Title:
A Concise Guide To MICR And Associated Technologies

Word Count:
1344

Summary:
Magnetic Ink Character Recognition (MICR) was developed to utilize the benefits of computer technology in the banking industry. Prior to the use of a MICR line, check sorting by account number was a manual process. Two systems were previously used to handle the large numbers of checks processed in the banking industry: Sort-A-Matic and Top Tab Key Sort.

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Article Body:
Magnetic Ink Character Recognition (MICR) was developed to utilize the benefits of computer technology in the banking industry. Prior to the use of a MICR line, check sorting by account number was a manual process. Two systems were previously used to handle the large numbers of checks processed in the banking industry: Sort-A-Matic and Top Tab Key Sort.

The Sort-A-Matic system included 100 metal or leather dividers numbered 00 through 99. Each check was placed in the corresponding divider by the first two numbers of the account. The sorting process was then repeated for the next two digits of the account number, and so on. When the process was complete, the checks were grouped by account number.

Under the Top Tab Key Sort system, small holes punched at the top of the checks indicated the digits. For instance, the first hole indicated the value of the first digits (0, 1, 2, 3...) A metal "key" was inserted through the holes to separate all of the checks with the same value in the first digit, and this step was repeated for each digit until all the checks were sorted.

Both of these systems worked, but they were time-consuming. With the advent of the computer and its movement from the laboratory into the business world, a

sorting and matching task seemed ideal. Stanford University and Bank of America were the first to successfully use computers to sort and match checks. They developed what is now known as MICR.

The Development of the MICR Font

The MICR font was developed by Stanford University in conjunction with Bank of America and approved by the American Banking Association. The font is known as the E-13B font. E-13B has a total of 14 characters: ten specially designed numbers (0 through 9) and four special symbols (Transit, Amount, On-Us, and Dash).

The letter E indicates the fifth version considered. The letter B indicates the second revision of that version. The number 13 is derived from the 0.013-inch module construction used for stroke and character width. This means that all character widths, both horizontal and vertical, are in multiples of 0.013 inches ranging from 0.052 to 0.091. The significance of this will be explained more thoroughly later in this article.

MICR Readers

Three types of machines are used to read MICR characters. The two that read the characters magnetically are referred to as MICR readers. The third machine is an Optical Character Recognition (OCR) reader.

E-13B characters are printed with toner containing iron oxide, which is capable of being magnetized. MICR readers transport the checks containing the E-13B magnetic characters past a magnet, thereby magnetizing the iron oxide particles. The magnetized characters then pass under a magnetic read head. The magnetic field (flux pattern) caused by the magnetized characters generates a current in the read head. The strength and timing of this current allows the reader to decipher the characters.

Magnetic readers come in two types: single track (single gap or split scan) and multiple track (matrix or pattern) readers.

Single-Track Reader Characteristics

Single track uses a read head with one gap to detect the magnetic flux pattern generated by the MICR character. When a magnetized E-13B printed character moves across the narrow gap of the read head, the electric voltage caused by the magnetic flux from the character generates a waveform unique to each character.

Multi-Track Reader Characteristics

The multiple track reader employs a matrix of tiny, vertically aligned read heads to detect the presence of the magnetic flux pattern. The small individual

read heads slice across the character to detect the presence of magnetic flux. This sensing of magnetic flux over time produces a unique matrix pattern for each character.

An OCR reader does not use magnetic properties to detect the E-13B characters. Instead, it uses a scanner to detect the amount of light reflected from the character and the amount of light reflected from the background. A photocell column detects the presence of the dark area of a character.

Waveform Theory

The readers move and read documents from right to left. The right-hand edge of the character, as a result, is the first to cross the read head. Analysis of the signal level created by reading the character 0 will help explain this in greater detail.

As the character moves from right to left under the read head, the gap detects the magnetism of the first right-hand edge (edge 1). This results in the increase in magnetism and a positive peak is created (peak 1). As soon as the right-hand edge moves beyond the read head gap, no new magnetism is found, and thus the wave form returns to the zero signal level.

At the second edge, the vertical read head detects a drop in magnetism, which results in a -110 signal level at peak 2. Again the waveform returns to zero until the next portion of the inner ring of the character is detected. At this point (peak 3), an increase in magnetism (+110) is indicated. Finally, the outer portion of the character is read, resulting in a negative peak (peak 4) of -130.

The placement of the vertical edges must occur in increments of 0.013 inches from the first right-hand edge. There are five characters that have two positive and two negative peaks similar to the character 0 and also appear in a positive-negative-positive-negative format. They are 0, 2, 4, 5, and the transit character, which are differentiated from one another by the horizontal location of the peaks in the waveforms. The peaks do require different amplitudes, but ANSI standards allow them to vary from 50% to 200% of the nominal amplitudes (Canadian standards allow them to vary from 80% to 200% of the nominal amplitudes). This is why the placement of the waveform is so important and why the characters are shaped unusually.

What Affects the Signal Level?

Signal level can vary based on a number of factors. The amount of iron oxide (concentration) that is present in the character will affect the signal level. This is a function not only of the toner itself, but also of how it is laid on the paper and the pile height, which can be controlled by numerous other

cartridge components (i.e., "hot" OPCs).

The taller the vertical edge of the character, the taller the peak (either positive or negative). A vertical edge that is not regular and/or not vertical will result in a reduction in the amplitude of the peak and will flatten the peak out.

Keys to proper waveform detection are:

* All peaks in a character's waveform must be detected. The reader sorter must know that the peak is there.

* The peak must be located at or near its anticipated location.

* No significant "extra" peaks can be present.

* There cannot be wide variations in the signal levels of peaks within a character.

What to Look for in MICR Printers and Consumables

Printers that are used for MICR printing must have a unique MICR font that is modified to suit the unique printer engine, and it must be modified to the pixel level to match the magnetic toner provided for that printer. This is essential to ensure the correct waveform, dimension, and signal strength when a check is printed with the correct MICR characters. In addition, the MICR font must meet ABA-X9 standards to ensure acceptance of your checks by banking institutions.

The magnetic MICR toner that you choose must be specifically designed for the particular print engine in the printer. Ensure the toner has been thoroughly tested for consistent signal readings, image permanence and uniformity, and excellent edge acuity. Toner coverage must be solid with no extraneous toner lay down.

OEM cartridges are always a safe (but more expensive) bet. If you buy a "compatible" brand, ensure it has a new OPC drum, new primary charge rollers (PCRs), a new black velvet magnetic sleeve, and new image wiper blades. The hopper system must be filled with high-quality, low-abrasion MICR toner.

The vendor you choose should use the latest and most advance MICR test equipment, such as a Verifier and Golden Qualifier to conform to ANSI X9 Standards. It is also recommended that the systems exceed U.S. and Canadian check printing standards.