

Return Document Specifications
Image Scannable Wholesale Lockbox



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I. INTRODUCTION

This manual contains the specifications for the machine readable return documents (invoice stub) which will be received in your scannable wholesale lockbox at Bank of America. These specifications must be followed in the production of your invoice stubs. Doing so will allow us to capture your remitter data in an accurate and timely manner. Invoice stubs that do not meet these specifications will be processed as traditional wholesale lockbox payments rather than in an automated manner.

II. OPERATING CONSIDERATIONS AND REQUIREMENTS

A. PAPER AND PRINTING REQUIREMENTS

1. General -- There are several documents that are an important part of the design of the automated data capture portion of your company's wholesale scannable lockbox: the invoice stub, which is an OCR form that will be returned by your customer accompanied by a check payment; and the check payment, which must be inscribed and endorsed for normal bank handling, in addition to being imprinted with an audit trail. This manual is exclusively concerned with the requirements for the stub.
2. Invoice Stub Design Considerations -- The invoice stub used in your company's scannable wholesale lockbox must contain a line of data that can be read by an OCR system. In an OCR system, the quality of the printed invoice stubs is of great importance for obtaining optimal reading results. Many related factors have a significant effect on the quality of OCR documents. These factors include the physical characteristics of the paper, ribbons and printing devices, and the care that is employed in printing these invoice stubs.

Sound design of the invoice stub will greatly contribute to trouble-free operation. Before discussing the detailed specifications for stub design, a few general points should be considered. These items have to do with the life cycle of the stub, that is, what happens to the stub from the time it is produced to the time it is finally processed. In the life cycle of the OCR stub, we can distinguish various stages. For example:

- i. production of the OCR document
- ii. handling of the document by your customer
- iii. bank handling
- iv. destruction.

At each of these stages, design issues that can be a source of future trouble should be noted and should be taken into consideration when finalizing the document.

Some examples of design issues that should be taken into account include the following:

- a. The stub should be attached to the invoice in such a way as to insure that the left hand and top edges of the stub are kept in good condition, since these edges serve to guide the document as it passes through the automated capture system. The perforation should be at the top of the coupon rather than the bottom.

- b. Room that is provided for your customer to write the amount paid and any change of address information should be located as far away as possible from the OCR data band that is scanned.
- c. If the return address is put on the front of the stub, then the stub and check will appear in the remittance envelope in the proper sequence for efficient processing. However, if it is printed on the back of the invoice stub, it should not infringe on the back of the OCR line.
- d. The size of the stub should allow it to fit into a regular envelope without folding so as to avoid damage to the stub when the envelope is being opened.
- e. Fields that the operator may have to reference should be easily identifiable outside of the OCR line. Fields in the scan line must be in readable form on the face of the stub so that corrections can be readily made if the OCR scan line is damaged and becomes unreadable at the scanning workstation. If they are not and the scan line is unreadable, the transaction will be processed as a wholesale item.
- f. For optimal machine performance the stub paper should be chosen within the framework provided by this manual and with a view of how the stub is to be handled in practice.
- g. The OCR line must have a .25-inch perimeter or "box" around the entire OCR scanline. Nothing may be printed on the reverse side of the coupon where the scanline "box" is located, as it will interfere with the ability of the equipment to read the OCR line and will create more rejects than normal.
- h. Most important in regard to machine performance is the quality of the OCR printing.
- i. Size may be a consideration in storing the stubs.

3. Recognizable Fonts -- The recommended fonts for the OCR scan lines are
- OCR-A Size 1 at 10 characters per inch
 - OCR-B Size 1 at 10 characters per inch

