Quality Assurance

1.1 General Comments

This section of the Standard has been developed to assist printers and CPA members' personnel in monitoring and interpreting the standards.

Each CPA Direct Clearer has developed a quality assurance program, and questions should be directed to the CPA member and department involved as indicated in Appendix V.

You should not engage in MICR printing without the aid of a minimum of two instruments:

a) a printing and layout gauge; and
b) a pocket comparator.

In larger document printing operations, more extensive and more expensive equipment will be required.

1.2 Printing and Layout Gauges

1.2.1 General

A printing and layout gauge is necessary to check horizontal and vertical positioning, skew and other specifications. The gauge has a transparent screen that is placed over a proof/document to determine dimension, location, skew and other details as illustrated in Figure 1.

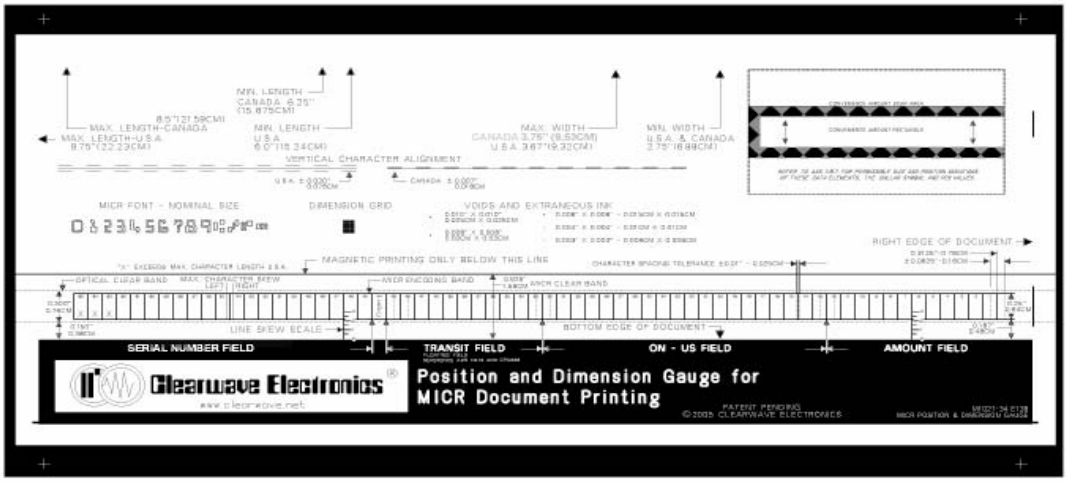
In addition, the printing and layout gauge provides examples of MICR conventions -- minimum, nominal, and maximum -- which will help to judge the acceptability of the line you are printing.

Note: In Canada the maximum size for cheques and other payment items is 21.59 cm ($8^1/_2$") as shown on the printing and layout gauge in Figure 2.

Quality Assurance

Figure 1

Diagram courtesy of Clearwave Electronics Ltd. (not to scale)



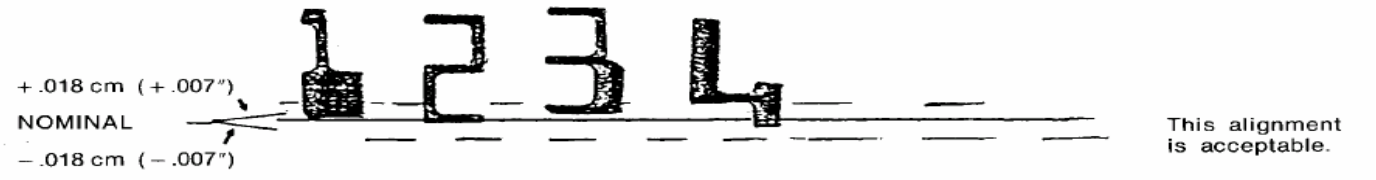
1.2.2 Alignment

When printing MICR characters, the alignment of the bottom edge of any two adjacent numerical characters must not vary more than .018 cm (.007"). This tolerance is checked quickly and easily on the printing and layout gauge where a special checking line is provided for this purpose. Comparators can also be used to check this requirement.

There are no limitations on alignment between fields, providing the upper and lower limits of the MICR fields measure .64 cm ($^1/_4$"), lie within the 1.59 cm ($^5/_8$") MICR band and the spacing between fields conforms to the standard spacing requirements (see section 1.2.4 of this document).

When you purchase a photo-set line of MICR characters on film, you can usually depend on the supplier having met this specification. However, it takes only a moment to verify.

If you use foundry type or monotype characters, care must be taken with lock-up to make certain that the bottom alignment comes within the required tolerance.



Quality Assurance

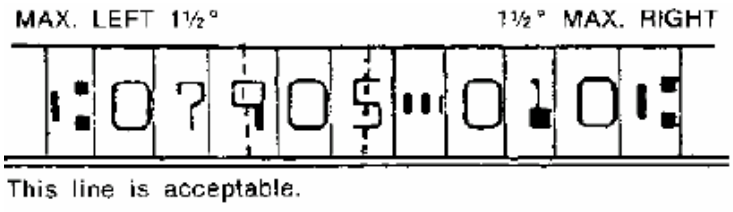
1.2.3 Character and Line Skew

Skew is the rotational deviation of a character from the vertical with reference to the bottom edge of the document. Each character must be judged on its own merit. Dirty matrices and bent encoder bar heads contribute to individual character skew. This, plus any line skew, is cumulative and represents total character skew.

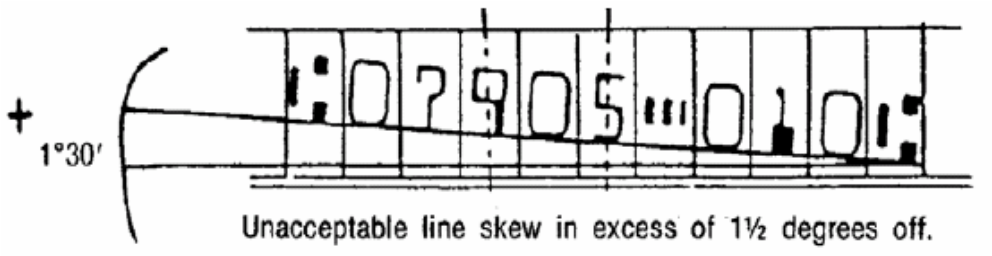
The maximum skew of any character or line cannot be more than 1½ degrees off vertical, either one way or the other, using the bottom edge of the cheque as a horizontal reference.

This tolerance can be checked visually by using the printing and layout gauge, where test lines are provided for this purpose. A skew scale is also provided on the gauge for both line and character testing.

Comparators can also be used to check these requirements.

