

Kodak i800 Series Scanners — Using Custom Check Digit

Understanding check digit

This document provides information for using the Check Digit option.

Check digit is used to ensure the integrity of the image address. All parameters in the algorithm are user-definable.

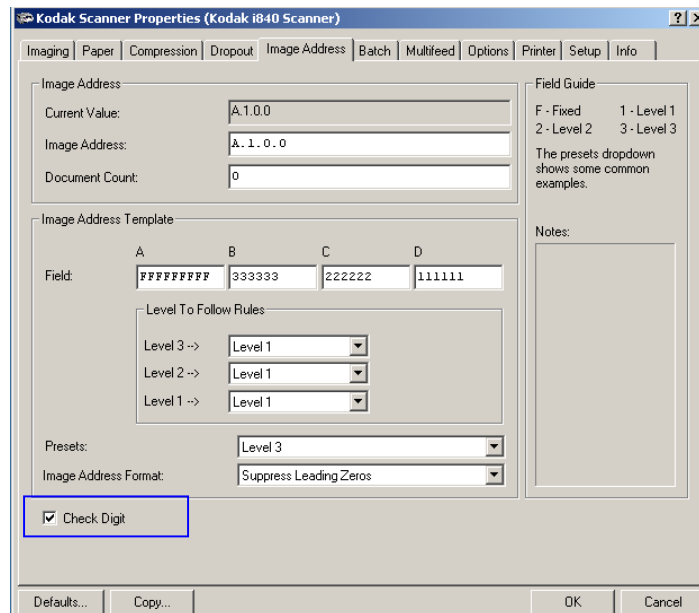
During scanning, the scanner assigns each document an image address. The image address is used to compute the check digit. The check digit then becomes the right-most digit of the image address (therefore, the image address defined cannot exceed 26 characters).

To use check digit for the i800 Series Scanners an alteration file containing the check digit formula must be created and downloaded to the scanner. See the sections entitled, "Check digit formula" and "Creating a check digit alteration file" for more information.

Accessing the check digit function

When the alteration file has been created and downloaded to the scanner, the Check Digit option can be accessed via the TWAIN or ISIS Driver.

TWAIN Driver – Image Address tab



If you enable **Check Digit**, the calculated check digit will appear as the right-most character of the image address in the print string and will be returned as part of the image address in the image header.

CAP_CHECKDIGIT

Custom: i800 Series

Allowed: FALSE, TRUE

Default: FALSE

If set to TRUE, the scanner will use image address check digit.

ISIS Driver – accessed via the More Scanner Settings dialog box

Counters	Start Value	Width	Level To Follow	Format Character
Level 3	1	4	Level 1	%3L
Level 2	0	4	Level 1	%2L
Level 1	0	4	Level 1	%1L

If you check **Enable Check Digit**, the calculated check digit will appear as the right-most character of the image address in the print string and will be returned as part of the image address in the image header.

TAG_IMAGEADDRESS_CHECKDIGIT (0x164d)

If the scanner supports check digit, the choices are 0 (Off) and 1 (On).

If the scanner does not support check digit, the only choice is 0 (Off).

Check digit formula

This section contains an explanation of each parameter in the check digit formula.

Check digit formula

$$\text{Check Digit} = \text{Constant2} - \frac{[\text{Sum of IA Digits} * \text{Attributes}] + \text{Constant1}}{\text{Divisor}}$$

- **Check Digit** — only one position is reserved, the check digit defaults to zero when the following conditions occur:
 - The Lookup Table is used and the check digit is greater than 10.
 - The Lookup Table is not used and the check digit is greater than 9.
- **Constant 2** — a constant value in the range 0 through 99.
- **IA Digits** — the digits comprising the image address. The image address may contain a fixed field as many as three level fields. The image address cannot exceed 26 data characters when accompanied by a check digit; the check digit occupies one character position.
- **Attributes** — position weights for digits in the image address. A zero value attribute causes the associated image address digit to be excluded from the check digit calculation. Each digit in the image address is multiplied by its attribute and summed. For example, if the image address is 1202.14.342.12 and you want to calculate a check digit that excludes the fixed field (1202), the attributes (using Table 1) would be 00001546231.

Table 1: Attributes

c10	c9	c8	c7	c6	c5	c4	c3	c2	c1	c0
0	0	0	0	1	5	4	6	2	3	1

NOTE: The “c” in Table 1 refers to the character position.

- **Constant1** — a constant value in the range 0 through 99.
- **Divisor** — a constant value between 1 and 99.

NOTE: The divisor is not used if the value specified is 0.

Check digit attributes

This section contains an explanation of each attribute in the check digit calculation.

In addition to the parameters in the equation there are other user-defined parameters which affect check digit processing:

- **Left/Right specifier** (also referred to as L/R of Decimal) — indicates the location of the check digit in relation to the decimal point in the calculation results. This rule is applied to the $([\text{Sum of IA Digits} * \text{Attributes}] + \text{Constant 1}) / \text{Divisor}$ portion of the calculation. If **Left** is specified, the check digit is the digit immediately to the left of the decimal point. If **Right** is specified, the digit immediately to the right of the decimal point is the check digit. For example: If the calculation produces the number 123.45 and **Right** is the designated Left/Right parameter, then 4 is used.