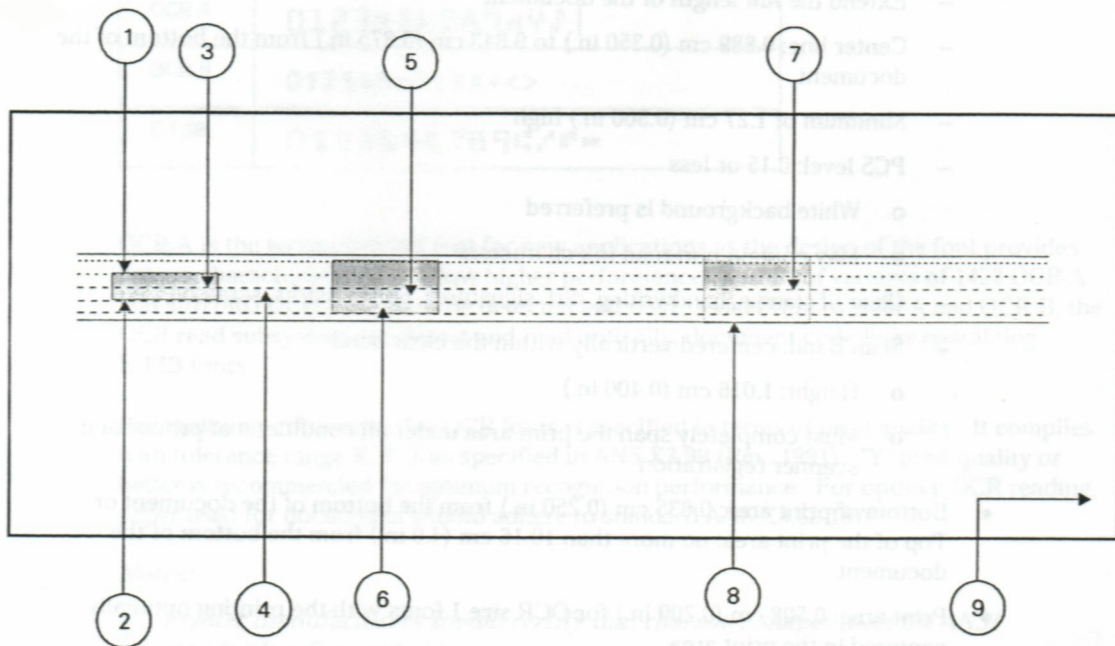
OCR A	0123456789H4J
OCR B	0123456789#+<>

4. Document Sizes -- The scannable processing equipment can handle returned invoice stubs within the following range of sizes, provided that the length-to-height ratio is in the range between 1.5:1 and 3:1. The length of the stub is measured in the direction parallel to the OCR line, while the height is measured in the direction perpendicular to the OCR line.

	<u>Minimum</u>	<u>Maximum</u>
Length:	4.875 in.	9.25 in.
Height:	2.75 in.	4.75 in.

The ideal invoice stub size has a height of 3.0 inches and a length of 6.5 inches.

5. The OCR Line -- The scannable processing equipment reads required remittance information from an OCR line on the invoice stub. The OCR line can contain a maximum of 80 consecutive character positions that can be read in one pass through the bank's remittance processing equipment. The discussion that follows can best be understood when using the following illustration as a guideline.



1. Top of print area should be a maximum of 4 in. from bottom of document.
2. Bottom of print area should be a minimum of 0.25 in from the bottom of the document centered in the clear band.
3. Print area.
4. Center of scan line should be a minimum of 0.35 in. from bottom of document.
5. Scan band should be centered in the clear band.
6. Scan band.
7. Clear band should be free of other printing such as lines, handwriting and miscellaneous characters.
8. Clear band (0.5 in.).
9. All OCR printing must be a minimum of 0.25 in. from all document edges.

Requirements for the OCR data area have to do with the allowable location for the OCR line, and with the limitations placed on the presence of non-OCR data and of background inks.

Additional considerations for the location of your OCR data line include the following:

- a. *Handwritten information:* The strip should not be too close to areas that might be used for handwritten information, such as change of address or handwritten amount. To minimize contamination, the graphic design of the document should indicate clearly which strip is to be used for OCR reading.
 - b. *Print on back of the document:* Printing must be avoided on the reverse of the clear band position. If the ink is still wet on a document, it can possibly contaminate the clear band of the next document. Furthermore, depending on the paper quality, the ink may become visible through the document.
7. Fields and Their Delimiters -- As mentioned earlier, the OCR line can contain a maximum of 80 character positions, which may consist of one or more fields of data including any field delimiters. The division of OCR line may be visible, that is, field delimiters may be used to visibly separate the fields from one another. Adjacent fields can use the same delimiter. For example, the right delimiter of one field acts as the left delimiter of the next field on the right. Bank of America's system does not require the use of field delimiters. If used, Bank of America recommends the use of blank spaces as field delimiters.

The following field delimiters can be used to separate fields in the OCR-A font line:

Single blank, double blank.