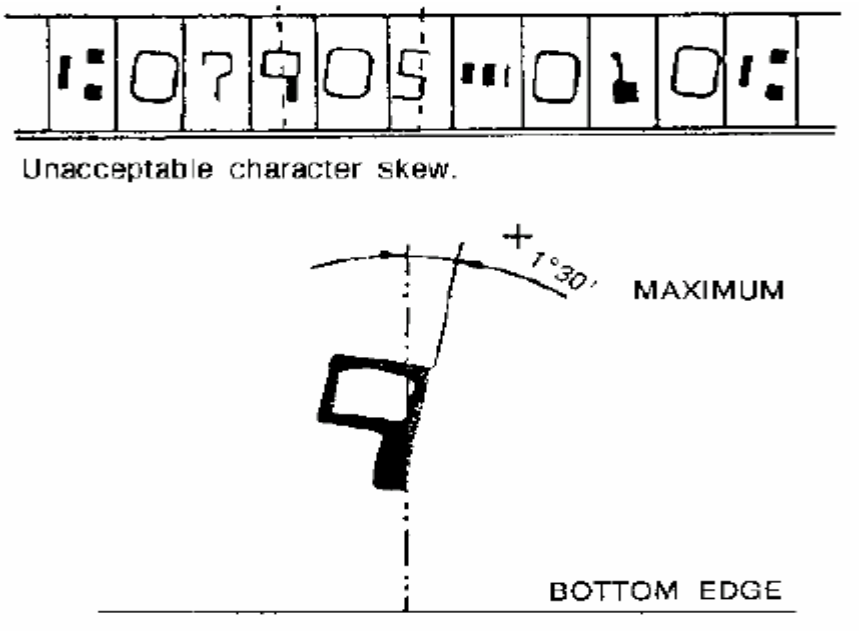


This line is acceptable.



Unacceptable line skew in excess of 1½ degrees off.

Quality Assurance



1.2.4 Spacing Requirements

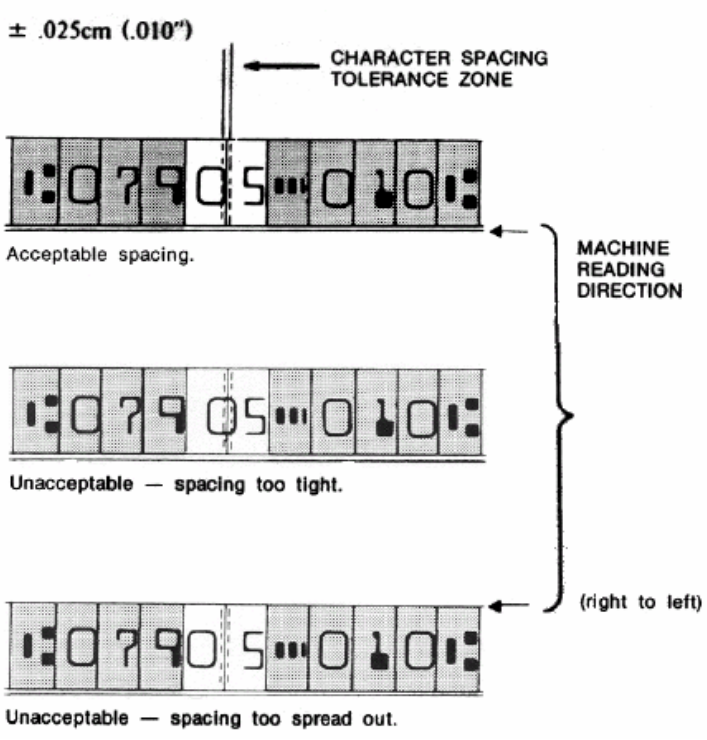
The space between MICR characters must conform to certain measurements. The distance between the right average edges of adjoining characters is .318 cm (.125"), plus or minus .025 cm (.010") in the Transit Number and Amount Fields. The plus or minus tolerance is the width of any one of the squares on the layout gauge grid. In the On-Us and Serial Number Fields, and between adjoining fields, the distance between right average edges can never be less than .292cm (.115").

When MICR characters are photo-set on film for offset reproduction, this requirement is usually met by the supplier. The shoulders of foundry type and monotype characters usually are cast to provide the proper distance.

When using the printing and layout gauge, proceed as follows: a long-dashed line appears in space #43 (and #1). When the symbol, at nominal line width, is placed between this line and the right-hand solid vertical line of space #43, all characters in this field should have their right-hand edge touching the vertical space-lines. When a character is out of contact, or under a line, the gauge should be shifted to bring the character into space #43 where the tolerance can be checked.

Comparators can also be used to check this requirement one character at a time, where one character may look doubtful under your examination with the layout gauge.

Quality Assurance



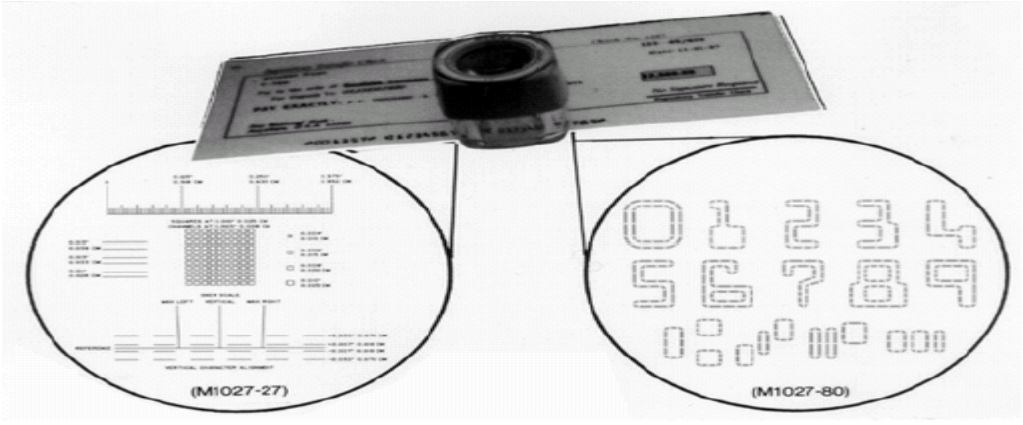
1.3 Comparators

1.3.1 General

The pocket comparator enlarges the print image 12 times and enables you to see and verify the position and width of horizontal and vertical bars, overall dimensions and general quality.

A grid designed to give a visual check on the image is etched on the window surface of the pocket comparator.

More powerful table model comparators enlarge many times more than pocket comparators and provide a greater degree of accuracy. Table model comparators use a layout chart with a grid as the centre of its format.



Quality Assurance

1.3.2 The Grid - A Key to Quality Assurance

The grid which appears on the lens through which you view the magnified image is a pattern of etched squares against which the darker image of the character under examination shows up sharply.

The printer who is being asked to print characters within these limits must have some visual means of determining whether or not the characters printed are too thick, too narrow, too heavy, too light, or just right. This can be done with a comparator which enlarges the printed impression of the character to a point where minute variations are plainly seen and provides a grid or pattern against which to measure variations not in millimetres (decimal centimetres, thousandths of an inch) but simply by comparison to plainly discernible areas.

The following is a simple explanation of the principle of the grid pattern which printers will use in MICR work:

Suppose you were given a printing assignment to produce and print a line of 8 point type **exactly** 2.54 cm (1") long and you were told that you might have .020 cm (.008") leeway. How could you be sure that your line did not measure the prescribed 2.54 cm (1") plus, say, .025 cm (.010")?

To measure such a line would require exact equipment and highly trained and experienced technicians. But, if you were given a pattern of that distance and some means to enlarge the 2.54 cm (1") line to a point where millimetres (decimal centimetres, thousandths of an inch) were easy to see, you would have no difficulty in printing that line to meet the required specifications.