The following are exceptions to the Left/Right specifier rule:

- If Constant2 is not 0, and the Left/Right specifier is **Left**, the check digit equals the difference between Constant2 and the first digit to the left of the decimal point. If Constant2 is 0, the first digit to the left of the decimal point becomes the check digit.
- If Constant2 is not 0 and the Left/Right specifier is **Right**, the check digit equals the difference between Constant2 and the first digit to the right of the decimal. If Constant2 is 0, the first digit to the right of the decimal point becomes the check digit.
- **LUT (Lookup table) Status** — if **Yes**, the final check digit calculated is used as an index into a Lookup Table. If **No**, the Lookup table is ignored.
- **Lookup table** — a table of check digit values (refer to Table 2)

Table 2: Lookup table

c10	c9	c8	c7	c6	c5	c4	c3	c2	c1	c0
a	b	c	d	e	f	g	h	i	j	k

NOTE: The “c” in Table 1 refers to the character position.

Custom check digit configuration summary

The following table provides a listing of parameters and their descriptions:

Parameters	Explanation
Attributes	These are position weights for digits in the image address. A zero value attribute causes the associated image address digit to be excluded from the check digit calculation. Each digit in the image address is multiplied by its attribute and summed. An attribute is a numeric value between 0 and 9.
Constant1	A constant in the range 0 through 99.
Constant2	A constant in the range 0 through 99.
Divisor	A constant in the range 1 through 99. Not used if value is zero.
Left/Right	Indicates the location of the check digit in relation to the decimal point in the calculation results. If Left is specified, the check digit is immediately to the left of the decimal point. If Right is specified, the check digit is immediately to the right of the decimal point.
LUT Status	If Yes , the final check digit calculated is used as an index into a Lookup table. If No , the Lookup table is ignored.
Lookup Table	A table of check digit values.

Check digit examples

Sample check digit calculation #1

$$\text{Check Digit} = \text{Constant2} - \frac{[\text{Sum of IA Digits} * \text{Attributes}] + \text{Constant1}}{\text{Divisor}}$$

Assume the following:

Image address = 123.45.678.912
Attributes = 46231546231
Constant 1 = 7
Constant 2 = 10
Divisor = 11
Left/Right = Right
LUT Status = No/off
Lookup Table = abcdefghijk

Then the check digit calculation would be:

1. Set up the equation:

$$\text{Check Digit} = 10 - [\text{Calculation 1}] + 7$$

NOTE: For this calculation begin with the right-most character of the image address and work your way to the left.

$$\text{Calculation 1} = (2 \times 1) + (1 \times 3) + (9 \times 2) + (8 \times 6) + (7 \times 4) + (6 \times 5) + (5 \times 1) + (4 \times 3) + (3 \times 2) + (2 \times 6) + (1 \times 4)$$

2. Calculate the value of the fraction:

$$168 + 7 = 15.91$$

3. Apply the Left/Right parameter:

$$15.91 = 5 \text{ if Left is specified}$$

$$15.91 = 9 \text{ if Right is specified}$$

In this example, 9 is used.

4. Complete the calculation:

$$10 - 9 = 1$$

In this example, 1 is the check digit. The image address printed by the Document Printer is: 123.45.678.9121.

NOTE: Because only one position is reserved, the check digit defaults to zero when the following conditions occur:

- The Lookup table is used and the check digit is greater than 10.
- The Lookup table is not used and the check digit is greater than 9.

Sample check digit calculation #2

$$\text{Check Digit} = \text{Constant2} - \frac{[\text{Sum of IA Digits} * \text{Attributes}] + \text{Constant1}}{\text{Divisor}}$$

Assume the following:

Image address = 123.45.678.912
Attributes = 46231546231
Constant 1 = 7
Constant 2 = 10
Divisor = 11
Left/Right = Right
LUT Status = Yes/on
Lookup Table = abcdefghijk

Then the check digit calculation would be:

1. Set up the equation:

$$\text{Check Digit} = 10 - [\text{Calculation 1}] + 7$$

$$\text{Calculation 1} = (2 \times 1) + (1 \times 3) + (9 \times 2) + (8 \times 6) + (7 \times 4) + (6 \times 5) + (5 \times 1) + (4 \times 3) + (3 \times 2) + (2 \times 6) + (1 \times 4)$$

2. Calculate the value of the fraction:

$$168 + 7 = 15.91$$

3. Apply the Left/Right parameter:

$$15.91 = 5 \text{ if Left is specified}$$

$$15.91 = 9 \text{ if Right is specified}$$

In this example, 9 is used.

4. Complete the calculation:

$$10 - 9 = 1$$

5. Apply the Lookup Table values:

1 cross references to B in the Lookup Table in this example

NOTE: When using a Lookup Table, 0 cross references to the left-most value in the Lookup Table.

In this example, 1 is the check digit. The image address printed by the Document Printer is: 123.45.678.912B.

