TOSHIBA

TOSHIBA RFID Kit for B-SX4T/SX5T bar code printer

B-SX704-RFID-U2-US-R

RFID Supply Specification

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TOSHIBA TEC CORPORATION
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. SCOPE</td>
<td>1</td>
</tr>
<tr>
<td>2. GENERAL</td>
<td>1</td>
</tr>
<tr>
<td>3. MEDIA SIZE AND SHAPE</td>
<td>1</td>
</tr>
<tr>
<td>4. RIBBON</td>
<td>1</td>
</tr>
<tr>
<td>5. RFID TAG</td>
<td>1</td>
</tr>
<tr>
<td>5.1 TYPE OF USABLE RFID TAGS</td>
<td>1</td>
</tr>
<tr>
<td>5.2 LOCATION OF RFID TAG</td>
<td>2</td>
</tr>
<tr>
<td>5.3 SHORT-PITCH TAGS</td>
<td>5</td>
</tr>
<tr>
<td>6. CAUTIONS FOR USING RFID TAGS</td>
<td>6</td>
</tr>
<tr>
<td>6.1 LIFT-UP OF THE THERMAL HEAD</td>
<td>6</td>
</tr>
<tr>
<td>6.2 STORAGE OF RFID SUPPLIES</td>
<td>6</td>
</tr>
<tr>
<td>6.3 ROLL-TYPE RFID SUPPLIES</td>
<td>6</td>
</tr>
<tr>
<td>6.4 SENSOR</td>
<td>6</td>
</tr>
<tr>
<td>6.5 CUTTER</td>
<td>6</td>
</tr>
<tr>
<td>6.6 STATIC ELECTRICITY</td>
<td>6</td>
</tr>
<tr>
<td>6.7 PRINTING ON BUMP (CHIP/ANTENNA) AREA</td>
<td>7</td>
</tr>
<tr>
<td>6.8 AMBIENT TEMPERATURE</td>
<td>7</td>
</tr>
<tr>
<td>6.9 STRIP ISSUE</td>
<td>8</td>
</tr>
<tr>
<td>6.10 CAUTION ABOUT MINIMUM LABEL PITCH LENGTH</td>
<td>8</td>
</tr>
<tr>
<td>6.11 DEFECTIVE RFID TAG</td>
<td>8</td>
</tr>
<tr>
<td>6.12 PRINT POSITION ACCURACY</td>
<td>8</td>
</tr>
<tr>
<td>6.13 PAPER JAM ERROR</td>
<td>8</td>
</tr>
<tr>
<td>7. IMPROVEMENT OF WRITING ACCURACY</td>
<td>9</td>
</tr>
</tbody>
</table>
1. SCOPE

This document describes the specifications of RFID supplies which are used when the optional RFID kit, B-SX704-RFID-U2-US-R, is installed in the B-SX4T/SX5T series industrial high-performance class general-purpose bar code printers.

2. GENERAL DESCRIPTION

The RFID supplies are RFID tag (wireless IC tag) inlays designed to be converted into tag and label applications. Printers, which are equipped with an RFID kit, can print data on the surface of RFID supplies as well as write data on the embedded RFID tags. The B-SX704-RFID-U2-US-R is destined for North America and operates in the UHF band (902.75 MHz to 927.5 MHz).

3. MEDIA SIZE AND SHAPE

The specifications of size and shape of media to be used by the B-SX4T/SX5T series printers must conform to those described in the B-SX Series Supply Specification (TAN-0111).

4. RIBBON

The specifications of ribbons to be used by the B-SX4T/SX5T series printers must conform to those described in the B-SX Series Supply Specification (TAN-0111).

5. RFID TAG

5.1 TYPE OF USABLE RFID TAGS

EPC Class1 Generation 2
5.2 LOCATION OF RFID TAG

The location of an RFID tag in a label influences on the accuracy of writing data on the RFID tag. It is impossible to define the one best location for every RFID tag in labels because the best location depends on the type of RFID tag and RFID tag antenna. The RFID Analyze Tool (7FM001113) can evaluate the accuracy of writing data on the RFID tag. For the usage of this tool, refer to the RFID Analyze Tool Operation Specification (TAA-2195).