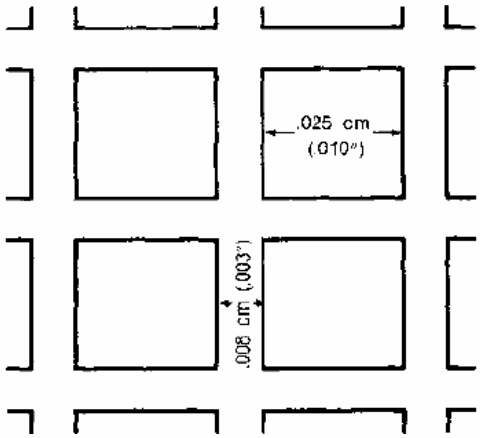
While the pattern itself would conform exactly in millimetres (decimal centimetres, thousandths of an inch) to the specifications, you would not be asked to measure that .020 cm (.008") tolerance. All you would have to do would be to keep your 2.54 cm (1") line within two marks, say, on a transparent piece of plastic.

Put that extremely accurate piece of plastic against the printed impression of your 2.54 cm (1") line; enlarge the whole thing up to a point where you can see if your impression touches, nearly touches or goes over the line and you have really measured the line in millimetres (decimal centimetres, thousandths of an inch)… not by measuring in the sense of computing the distance, but simply by comparing the line with a guide which you know represents the exact distance required. Under such circumstances you do not need to know how many millimetres (decimal centimetres, thousandths of an inch) you can go this way or that; millimetres (decimal centimetres, thousandths of an inch) need not come into the picture. The pattern has taken care of the strict requirements and all you have to do is match the pattern. If your printed image falls within the boundaries of that pattern, you are automatically complying with millimetre (decimal centimetres, thousandths of an inch) tolerances.

In principle and in practice, this is exactly what you do when you check a MICR character with a viewer or comparator. The grid supplies the pattern and when you view the printed character through it, the image is enlarged up to a point where you can see whether it is too thick or too thin because the grid provides the reference marks needed to do this.

The tolerance data which follows, is expressed in millimetres (decimal centimetres, thousandths of an inch) as well as in terms of comparison with the grid pattern areas. These you can see on your comparator.

Quality Assurance



The grid, as seen in the above illustration and following pages, is a pattern of identical squares separated by channels of uniform width.

The characters used in MICR printing are closely related to the size of the squares on the grid. The various strokes which make up MICR characters are one, two, three or four squares wide.

The ideal printed character will fill the respective number of squares and will bisect the channels on either side of the squares. When the magnified image of the character is viewed against the grid, it is easy to see if it meets the required standards.

The digit "8" in figure 1.4.3 is in an "**Acceptable**" form. All of its edges lie between the squares within the channels.

The digit "8" in figure 1.4.4 is at the "**Upper limit of tolerance**". The edges extend over the channels between the squares and are touching the adjacent squares.

The digit "8" in figure 1.4.5 is in an "**Unacceptable**" form. Its edges do not cover the minimum designated area.

Quality Assurance

A printed MICR character is within tolerance if its right, left, top and bottom average edges lie within the channels between squares when the character is viewed in isolation, under the grid (see figure 1.4.1).

Thus, the use of the grid enables one to see if the vertical and horizontal bars of a character are positioned properly in relation to one another and if they are within tolerance.

So that you may relate the size of the squares and the channels between them to the millimetres (decimal centimetres, thousandths of an inch) usually used in stating tolerances, and get the feel for these tolerances on the viewing screen of the grid, these sizes are as follows:

a) each square on the grid is .025 cm x .025 cm (.010" x .010"); and

b) the channel between the squares is .008 cm (.003") wide

Here, then, is where you can reconcile the tolerances which the electronic sorting machine demands. There are no millimetre (one-thousandth) graduations on the grid pattern, but with the knowledge that each square is .025 cm (.010") wide, with intervening channels .008 cm (.003") wide, and also with examples of MICR character printing to illustrate both permissible and unacceptable variances, you should have no difficulty.

1.4 Character Dimensions

The minimum width of the horizontal single stroke bars in any character, (e.g. the uppermost bar of the digit "8") is to be .028 cm (.011"). The minimum width of vertical bars is governed entirely by dimensions locating each edge.

Subject to these dimensions being correctly at tolerance limit (see figures 1.4.1 – 1.4.5 for diagrams of "8's"), the minimum width of these vertical bars may be as low as .025 cm (.010"). For use of the grid in testing character dimensions refer to figure 1.4.1.