With regard to field delimiters, please note the following:

- a. Field delimiters are not allowed within fields.
- b. It is strongly advised not to use identical field delimiters within one inch (10 characters) of one another, unless the delimiters are blanks.
- c. A unique combination of left and right delimiters is recommended for each field in the OCR line, except when blanks are used as delimiters.
- d. It is necessary that the actual position of the printed delimiter on the stub be within 2.54 mm (0.10 inches) of its defined position. Fields that start outside of this tolerance can cause a field boundary error and be rejected. Note that this restriction also applies to blanks used as field delimiters, even though they are not printed.

When a blank is used as a field delimiter, the following points must be met:

- i. Either a single blank or a double blank may be used as a field delimiter, but both cannot be used in the same OCR line.
- ii. When single blanks are used as field delimiters, the entire OCR line must be printed in one run in order to maintain the proper interfield distance.
- iii. Blanks used as field delimiters may be located in the left and right hand margins.

An OCR field must have a fixed length, that is, the field in question must be the same length for all of your company's invoice stubs. A variable length field such as the dollar amount must be right justified with leading zeros. Blanks may be used in the scan line only as field delimiters.

Non-OCR data is permitted within the clear band when it is printed in an acceptable ink, or when there is a blank space of at least 12.7 mm (0.50 inches) in the horizontal direction between non-OCR data and OCR printing. Non-OCR data may also be present directly at the left side of the left field delimiter of the left-most field on the document, provided that the field delimiter in question is not a blank.

8. Invoice Stub Test -- As part of the establishment of the company's and the bank's relationship, and prior to live operation of Bank of America's scannable wholesale lockbox service, a batch of your company's invoice stubs must be submitted to the bank in accordance with the following:
 - a. The invoice stubs must conform to the requirements outlined in the paper and printing requirements section of this manual. They must be prepared on the same type of paper, using the same equipment, and in the same format as the actual stubs.
 - b. These stubs will be processed by the bank using the same type of procedures and on the same type of equipment as will the actual stubs. If not acceptable, a new batch of stubs must be produced and subsequently tested by the bank. The bank requires a minimum of 100 stubs, and acceptable stubs must be provided prior to service initiation.
 - c. In return, the bank will prepare an output file representing the previously supplied batch of invoice stubs.

B. ADDITIONAL OCR PAPER CONSIDERATIONS

1. General -- Invoice stubs that are to be processed by the bank's equipment are required to meet certain paper quality characteristics. The primary considerations are that the paper must be suitable for providing an adequate printing quality, and must have the proper optical characteristics. This section of the manual provides recommended guidelines for OCR paper documents rather than absolute specifications.
2. Permissible Document Mutilation --
 - a. *Document Edges*: For best performance, document edges should satisfy the following requirements:
 - * The bottom edge must be perpendicular within 2° to the right-hand and left-hand edges.

- * There must be no tears on the top and left-hand edges.
- * On the other two edges, there must be no tear longer than 6.4 mm (0.25 inches), and no more than one per edge.
- * Documents with corner cuts are allowed. The missing corner may not be larger than 1.6 mm (1/16 in. by 1/16 in.), and must be outside the clear band. Rounded corners with a radius of 6.4 mm (0.25 in.) like those used on card documents are allowed outside the clear band.
- * Excess material on any edge must not exceed 3.9 mm² (1/16 in.²) and cannot extend beyond the maximum document size at any point. No more than 0.8 mm (1/32 in.) of excess material can be tolerated on the top edge or on the left-hand edge.
- * Material missing from any edge must not exceed 3.9 mm² (1/16 in.²). For the bottom and right-hand edges, missing material cannot extend into the document more than 3.2 mm (1/8 in.). For the right-hand and bottom edges, missing materials cannot extend into the document more than 0.8 mm (1/32 in.).

b. *Document Surface:* For the best performance, the document should satisfy the following mechanical requirements:

- * Rips, cuts, or tears should be avoided. The combined length of all such mutilations must not exceed 12.7 mm (1/2 in.). The adjacent edges of such mutilation or tear must be mismatched by more than 0.12 mm (0.005 in.), measured perpendicularly to the surface.
- * No portion of any rip, cut, tear, score, or hole must be within the clear band.
- * Carbon coating and no-carbon-required coatings are unacceptable.
- * The document must be free of foreign matter such as staples, paper clips, adhesive tape, gum, wax, grease, glue, spilled liquids, postage stamps, carbon backing and powdery substances.
- * No more than three creases are permitted. The distance between any two creases must be at least 50 mm (2 in.).
- * Folded, creased, warped, or crumpled documents will be acceptable only after they have been reconditioned to meet the following specification: All portion of the document must lie flat within two parallel planes separated by a maximum of 3.2 mm (1/8 in.) under the weight of a flat, standard 80-column card.