As a guideline, the best location for some common RFID tags is given below. It is recommended to use the RFID Analyze Tool to evaluate the accuracy of writing data on an RFID tag to be used, then determine a specific location of the RFID tag. If the RFID tag cannot be placed on the best location specified, perform a forward/reverse feed before a data write using the RFID Tag Position Adjustment Command ([ESC]@003).

Note that the best location described in this specification may not be applicable depending on the type or paper or glue even if the same RFID tags are used. This guideline applies to RFID labels for thermal transfer issue. When using the media made of PET or thermal paper, the best location needs to be found again.
(1) Avery Dennison AD-222 Tag
   It is recommended to locate the vertical center of an RFID tag at 35 mm ± 3 mm from a leading edge of a label and align the horizontal center with the horizontal center of the label.
(2) Alien Squiggle Tag

It is recommended to locate the vertical center of an RFID tag at 35 mm ± 3 mm from a leading edge of a label and align the horizontal center with the horizontal center of the label.
5.3 SHORT-PITCH TAGS

A short-pitch tag kit is supplied with the B-SX704-RFID-U2-US-R to enable the RFID kit to encode short-pitch tags properly. When the short-pitch tag kit is attached to the printer, the write field will be narrower. The RFID kit is designed so that the second label is positioned just above the antenna while the first label is at the print start position, when using the following short-pitch label.

![Rafsec Short Dipole2 Tag](image)

After printing a label, a reverse feed for a distance equivalent to one label pitch is required to write data onto its tag. During this reverse feed, the bottom edge of the printed label may be stuck on the print head edge, causing a feed jam. This is because the labels become thicker due to embedded tags.

In most cases, this problem can be avoided by enabling the ribbon saving function of the printer which raises the thermal head during a reverse feed. When using short-pitch tags, enable the ribbon saving function.

When several labels are issued in a batch, set the offset printing parameter to 1 (Offset printing is performed without a reverse feed of the first label.) in order to make the printer issue labels without performing a reverse feed. In this case, however, the printer does not print or write data on the first label, so it is wasteful. This mode is not suitable for applications where a small number of labels are issued on an as-needed basis.

For details of the offset printing feature, refer to the B-SX4T/SX5T External Equipment Interface Specification (TAA-1380).

[Printer settings for use of short-pitch tags]

In the printer system mode, set the RFID-related parameters as follows:

- Q value: 2
- WT AGC (AGC threshold for data write): 10
- WT MIN AGC (AGC threshold lower limit for retry): 10

When using short-pitch tags, a target tag is identified by measuring the AGC of tags within the read range. A tag of which AGC is equal to or higher than the specified threshold (10) is considered to be positioned just above the antenna (=target tag), and a data write is performed on it. When the AGC is less than the threshold, a data write is not performed on such tag.
6. CAUTIONS FOR USING RFID TAGS

6.1 LIFT-UP OF THERMAL HEAD

An RFID tag chip or the thermal head may be damaged when the thermal head passes over the chip. This can be prevented by using the ribbon saving module (standard feature for the B-SX5T and optional for the B-SX4T) by which the thermal head is lifted up preventing it from touching the chip when it passes over the chip.

When the thermal head is lifted up, the distance from the platen roller to the head is approximately 1 mm.

6.2 STORAGE OF RFID SUPPLIES

Do not store RFID tags close to printers, or their communication performance may not be as specified when they are used.

6.3 ROLL-TYPE RFID SUPPLIES

When RFID supplies are to be rolled, roll hardness must be concerned. Although it depends on the type of glue, tag, and backing paper, RFID-tag embedded labels tend to stay rolled. Especially, when they are wound outside, a media jam error may occur. Unless otherwise specified, it is recommended that the RFID-tag embedded labels be wound inside.

6.4 SENSOR

When the transmissive sensor or reflective sensor is enabled, transmissivity or reflectivity of a label or tag may vary at an RFID-tag embedded area depending on the pattern of an antenna or other factors. In such cases, a manual threshold setting is required in the printer system mode. For details, refer to the B-SX4T/SX5T Key Operation Specifications (TAA-1379).