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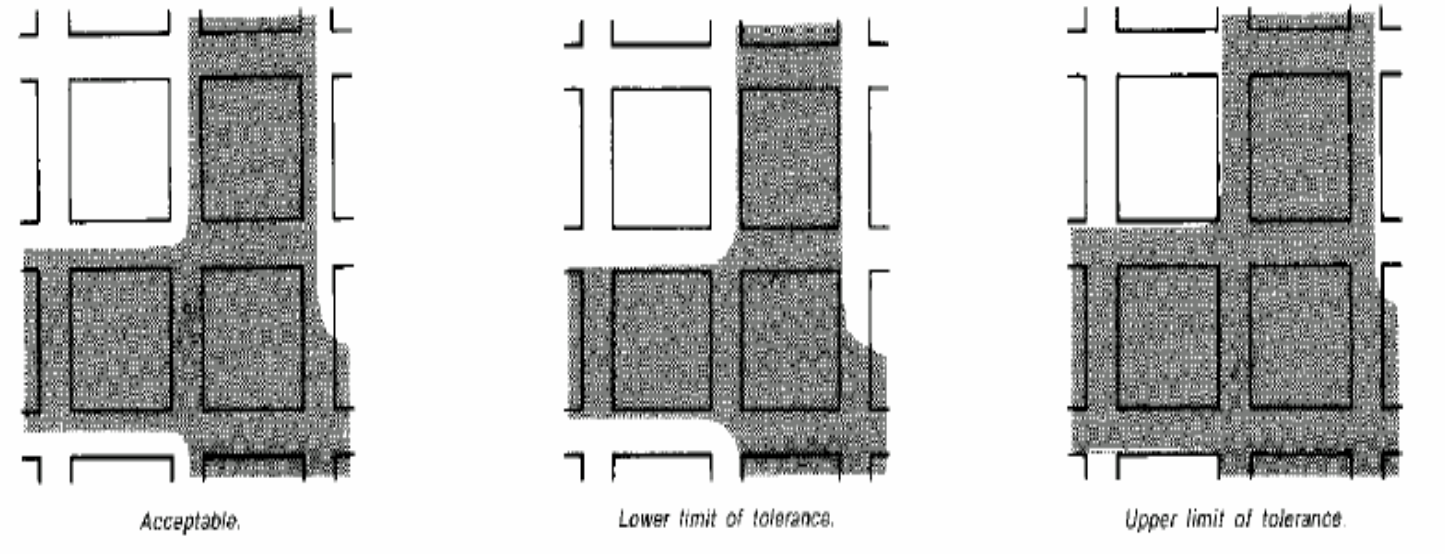
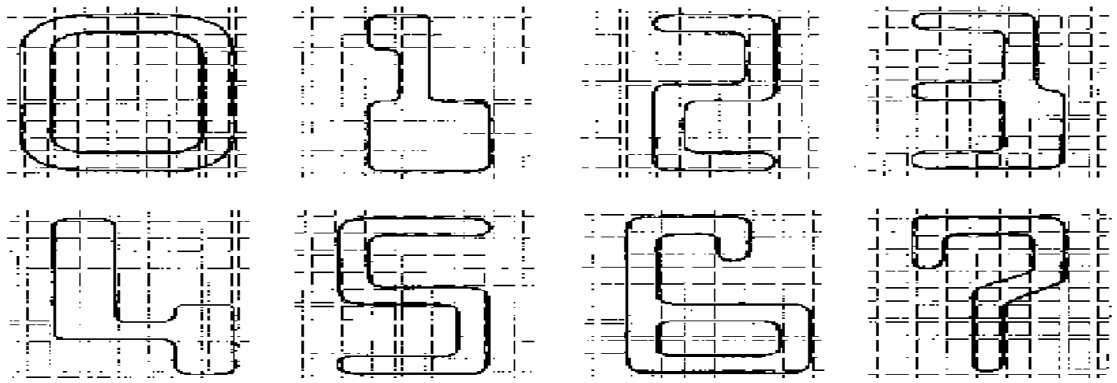
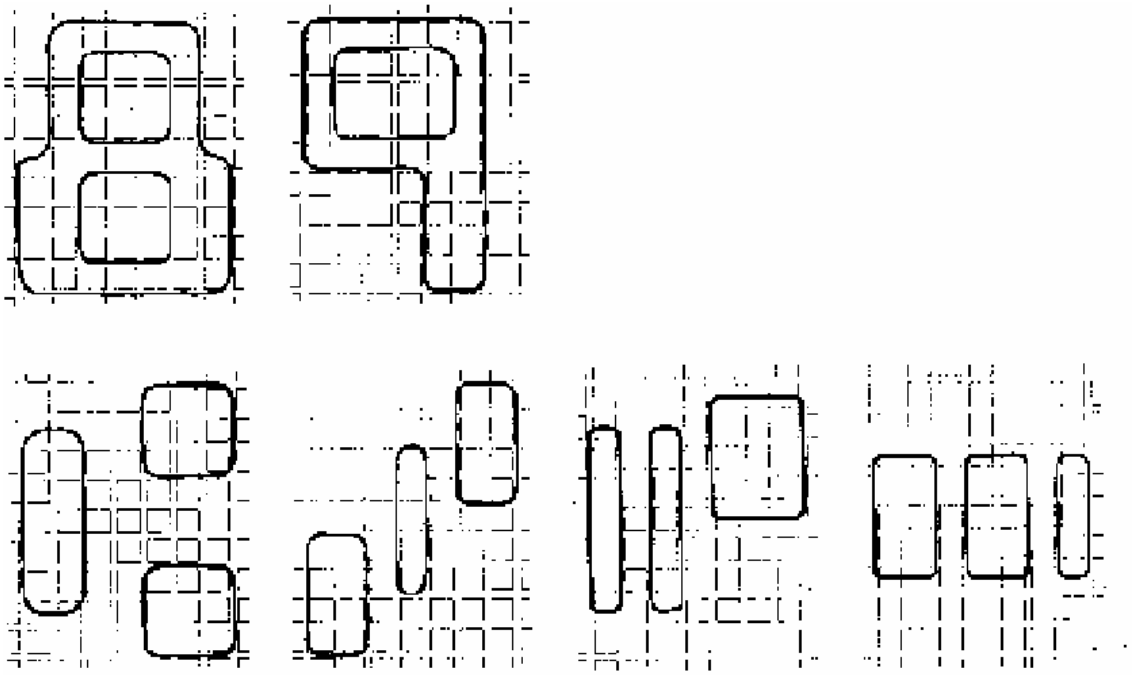