3. Optical Characteristics of Paper -- To ensure accurate reading by the bank's equipment, the document should be a perfect carrier for the printed OCR character image. "Perfect" refers to the quality of the paper area scanned by the optical scan head, that is, the clear

band. In the selection of paper, a balance should be found between the paper cost (optical quality) and the reading performance that can be obtained.

The average reflectance of the paper should be high. The human eye cannot adequately judge the reflectance, however, because the spectral sensitivity of the eye differs from that of the scan head. Measurements of reflectance, therefore, should be carried out with an instrument that works in the proper spectral range, that is, in the 550 to 950 nm range.

Irregularities in the paper (transparent areas, pin holes and foreign matter) can be "seen" by the scan head. The degree of irregularity, therefore, affects the reading performance of the machine.

The paper should be white, however pale color shades are also allowable. It should have a flat finish and a low gloss, It should be of high opacity. To prevent read errors, the paper should be free of watermarks, transparent spots, pin holes and foreign material such as bark particles and dirt.

- a. *Cleanliness:* Dirt in the paper refers to the presence of foreign particles embedded in the sheet. The dirt shall not exceed 150 marks per 0.645 m² (1000 in.²). Every visible mark that cannot be confined within a square of 0.1 by 0.1 mm (0.004 by 0.004 in.) shall be counted.
- b. *Opacity:* The opacity of the paper is the ratio (expressed as a percentage) of its reflectance with a black backing to its reflectance with a white backing. The opacity of the paper when measured in accordance with the TAPPI (Technical Association for the Pulp and Paper Industry, 360 Lexington Avenue, New York, NY) method T425 shall not be less than 80%.
- c. *Reflectance:* The reflectance of the paper is measured with the Elrepho instrument (Carl Zeiss, Oberkochen) or the Beckman Model DK-2 spectrophotometer, using a mat black backing for one thickness of the sample. With the Elrepho instrument, filters B.680 and B.90 are used; with the Beckman instrument, the wavelength range that is of interest is 550 to 950 nm.

The reflectance is measured relative to magnesium oxide. (Magnesium oxide is 100% light, absence of light is 9%.) Specular reflected light must be excluded during the measuring. Measurements must be made over areas of at least 65mm² (0.1 in.²). Paper reflectance must be at least 70% in the 550 to 950 nm spectral range.

- d. *Variation in Paper Reflectance:* The variation in paper reflection is the standard deviation of reflectance measurements, taken over well separated circular areas of 0.20 mm (0.008 in.) diameter, using black backing. This deviation includes the effect of opacity variations.

The variation in paper reflectance must not exceed 3.5% of paper reflectance in the 550 to 950 nm spectral range.

4. Mechanical Characteristics of Paper -- The selection of a suitable paper quality for OCR documents is important for successful operation of the system. The guidelines indicated below refer to measurements made at 22° C (72° F) and 50% relative humidity.

- a. *Weight:* Since lightweight documents have a tendency to curl, the basis weight of the paper affects document performance in the transport mechanism of the remittance processor.

The basis weight for paper used in the bank's equipment should be between 18 and 24 lb/500 sheets of 17 x 22 in. The optimal weight is 90g/m² (24 lb/500 sheets of 17 x 22 in.). The maximum weight for card stock is 105 lbs., but use of this weight will cause at least a 10% increase in track stoppages.

- b. *Smoothness:* The smoothness of paper is measured with a Sheffield Tester. The smoother the paper, the lower is the reading. The smoothness of the side to be read must fall between 65 and 200 Sheffield units. The smoothness of the non-read side must fall between 65 and 250 units.

It is recommended that the "felt" side of the paper and the "wire" side of cardstock be used for best printing results.

- c. *Grain:* The grain of the paper can lie on either axis for paper that weighs at least 24 lbs. For lighter papers, it is strongly recommended that the grain lie with the length of the document.