6.5 CUTTER

When an RFID label or tag is used in cut issue mode, care must be taken not to cut the antenna or the IC chip of an RFID tag in order not to damage the cutter.

6.6 STATIC ELECTRICITY

When printing is performed in a place where humidity is low or under some specific conditions, writing data on an RFID tag may fail due to static electricity generated by a label or a ribbon.
6.7 PRINTING ON BUMP (CHIP/ANTENNA) AREA

Embedding RFID tags in labels creates bumps in a chip/antenna area in the labels, causing incomplete printing.

Especially, in the areas 5 mm from and left and right sides of the RFID-tag embedded area shown in the figure below, uneven printing or incomplete printing can occur easily. Print quality in such areas is not guaranteed.

* The degree of poor printing quality differs depending on height of a chip/antenna used.

6.8 AMBIENT TEMPERATURE

Low operating temperature deteriorates wireless performance, under which conditions writing data on an RFID tag may fail.
6.9 STRIP ISSUE

Stripping performance in strip issue mode depends on the type of glue, tag, and backing paper. For some RFID supplies used, an issue may not be performed properly in strip issue mode.

6.10 CAUTION FOR MINIMUM LABEL PITCH LENGTH

When short-pitch media is used, data may be written on a next RFID tag instead of the target RFID tag. As the location, where data is to be written, differs among RFID tag types, a check must be performed using the labels to be used to make sure that the data is written on the target RFID tags. The RFID Analyze Tool (7FM001113) can be used for this purpose.

6.11 DEFECTIVE RFID TAG

Defective tags could be embedded while they are converted into labels, and the error rate differs depending on the tag types or the conversion methods. Label manufacturers should mark such defective labels with something to indicate the tag is defective, or should prevent defective tags from being used. Also, how to identify defective tags and good tags should be properly notified to end users.

6.12 PRINT POSITION ACCURACY

When using RFID tag embedded media, the print position accuracy may exceed the guaranteed tolerance of ±1 mm in all issue modes. It is required to check the print position accuracy for each media type.

6.13 PAPER JAM ERROR

Depending on the type of glue or the flexibility of labels, a label may come unstuck at the print head edge, which causes a paper jam. Particularly, the frequency of paper jam could become higher on the condition of low operating temperature or use of short-pitch labels. It is required to check the media feed using the media to be used under the actual operating environment.
7. IMPROVEMENT OF WRITING ACCURACY

As RFID tags use wireless technologies, writing data on the RFID tag may fail depending on environment and characteristics of the RFID tags.

In order to improve the accuracy of writing data on the RFID tags, the following method can be used:

1. Change of the maximum number of write retries
   The maximum number of write retries is variable and can be changed in the system mode. Setting the greater value can improve the writing accuracy. However, overall printing throughput may become worse because a retry is also performed for tags on which data cannot be written. For details of settings, refer to the B-SX4T/SX5T Key Operation Specification (TAA-1379).

2. Enabling of RFID adjustment for retry
   The printer has the feature “RFID adjustment for retry”. If writing data on the RFID tag fails, the printer automatically feeds the RFID tag forward or backward for a specified length in order to retry a data write.
   Enabling this feature can improve the writing accuracy. However, overall printing throughput may become worse because a retry is performed even for defective tags. For details of settings, refer to the B-SX4T/SX5T Key Operation Specification (TAA-1379).

3. AGC threshold for data write
   When writing data on tags, especially on short-pitch tags, the antenna may communicate with non-target tags, and this lowers the write rate.
   The B-SX4T/SX5T has a feature to pinpoint a target tag by evaluating the output power (AGC) of tags. Setting an AGC threshold for data write enables choosing a tag of which AGC is higher than the threshold, determining this tag to be a target tag positioned just above the antenna, and writing data on it. This feature can prevent writing data to non-target tags (= off the antenna).
   For details of settings, refer to the B-SX4T/SX5T Key Operation Specification (TAA-1379).