NOTE: Because only one position is reserved, the check digit defaults to zero when the following conditions occur:

- The Lookup Table is used and the check digit is greater than 10.
- The Lookup Table is not used and the check digit is greater than 9.

Creating a custom check digit alteration file (Chkdigit.txt file)

Use Mode Setup Software to review and document the values you are currently using for your custom check digit.

Parameters	Possible values	Your selection	Variable in the Chkdigit.txt file
Image address			CHECKDIGIT_USE_FIXED_FIELD
Attributes	0-9		CHECKDIGIT_COEFFICIENTS
Constant1	00-99		CHECKDIGIT_CONSTANT1
Constant2	00-99		CHECKDIGIT_CONSTANT2
Divisor	1-99		CHECKDIGIT_DIVISOR
Left/Right	Left or Right		CHECKDIGIT_DIRECTION
LUT Status	Yes or No		CHECKDIGIT_USE_LUT
Lookup Table			CHECKDIGIT_LOOKUP_TABLE

Syntax of Chkdigit.txt file

Use a text editor to create the Chkdigit.txt file. This file should contain an entry for each of the items listed below. The parameter name is separated from the parameter file by an equal sign.

Example file:

```
CHECKDIGIT_ALGORITHM=CUSTOM
CHECKDIGIT_USE_FIXED_FIELD=YES
CHECKDIGIT_STATUS=1
CHECKDIGIT_COEFFICIENTS=212121212121212121212121212121
21212121212121212121212121212121212121212121212121
CHECKDIGIT_CONSTANT1=7
CHECKDIGIT_CONSTANT2=10
CHECKDIGIT_DIVISOR=11
CHECKDIGIT_DIRECTION=RIGHT
CHECKDIGIT_USE_LUT=YES
CHECKDIGIT_LOOKUP_TABLE=abcdefghijkl
```

CHECKDIGIT_STATUS

Must be either **0** (for disabled) or **1** (for enabled).

Default value: If this parameter does *not* appear in the file, the default will be assigned in firmware to **0** (disabled).

CHECKDIGIT_ALGORITHM

Must be one of the following: **GEZ**, **QUELLE**, **IBM7**, **IBM10**, **IBM11**, or **CUSTOM**.

Default value: If this parameter does *not* appear in the file, the default will be assigned in firmware to **GEZ**.

All check digit configuration options except **CHECKDIGIT_USE_FIXED_FIELD** and **CHECKDIGIT_STATUS** are ignored unless the **CHECKDIGIT_ALGORITHM** parameter is set to **Custom**.

CHECKDIGIT_USE_FIXED_FIELD

Yes or **No**. Refers to whether or not the fixed field will be included in the check digit calculation.

Default value: If this parameter does *not* appear in the file, the default will be assigned in firmware to **No**.

NOTE: If this parameter is enabled, only numbers can appear in the fixed field.

CHECKDIGIT_COEFFICIENTS

As part of the check digit calculation, each image address digit is multiplied by a corresponding “weight” attributed to the digit in that position. These weights are the **CHECKDIGIT_COEFFICIENTS**. There must be at least 26 coefficients to cover the maximum possible width of the image address.

Default value: If the **CHECKDIGIT_ALGORITHM** is set to **Custom**, and this parameter does not appear in the file, the default value will be 1-3-2-6-4-5 repeating 6 more times for a total of 42 coefficients.

CHECKDIGIT_CONSTANT1

An integer value 0 to 99.

Default value: If the **CHECKDIGIT_ALGORITHM** is set to **Custom** and this parameter does not appear in the file, the default value will be **7**.

CHECKDIGIT_CONSTANT2

An integer value 0 to 99.

Default value: If the **CHECKDIGIT_ALGORITHM** is set to **Custom** and this parameter does not appear in the file, the default value will be **10**.

CHECKDIGIT_DIVISOR

An integer value 1 to 99.

Default value: If the CHECKDIGIT_ALGORITHM is set to **Custom** and this parameter does not appear in the file, the default value will be **11**.

CHECKDIGIT_DIRECTION

Left or **Right**. Refers to which digit will be used as the Checkdigit, the one to the left of a quotient's decimal point or the one to the right. See "Check digit attributes" for more details.

Default value: If CHECKDIGIT_ALGORITHM is set to **Custom** and this parameter does not appear in the file, the default value will be **Right**.

CHECKDIGIT_USE_LUT

Yes or **No**. Refers to whether or not a Lookup table will be used for the final check digit.

Default value: If the CHECKDIGIT_ALGORITHM is set to **Custom** and this parameter does not appear in the file, the default value will be **Yes**.

CHECKDIGIT_LOOKUP_TABLE

This is a table of check digit values. There must be at least 11 alphanumeric characters in this table.

Default value: If the CHECKDIGIT_ALGORITHM is set to **Custom** and this parameter does not appear in the file, the default value will be a-b-c-d-e-f-g-h-i-j-k.

Creating a package file from the Chkdigit.txt file

Once you have created the chkdigit.txt file, contact Kodak Service & Support (1-800-822-1414) to convert this file to a format that can be downloaded to the scanner. .