C. OCR CHARACTER REQUIREMENTS

1. General -- The scan head of the bank's remittance processor reads the OCR line on the stub by converting the printed character images into electrical character images. The characters are read one-by-one as they pass the scan head, the right most characters being scanned first.

The optical requirements for the characters on the document are as follows:

- * Characters must be printed within the printing band (vertical positioning).
- * Characters must be printed at certain positions along the OCR line (horizontal positioning).
- * To permit satisfactory identification, characters should not touch each other or be too close to one another.
- * The printed character image, including its immediate surroundings, should resemble the ideal character image as closely as possible.
- * As seen by the scan head, the printed character image should have adequate contrast with respect to the clear band in the 550 to 950 nm spectral range.

The reading performance and the proper recognition of the OCR printed characters depend on how closely the printing conforms to certain standards. These standards are

not readily apparent to the human eye and, therefore, OCR printing usually requires more care than does normal printing.

Again, the following recommendations are a guide, rather than a specification, for the quality of character printing.

2. Character Outline Limits (COL) -- Many of the following parameters for the printed character image are measured with the aid of the minimum/maximum character outline limits after alignment for best fit. The character outline limits may be determined with the help of a commercially available magnifying glass equipped with the proper reticle.
3. Character Centerline -- The distance between any two points on the smoothed centerline of the printed character should not differ more than 0.076mm (0.003in.) from that on the nominal centerline.
4. Edge Irregularities -- The edges of the character stroke should not extend outside the maximum COL or inside the minimum COL by more than 0.30mm (0.012 in.). Edge irregularities can be observed with a magnifying glass.
5. Printed Character Dimensions -- The standard dimensions for OCR-A font are:
0.094 inches high, ± 0.003 in.
0.055 inches wide, ± 0.003 in.
0.014 inch nominal stroke width.

The recommended font is OCR-A size 1 at 10 CPI.

6. Print Contrast Signal Measurement -- The print contrast is the contrast between a point (P) in the printed image and the paper. The print contrast varies between 0 (no contrast) and 1 (maximum contrast). The following formula is used to calculate the contrast:

$$\text{Print contrast in point P} = \frac{R_W - R_p}{R_W}$$

where:

R_W = maximum reflectance found in surrounding area

R_p = reflectance in point P

Measurements are made with a white backing within a circular area of 0.20 mm (0.008 in.) diameter in the near-infrared range. Of the measurements within the minimum COL (along the centerline), at least 80% of the points should preferably have a print contrast greater than 0.35.

7. Spots -- Spots are contrasting areas outside the maximum COL and inside the clear band of the document. Spots are allowed in the following circumstances:

- a. If they can be contained entirely within a circle of 0.20 mm (0.008 in.) diameter, provided the center-to-center distance to the nearest other spot is at least 1.00 mm (0.040 in.).
 - b. If they cover less than one third of the area of a 0.20 mm (0.008 in.) diameter circle without restriction. This should not be interpreted that the whole character area can be full of such spots.
8. Voids -- Voids are low-contrast areas (print contrast below 0.3) inside the minimum COL. Voids are allowed in the following circumstances:
- a. If they can be contained entirely within a circle of 0.20 mm (0.008 in.) diameter, provided the center-to-center distance to the nearest other void is at least 1.00 mm (0.040 in.).
 - b. If they cover less than one third of the area of a 0.20 mm (0.008 in.) diameter circle, without further restriction.
9. Character Skew -- The skew of a character is its rotational deviation from the perpendicular relative to the aligning edge of the document. Character skew should not exceed 3° to either side.
10. Character Spacing -- The character spacing is the horizontal distance between the geometric centers of two adjacent characters. A preprinted long vertical mark is considered a character.
- The nominal character spacing is 2.54 mm (0.10 in.), which allows for ten characters in 25.4 mm (1.00 in.). Character spacing should never be less than 2.29mm (0.09 in.) nor more than 4.57mm (0.18 in.). Character spacing that approaches the maximum spacing allowable may result in a recognized Character Space.
11. Character Misalignment -- Character misalignment is the vertical shift of one character relative to another. The ISO printing specifications allow a maximum adjacent character misalignment of 0.66 mm (0.026 in.) and a maximum misalignment of 1.32 mm (0.052 in.) in a field. In addition, the printing band is 5.6 mm (0.22 in.) height, and the OCR line must fall completely within this band.