Acceptable. *Lower limit of tolerance.* *Upper limit of tolerance.*

1.4.1 Illustration of E-13B Font Characters as They Appear on the Grid

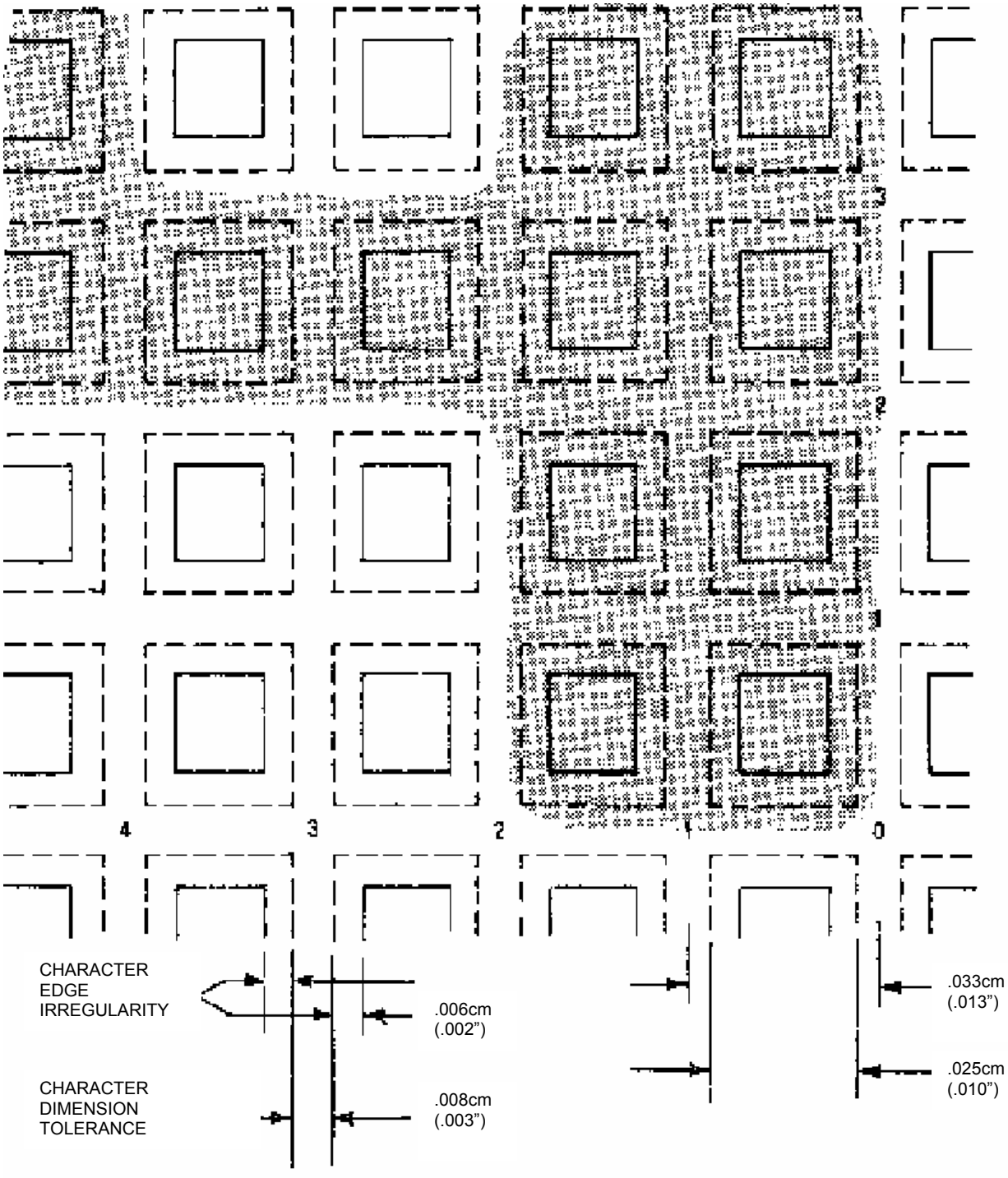


Quality Assurance



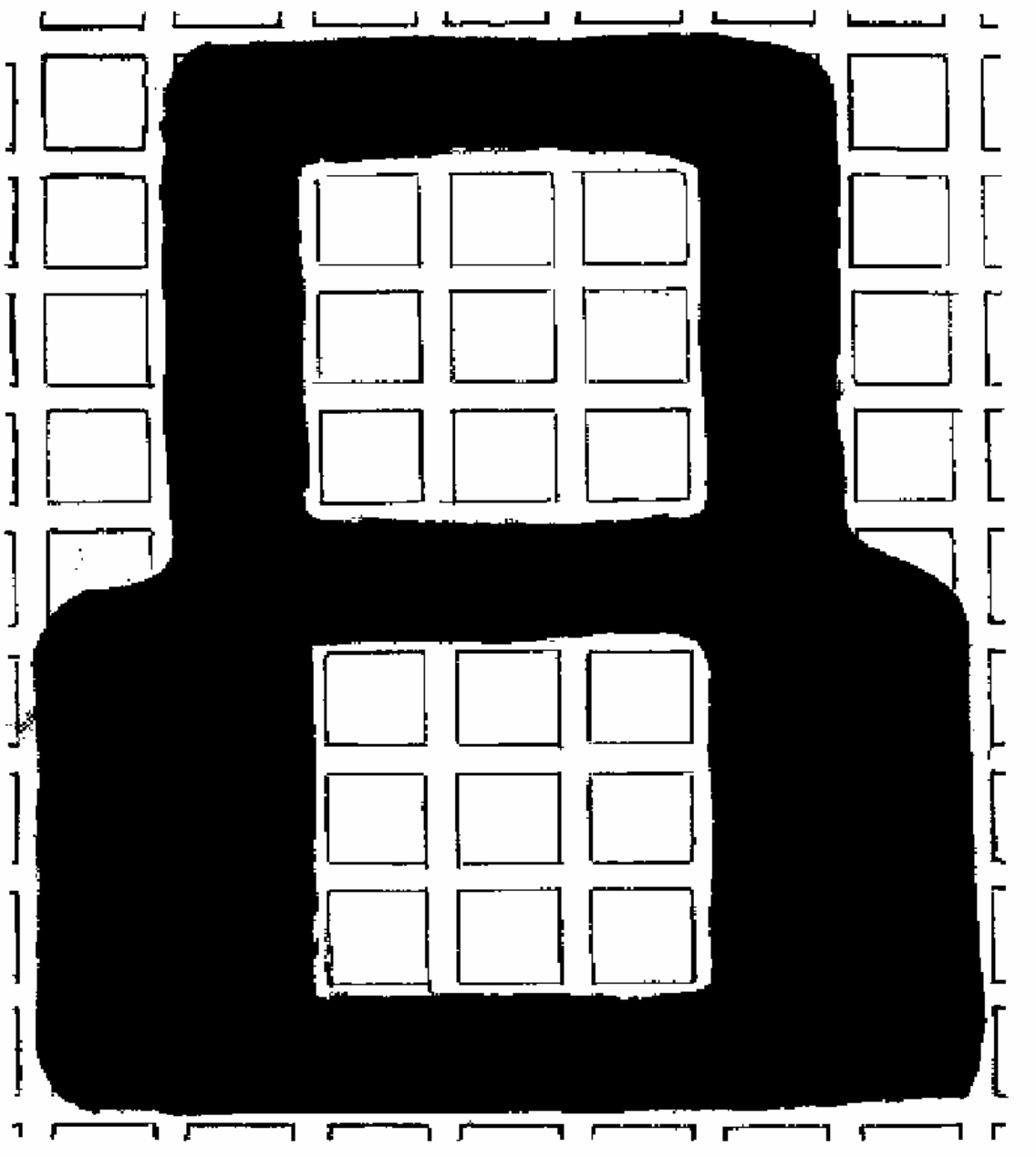
Quality Assurance

1.4.2 Example of Grid Detail



Quality Assurance

1.4.3 Acceptable Character Dimensions



Reproduced through the courtesy of Canadian General Electric Company Limited and Honeywell Systems.

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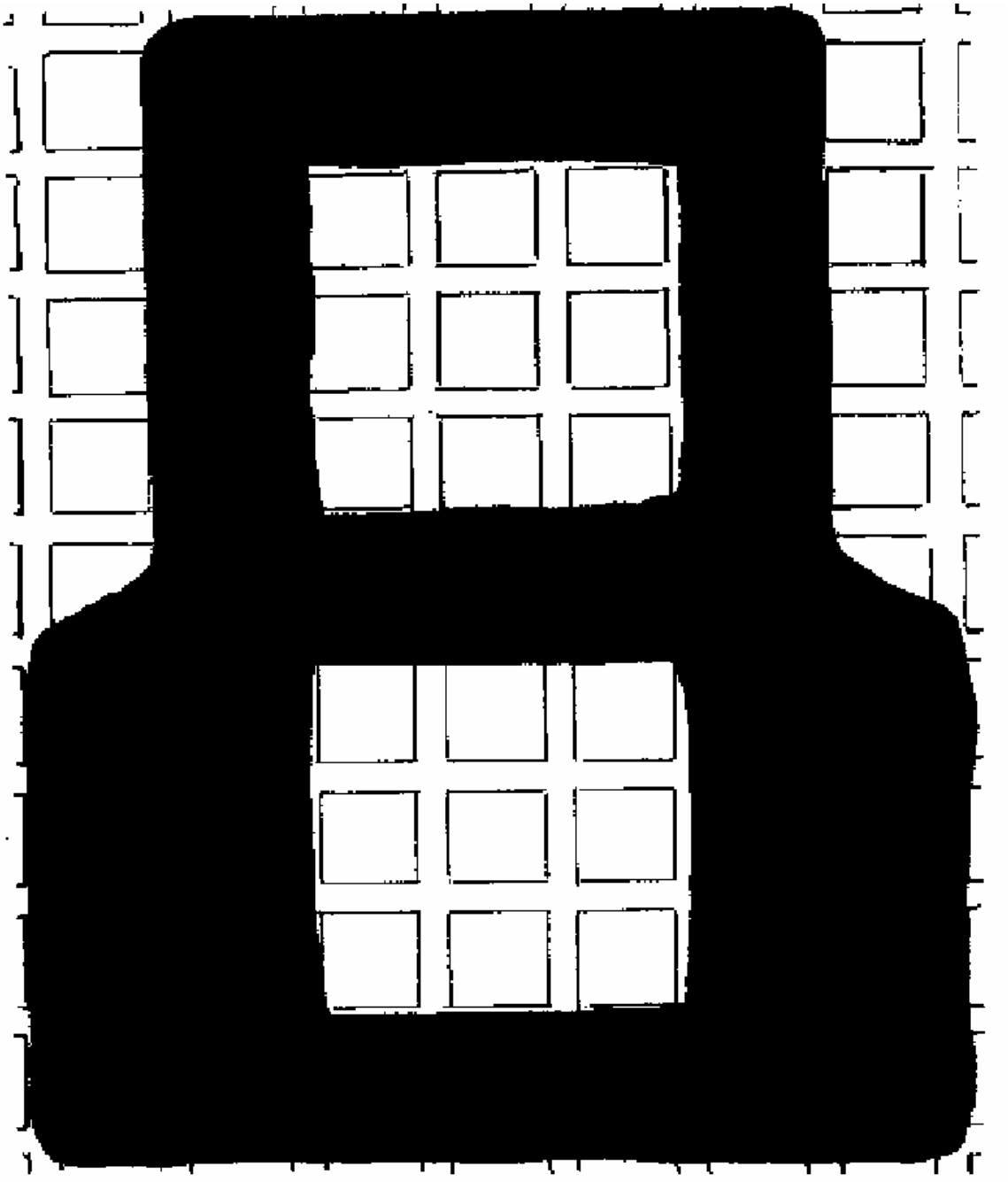
1.4.4 Upper Limit of Character Dimension Tolerance



