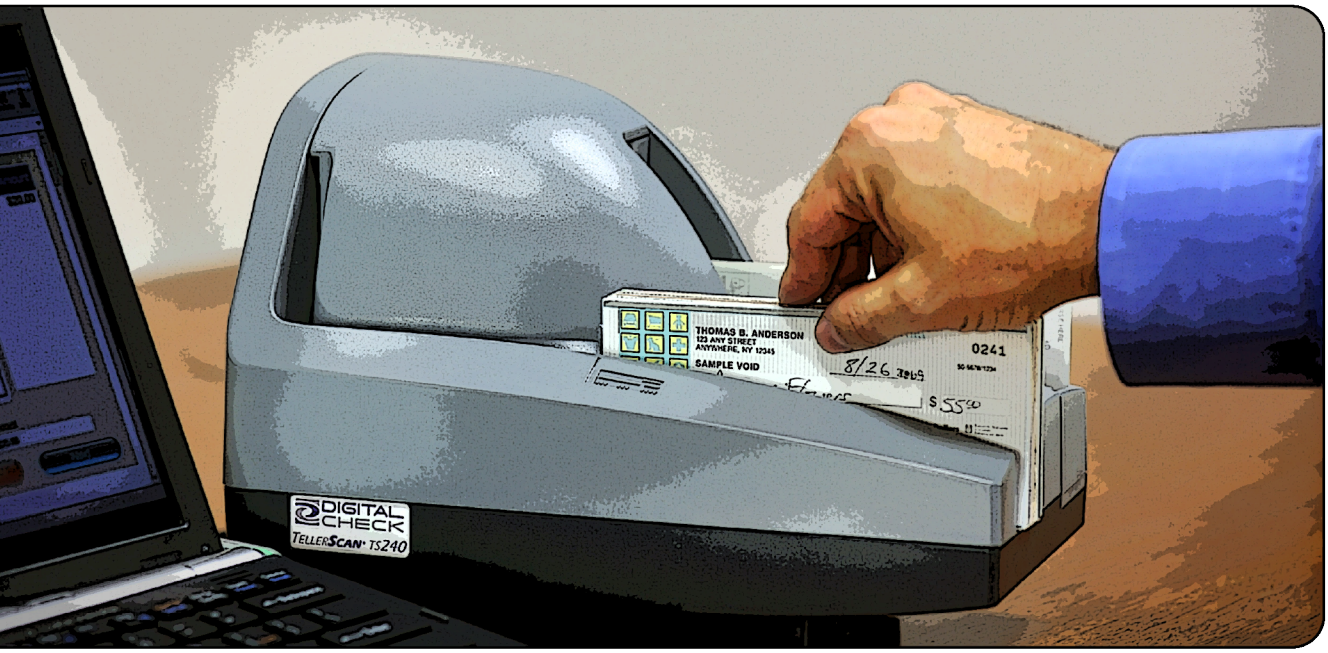
Deconstructing
The Scanner Speed Wars



At the Teller Window, Does Faster Mean Better?

Ask 10 bankers what they believe are the key specifications of a scanner at the teller window, and all 10 will put speed high on the list. It's a logical stance: Scanning checks takes time, so the faster you scan, the more time you'll save – right? That's why each new generation of scanners has pushed the upper limit of speed a bit higher – from 30 documents per minute (dpm) up to 60, 75, 100, 120, and now 160 and even 200.

But does there exist a point of diminishing returns for scanning speed – a point at which you're going so fast that it doesn't matter if you go any faster?

In fact, the evidence indicates that not only does such a point exist, but that we already reached it years ago.

With the most recent generation of scanners, the standard leap was from 100 dpm to 120 – and for the first time, we found customers asking: Since tellers usually only scan a few items at a time, will increasing the speed actually make any difference?

Answering that question required a closer examination of the transaction process at a branch. In a series of trial runs, we found the main elements of a typical teller-window deposit to break down roughly as follows:

Greeting, statement of purpose	*15-60 sec.*
Establishing identity of customer	*15-45 sec.*
Presentment of deposit; data entry	*60-300 sec.*
Insert items and activate scanner	*3 sec.*
Scanning of documents	*1-2 sec.*
Remove documents and sort	*3 sec.*
Any necessary keying	*15-45 sec.*
Offer/print receipt	*5 sec.*
Total	**117-463 sec.**

The shortest transactions, in which everything went smoothly, tended to wrap up in just under two minutes. The longest — in which we requested cash back, asked about our account balance, and listened to a comparison between two different types of accounts — clocked in at a line-clogging seven and a half minutes. (Before you write that off as an extreme outlier, remember that these transaction-as-a-sales-opportunity moments are a big reason why banks still keep as many branches open a they do.)

