfully processed over 1.5 million deposit transactions from home scanners and mobile phones since its initial deployment. This is in addition to the billions of check images AMP has processed in the traditional venues.

AMP’s trusted relationship with major financial institutions has given AMP access to large databases of real customer deposited check images. This has allowed AMP to develop technology that is able to solve the major challenges of processing check image deposits with reliable OCR extraction for the existing and emerging segments of the RDC marketplace.

For more information about All My Papers solutions to the challenges of Remote Deposit Capture and Remote Deposit Camera Capture, contact sales@allmypapers.com

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