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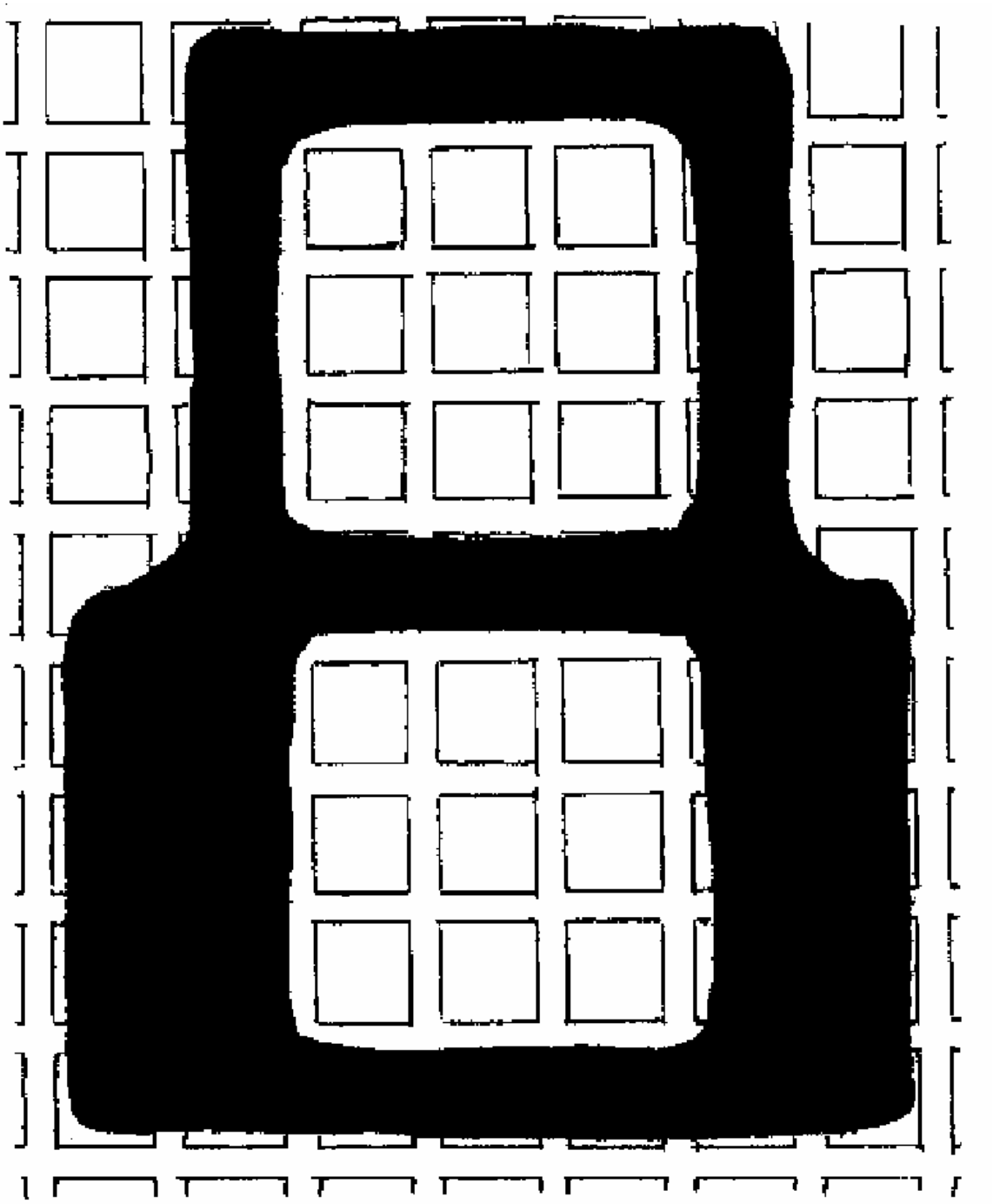
1.4.5 Unacceptable Character Dimensions



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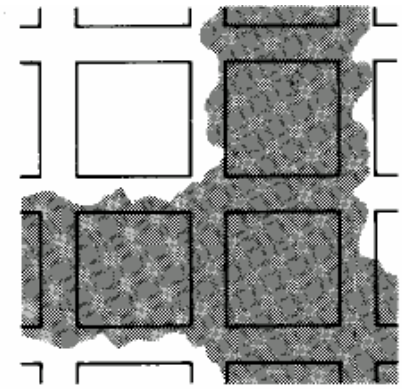
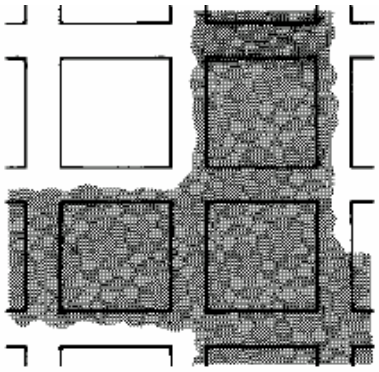
1.5 Average Edge Tolerance

When magnified, it can be seen that the typical edge of a printed character is not a straight line. The average edge can be considered as an imaginary line dividing the irregularities as equally as possible. In viewing MICR characters, this becomes a matter of judgment.

When you size this average edge on the comparator, the character dimension should reach no more than .0038 cm (.0015") on either side of the average edge dimension. In other words, the average edge must stay within the channels between the squares on the grid. Bear in mind that the minimum dimension of single width horizontal lines is limited to .028 cm (.011") and vertical lines to .025 cm (.010").