While far from scientific, our test laid bare an important practical truth: Going from 100 dpm to 120 dpm sounds like an impressive 20% increase in speed – but in everyday use, that means the difference between scanning a check in 0.6 seconds and scanning a check in 0.5 seconds, which is not noticeable. According to data from several of our partner banks, 99% of transactions at the teller window involve scanning fewer than six total items (including checks, deposit tickets and any other documents), with the average being just more than three. Even assuming the maximum six items per transaction, the overall impact on transaction time would be:

For 99% of typical transactions,the segment of time that we can address by increasing scanner speed is extremely limited. Even small percentage reductions become increasingly difficult to obtain the faster we go: Raising the top scan speed by 600%, from today's median of 160 dpm to a theoretical 1,000 dpm, only speeds up the overall transaction by about 1.6%. Increasing the speed from 1,000 dpm to infinite dpm would shave off another 0.3%, and that's the most we can get out of scanner speed. In other words, there's hardly anything left to reduce anymore.

End of the Line? Not yet ...

So, does that mean that check scanners are a mature technology, with no room for improvement? Far from it. Even at 100 dpm, we were already pushing the maximum of what can be done with faster "feeds and speeds." But let's look at a few other issues that can come into play during a typical two-minute teller window deposit.

Misread and re-scan	*20 sec.*	*+16%*
Device reset and warm-up	*60 sec.*	*+50%*
Document jam	*60 sec.*	*+50%*
Unreadable document	*60 sec.*	*+50%*
Major account error/dispute	*$10.00-$27.00 per item*	

For the teller scanner of the future, the critical attributes will be reliability and, especially, image quality. While mechanical failures are time-consuming "critical stops," they already tend to be few and far between. Image quality issues — especially poor handwriting and dark backgrounds — affect up to 15-20% of all items scanned, including many that cause problems even when the scanner is functioning perfectly. Since these issues can also cause expensive problems to crop up later on in the clearing process if not dealt with at once, their proportional importance in the teller workflow is huge. With multiple levels of software validation, we have achieved MICR read rates of up to 99.7% in lab conditions, leading us to conclude that the most fruitful ground for improving efficiency in future scanner generations lies not with faster mechanical speeds, but rather with ever-increasing accuracy and image quality.

Scanner speed	Scanning time	Total transaction time	% Difference
100 dpm	3.6 sec	120 sec	n/a
120 dpm	3.0 sec	119.4 sec	-0.50%
160 dpm	2.25 sec	118.65 sec	-1.13%
200 dpm	1.8 sec	118.2 sec	-1.5%
1,000 dpm*	0.36 sec	116.76 sec	-2.70%
∞ dpm*	0.0 sec	116.4 sec	-3.00%

This should not be mistaken to mean that there exists no room for improvement within scanning hardware itself; durability and maintenance costs comprise a secondary but still important dynamic of scanner ownership. The duration between routine cleanings represents the most visible aspect of maintenance in day-to-day operations: A typical cleaning takes several minutes and may use $1-$2 of consumable supplies.

Early scanners tended to pick up so much dirt through the document feeder that they often required cleaning more than once a day during heavy use. But advances in polymers used in the rollers for feeding mechanisms have increased the cleaning interval to weeks and months, and improvements to other core components have allowed them to last through hundreds of thousands of scans. Here, too, we expect to see continuing advances through the next scanner generation – however, as we advance closer to the level of the "maintenance-free machine" over the next generation or two, so will we also approach the point of diminishing returns for further efficiency gains.

When Speed *DOES* Matter

So the one big question that remains is: If speed is making less and less difference in the teller capture process, why use an auto-feed scanner at all? After all, the difference between scanning a check with a 100 dpm high-speed scanner or a 30 dpm single-feed scanner is only 1.4 seconds per item – still a trivial amount of time, right?

But here is where the difference in user experience tips the balance back toward higher speed: With a single-feed scanner, in addition to the difference in scan speed, the manual insertion/removal and sorting processes must be repeated for each individual item. Let's look at the impact that has on a transaction involving six documents:

So switching from automatic to single-feed not only affects the actual scanning speed; it quintuples the time of the overall scanning process. The true breakthrough was achieved by removing repetitive manual steps.

Similar trends are present in the typical profiles of remote deposit capture end users. Those with only a few items per month are content to use mobile devices that take several seconds to capture an image; those with up to several checks per day prefer the user experience of a flatbed scanner; and those with more than that find it worthwhile to invest in a dedicated check scanner.