D. GENERAL CONSIDERATIONS OF RIBBON, INKS AND PAPER

- 1. General -- Any printing device that produces a quality document as recommended in this manual is acceptable for printing the stubs to be read by the remittance processor. Supplies used in the printing device influence the print quality, so we note here some of the most important considerations regarding supplies.
- 2. Fabric Ribbons -- When fabric ribbons are used for OCR printing, heavy inking may cause excessive stroke width of characters, extraneous ink, or raggedness in character shape. Under these conditions, the system cannot always recognize characters.

Insufficient inking reduces ribbon life, and thereby increases the cost of the operation. If insufficient inking is not detected, documents might be printed with insufficient character stroke width, so that the system might not recognize the characters.

A low thread count for the ribbon, usually indicating relatively thick threads, can produce poor print quality. The low thread count causes extraneous ink marks, and the thread pattern becomes visible in the printed character. A ribbon that is too thick may produce excessive character stroke width.

Poor ribbon edge binding can cause fraying which, in turn, can cause extraneous ink marks on the OCR document.

The ink formula that is chosen must contain ingredients that absorb light in the wavelength band (550 to 950 nm) of the scan head in the machine. This is generally the case if the printed character looks black and not dark purple. The ink quality should be verified on the printed character image from the beginning until the end of the ribbon life, because the ink mixture may change as the ribbon is used. OCR ribbon life is usually specified as a number of printed lines. Ribbons that have completed their useful life for OCR work can often still be used for other purposes.

Proper storage of ribbons is important, especially when they have been partly used. Ribbons should be as fresh as possible, and must not be allowed to dry out.

3. Film Ribbons -- Film ribbons can be used for OCR printing if they produce the desired print quality, including absorption in the 550 to 950 nm wavelength band. This is usually the case with first impressions. With subsequent impressions, the previously printed characters cause unevenness of density because there is no reflow of ink, thus severely limiting their useful OCR life.

Flakes of ink around the printed character, or on the paper in areas not directly adjacent to the printed character, usually indicate excessive impact pressure on the film ribbon. This pressure destroys the bond between the ink and the base material. Ink usually releases from a film ribbon at a lower impact pressure than from a fabric ribbon.

4. Inks -- Ink quality for OCR letterpress or offset lithographic printing is not critical. The major considerations are as follows:
 - a. The ink in the printed character image must absorb light in the 550 to 950 nm range. This, in general, means that a true black ink must be used.
 - b. To avoid extraneous ink spots, the ink should have no tendency to spatter or to smear. Spattering can occur during printing, and smearing can occur if the printed line on the document is rubbed.

Scan ink must be fairly non-reflective in order to provide sufficient contrast. Carbon-based black ink is the most effective. Scan ink must register a minimum of 0.50 on the print contrast scale of the tester.

5. Paper -- Most papers that satisfy the recommendations given before on paper characteristics will produce an acceptable OCR-print quality. The paper chosen should, however, be tested and evaluated over the entire life of a ribbon. Heavy paper (over 24

lb.) and card stock should only be used if necessary and after an evaluation of their characteristics. The stiffness of heavy paper can cause phantom images and smears to appear in the OCR line, obstructing optical reading.

Multi-part forms are not recommended for OCR use.

III. PROCESSING CONSIDERATIONS AND REQUIREMENTS

A. INTRODUCTION -- Along with technical considerations, Bank of America will require guidance on how your company's payments should be processed to meet requirements and constraints on your system, as well as Bank of America's systems. This section will outline the options that are available to you. Recommendations and suggestions are also provided based on the experience of Bank of America with existing scannable wholesale lockbox customers.