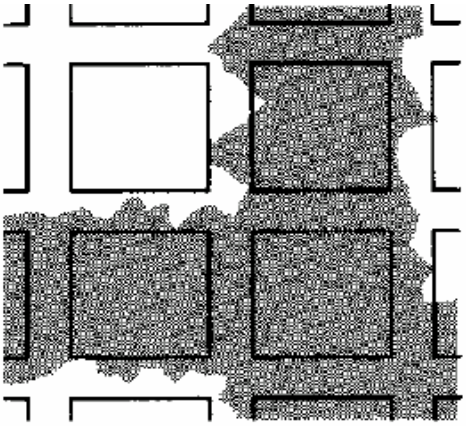
Acceptable



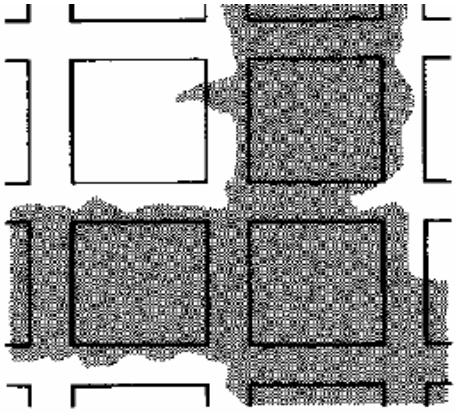
Excellent

1.6 Edge Irregularity

Peaks and valleys about the average edge are permitted to extend to plus or minus .0089 cm (.0035") from the dimension locating the edge. However, when these occur, the summation of the edge present in the .0038 cm to .0089 cm (.0015" to .0035") zone shall not exceed 25 percent of the total edge.



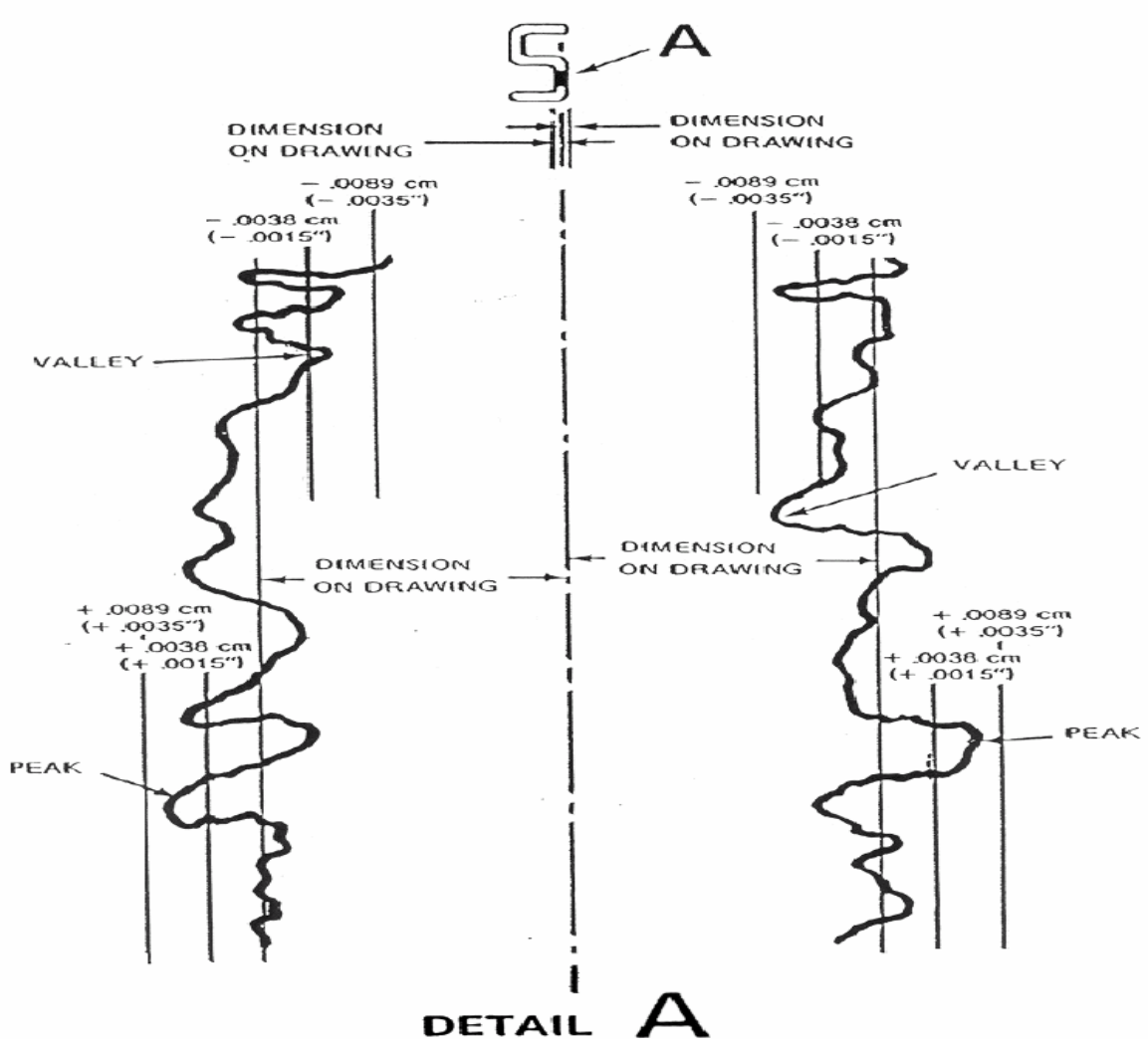
Unacceptable. Over 25% irregularity.



Unacceptable. Peaks and valleys beyond tolerance.

Quality Assurance

1.6.1 Edge Irregularity Tolerance



1.7 Voids

Voids are the absence of ink within the specific outline of the printed character. If any part of a void opens into the edge of the character, it is considered an edge irregularity. When enlarged, practically every printed surface presents voids.

You can judge these voids in MICR characters under the comparator by relating their size to the .025 cm (.010") squares on the grid.

In those bars of a character less than two squares wide -- such as in the upper part of the digit "8" -- voids must be contained within a .020 cm x .020 cm (.008" x .008") area.

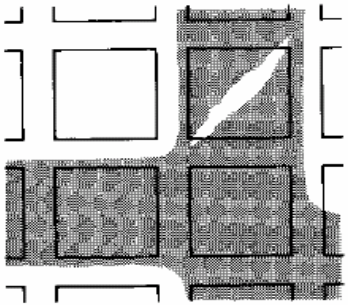
Quality Assurance

In those bars of a character two or more squares wide -- such as in the lower part of the digit "8" -- voids must be contained within a .025 cm x .025 cm (.010" x .010") area.

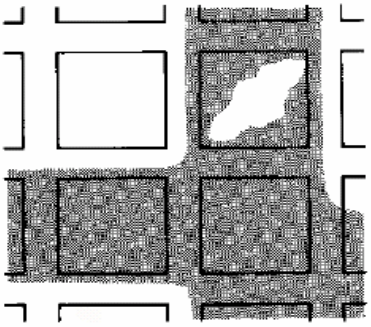
Simply stated, voids in these bars must fall within the area equal to that of any square on the grid.

Needle voids are long, slim areas where no ink appears. These are permissible in any length providing they are no wider between average edges than .005 cm (.002"), slightly less than the width of the channels between the squares on the grid. Needle voids often occur when long paper fibres lie close to the surface.

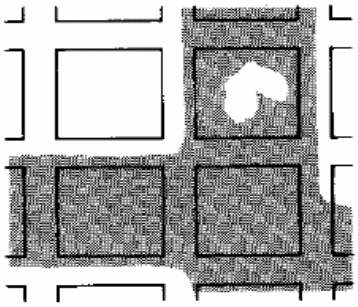
The total area of voids in any vertical or horizontal bar of a character must not exceed 20% of the bar area. Determining this must rest with your judgement.