We have, in fact, witnessed several overseas clients deploying single-feed scanners as teller and branch capture machines, providing an interesting window into the real-world implications of such a practice. Many of the scanners used in such situations scan more documents in three months (about 30,000) than most single-feed devices process in their entire lifetimes. And while the devices themselves have, for the most part, held up remarkably well, the time spent manually feeding documents over those three months adds up to well over 40 hours per machine.

Rated Speeds: Apples to Apples?

Another well-known but seldom-discussed fact about check scanners is that the rated speed is just that — the top speed at which the scanner can perform under ideal conditions. Usually, this means that speed at which it could scan a large stack of identical items at default settings, with little or no additional processing to get in the way. In real-world use, though, other factors can create "drag" that causes the actual speed to dip below the rated speed by as much as a few percent. Certain CAR/LAR functions, for example, are commonly designed to run at 75 dpm, rendering additional speed increases meaningless.

Task	Time at 100 dpm	Time with single-feed
Greeting; customer states purpose	15 sec.	15 sec.
Establish customer identity	15 sec.	15 sec.
Present deposit; teller entry	60 sec.	60 sec.
Insert documents (x6) into scanner	***3 sec.***	***18 sec.***
Scanning of documents	***3.6 sec.***	***12 sec.***
Removal/sorting of documents	***3 sec.***	***18 sec.***
Any necessary keying	15 sec.	15 sec.
Offer/print receipt	5 sec.	5 sec.
Total	**119.6 sec.**	**158 sec.**

In other cases, achieving a higher rated speed can mean other sacrifices. Some scanners (including our own TS240-150) achieve 150 or 160 dpm by reducing the native resolution from 300 dots per inch (dpi) to 200. While that meets the requirements of the great majority of banks — including those for Check 21 processing in the United States — certain special cases need higher resolutions: 300 dpi in Japan and Hungary; 240 dpi for some Canadian users; and 300 dpi to employ OCR on the CMC-7 font used in parts of Europe.

For teller capture, the most relevant difference between rated and actual scanner speed is the one illustrated below: The loss of efficiency when scanning items in small groups, instead of in a large stack. Multi-feed scanners derive a significant portion of their speed from constantly having two or more documents passing through the track at once. So the long "empty space" before the first check in a group means time in which the scanner is feeding but not reading, which can lower the actual speed by 50% or more. Digital Check's own Teller-Scan TS240-150, which runs at 150dpm in sustained feeding, processes at only 72 dpm for the first item.

It should be noted that this phenomenon does not mean there is any dishonesty on the part of manufacturers or distributors, and it affects every brand and model of scanner more or less the same. Think of it in the same way you would an automobile with an advertised top speed of 160 miles per hour — it may be perfectly true that the car is capable of reaching 160 mph, but that becomes a non-factor if you only plan on driving it a few blocks.

So, Is There a Need for Speed?

Make no mistake: There *IS* still a purpose for high-end, high-speed scanning equipment, particularly where large batches of checks are common. For a back-counter branch capture operation that processes 3,000 checks per day, a scanner rated at 200 dpm is absolutely a better choice than one running at half that speed (factors such as sorting capabilities and expected lifespan are also important to consider). But for uses such as teller capture, which involve a series of many small transactions in succession, "feeds and speeds" take a backseat to several other parts of the process.

As an electronics manufacturer, we face many decisions when designing products, and it's important to be open about why. With the most recent scanners, some choices were between pushing speeds higher into the triple digits, or keeping prices down; between bigger motors, or better software to clean up scanned images. Yes, we do play the speed game if you want — as evidenced by our introduction of a 150 dpm teller scanner — but we also feel customers should have the information available to make informed choices.

As we've tried to make clear, our conclusion was that raising the pure speed of a scanner has become an increasingly difficult way to improve productivity — and that the future of imaging depends on improvements in things like precision and intelligent recognition, as well as greater versatility. As we move forward into the next generation of hardware, it's our hope that time will prove this prediction correct.

FEWER ITEMS MEANS SCANNERS DO NOT REACH FULL SPEED

Multi-feed scanners gain much of their efficiency by having more than one document at a time in the track. In these examples, we see a scanner running at a theoretical speed of 120 dpm — but with only one check in the track, the actual speed is much lower. With three checks at a time, efficiency increases, but still does not reach the full rated speed of the device. Most teller window transactions will be subject to this effect. However, with large batches of documents, such as those common in branch capture environments, the impact is much less.

Example 1 - Single Document

0.0 sec.

0.5 sec.

1.0 sec.
= 60 dpm

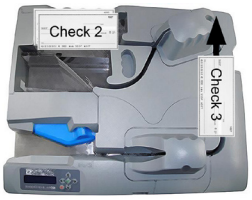
Example 2 - Multiple Documents

0.0 sec.

0.5 sec.

1.0 sec.

1.5 sec.



2.0 sec.
= 90 dpm