B. FIELD AND SCAN LINE COMPOSITION

1. General -- As detailed above, scannable processing consists of the machine capture of predetermined fields of data from a line of data printed in an OCR-readable font. The fields that make up that line of data, and the information contained within those fields, is determined by you, **however, the scanline must include the invoice/account number dollar amount.** Bank of America's system can capture all fields in the scanline, or only selected fields if you so desire. Your data fields, and their content, will partially determine how quickly Bank of America can respond to your requirements. They will also partially determine whether special charges will be assessed for setting your company up for scannable processing.
2. Field Content and Restrictions -- Bank of America's system should be able to capture any numeric data that appears in your company's scanline. Generally, the length of each individual field should also not be an issue, unless the field in question is unusually long. Scannable processing adds no additional field length constraints beyond those of Bank of America's base lockbox processing system. Alphabetic characters can be accepted as part of the OCR scan line. If alphabetic characters are represented in the OCR scanline, Bank of America recommends the use of the following conversion table:

A = 0	K = 0	U = 0
B = 1	L = 1	V = 1
C = 2	M = 2	W = 2
D = 3	N = 3	X = 3
E = 4	O = 4	Y = 4
F = 5	P = 5	Z = 5
G = 6	Q = 6	
H = 7	R = 7	
I = 8	S = 8	
J = 9	T = 9	

3. Printing of Data Fields -- Although Bank of America's equipment has some tolerance for printing and alignment problems, there will be times when it will not be possible to read all of the characters in all of the required fields from the OCR scan line. In such cases the system will stop the document and require that the mis-read data be manually keyed

by the machine operator. Since the data in the scanline is designed more for its machine readability than for its ease of reading for human operators, the data in the scanline is not used for the manual correction of machine reading problems. For this reason it is mandatory that all fields to be captured from the scanline also be printed in an easily identifiable form somewhere else on the face of the scannable document. The following is an example of this requirement:

REVOLVING CHARGE PAYMENT COUPON

ACCOUNT NUMBER	DUE DATE	MINIMUM DUE	PAST DUE	NEW BALANCE
4390 1234 5678 9012	08/01/90	25.00	35.50	85.75

AMOUNT OF PAYMENT ENCLOSED

\$

USE ENCLOSED ENVELOPE AND MAKE PAYMENT TO

XYZ Corporation
P.O. Box 12345
Chicago, IL 60693

IF NAME OR ADDRESS CHANGES ARE REQUIRED, PLEASE CHECK BOX AND ENTER NEW INFORMATION ON BACK OF DOCUMENT

MICHAEL A. SMITH
MARY SMITH
12345 MAIN STREET
ANYWHERE, USA 99001

439012345678901200085750002500

Please note that, with the exception of dashes, slashed and decimal points, the data appearing outside of the OCR scanline should exactly match the data printed in the scanline.

4. Check Digit Routines -- In the process of scanning, it is possible for the OCR equipment to read a character with a high degree of confidence and yet still read the character incorrectly. This type of error could result in bad data being passed to your company without it being detected. For this reason the bank requires that a check digit routine be used. These routines use algorithms to generate a single digit that is printed as part of the scanline. The bank's equipment uses an identical algorithm to calculate its own check digit after reading your scanline. If the two check digits match, the data is accepted and processing continues. If the check digits do not match, the document is stopped and the operator is prompted to verify and correct the data captured. Check digits are normally printed as the last character in the scanline when reading from left to right.

Check digit routines can either be applied on an individual field, or for the scanline as a whole. While Bank of America can support a field-level check digit, it is strongly recommended that the check digit be calculated on the entire scanline. This insures that all characters in all captured fields have been read correctly, thus insuring that the data you receive is correct.

Although Bank of America has been able to accommodate some unique check digit algorithms, experience has shown that a standard "Mod10" check digit routine is both simple and effective. The Mod10 check digit routine used by Bank of America is calculated as follows:

- a. Beginning with the first digit; multiply first digit by 2, multiple the second digit by 1, multiply the third digit by 2, the fourth by 1. Continue to follow this pattern until the end of the line. Please note that spaces do not count as digits.
- b. Add the individual digits from the product of step b to the digits not previously selected.
- d. Divide the number from step c by 10 and find the remainder.
- e. Subtract the remainder from 10 to get the check digit.

By using this formula the check digit from the example in paragraph III.B.3 above can be derived:

Scanline minus check digit = 9657302527435081015950000675324

```

  9 6 5 7 3 0 2 5 2 7 4 3 5 0 8 1 0 1 5 9 5 0 0 0 0 6 7 5 3 2 4
x2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2
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186107604547831001610110910000006145628

```

1+8+6+1+0+7+6+0+4+5+4+7+8+3+1+0+0+1+6+1+0+1+1+0+9+1+0+0+0+0+0+6+1+4+5+6+2+8 = 113

113/10 = 11 with a remainder of 3
 10 - 3 = 7, which is the check digit.