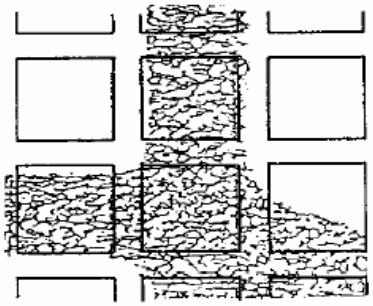
An acceptable needle void.



Unacceptable needle void.



An acceptable void.



Unacceptable void. Voids exceed 20% of the bar area.

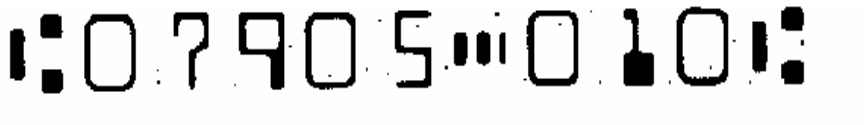
1.8 Extraneous Magnetic Ink within the 1.59 cm (5/8") MICR Band

Every printer knows that bits of ink, barely discernible to the naked eye, result from unavoidable splatter, smear, etc. Under a viewer these will show up. Within the 1.59 cm ($^5/_8$") MICR band the tolerances are as follows:

Note: These are illustrations only and characters and extraneous ink are exaggerated.

1) Spots up to .008 cm x .008 cm (.003" x .003") are acceptable in any number. This measurement is the width of the channels between squares on the grid.

Quality Assurance

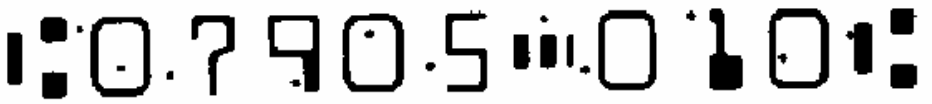


Acceptable spots - .008cm x .008cm (.003” x .003”) or less.

2) Extraneous ink spots exceeding .010 cm x .010 cm (.004" x .004") are unacceptable.

Spots too large – more than .010cm x .010cm (.004” x .004”)

3) Random spots up to .010 cm x .010 cm (.004" x .004") are permissible if they are limited to one per character space and not more than five in any one field.



Too many .010cm x .010cm (.004”) spots

4) On the back of the item, and with the 1.59 cm ($^5/_8$") band at the bottom, individual spots up to .015 cm x .015 cm (.006" x .006") are permissible in any number.

Illustrations of Extraneous Magnetic Ink

Spots up to .008 cm X .008 cm (.003" X .005") are acceptable in any number. This measurement is the width of the channels between squares on the grid.

Acceptable extraneous ink dots on front of an item – one per character space and not more than five in any one field - .010 cm X .010 cm (.004" X .004")

Unacceptable extraneous ink dots on front of an item – larger than .010 cm X .010 cm (.004" X .004").

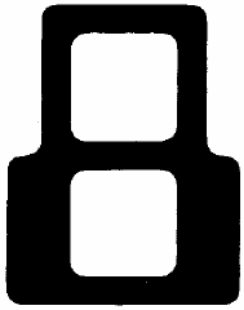
Quality Assurance

Acceptable extraneous ink dots on the back of the item, on the reverse of the 1.59cm (⅝") MICR band. Individual spots up to .015 cm X .015 cm (.006" X .006") are permissible in any number.

Unacceptable extraneous ink dots on the back of the item on the reverse of the 1.59 cm (⅝") MICR band – larger than .015 cm X .015 cm (.006" X .006").

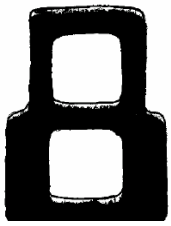
1.9 Uniformity of Ink Film

The ink is to be distributed uniformly within the outlines of each character. Conditions should be avoided that result in excessive squeeze-out, halo and other uneven deposits. Conditions should also be avoided which would result in chipping or smearing of ink on the paper after the drying period.

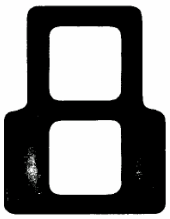


Acceptable

Uneven ink coverage



Ghost Image



Excessive squeeze-out or halo

Quality Assurance

1.10 Debossment/Embossment

Debossment is the depressing of the paper surface caused by excessive printing pressure. The tolerance specified is not more than .003 cm (.001").

The only equipment which can provide a precise measurement of debossment is a light section microscope or a debossment microscope. Micrometers will provide a guideline in measuring debossment. However, extreme caution must be exercised in interpreting readings from these production tools. **Readings taken with micrometers usually show a lesser degree of debossment than is actual.**

Every effort should be made to minimize debossment in order to ensure that it does not exceed the .003 cm (.001") tolerance.

Judging debossment is the skill of the experienced printer. When general printing quality of MICR has been established there should be no difficulty in controlling debossment to keep within limits. However, special equipment is available for checking depth of impression.

Embossment is a physical build-up of dry ink on paper causing the characters to sit above the surrounding paper surface. For most dry ink images, an embossment value of 0.0015cm (0.0006") or less should result in acceptable reader/sorter wear.

1.11 Allowable Signal Level Range (80% to 200% of the Nominal Signal Level Established for Each Character)

The document printer whose volume may warrant an investment in a magnetic ink tester, may, of course, check the signal strength of MICR printing in his shop. For the smaller printer, whose volume may not warrant the purchase, there is no means of testing the signal strength of MICR characters except to have this done through his CPA member's nearest Quality Assurance Department (see Appendix V).

While signal levels may vary from 80% to 200% of the nominal signal level established for each character, in actual practice the tolerance is not as broad as these figures might indicate. Running at the lower level may give problems with voids; running at the upper level may create problems with drying and squeeze-out.

1.12 Document Testing

1.12.1 Initial Setup

Your CPA member will co-operate fully in this matter. The following procedure is recommended:

Run off four or five batches of documents, ensuring that all specifications in matters of positioning, measurement tolerances, impression and imageability are met. For the first batch, keep your ink coverage quite light.

You will finish with four or five sample batches of documents, each printed with different roller coverage.

Quality Assurance

Submit the different batches, each plainly identified, to your CPA member's nearest Quality Assurance Department (see Appendix V) and they will be tested and returned with a report indicating which are acceptable. The procedures for submitting documents, the sample plan, and the conditions to be tested are detailed in Section 1 of the Supplement to Standard 006.

Do not forget to use the same manufacturer's ink and the paper you used when you ran the samples. This is important. So is the use of an ink agitator (see Appendix 1, Section 1.0). If you use another batch of ink at a later date, the above process should be repeated.

Note: The ideal levels average 110% to 125% of the nominal signal level established for each character.

1.12.2 Ongoing Quality Assurance Testing

Samples from both the start and finish of each production run should be submitted for acceptance to the Quality Assurance Department of your customer's CPA member.

1.12.3 Evaluation Report

The Quality Assurance Department of each CPA member will provide comments on their evaluation in an Evaluation Report based on “Conditions to be tested on Imageable MICR Documents Prior to Processing” (see Section 1 of the Supplement).