PRINTRONIX®

RFID Labeling Reference Manual

SL5R Energy Star™, SL4M™ MP2, and
SL4M Short Pitch RFID Smart Label Printers

SL5R Energy Star, SL4M MP2, and
SL4M Short Pitch RFID Smart Label Printers

RFID Labeling Reference Manual

PRINTRONIX®

Trademark Acknowledgements

Alien and Alien Technology are registered trademarks of Alien Technology Corporation.

Avery is a trademark of Avery Dennison Corporation.

Impinj is a registered trademark of Impinj, Inc.

Manhattan Associates is a registered trademark of Manhattan Associates, Inc.

Matrics is a registered trademark of Matrics, Inc.

Omron is a trademark of OMRON Corporation.

Printronix, PGL, and PrintNet are registered trademarks of Printronix, Inc.

Rafsec and Raflatac are registered trademarks of UPM Raflatac.

SATO is a registered trademark of SATO America, Inc.

SL5000r, SL5R Energy Star, and SL4M are trademarks of Printronix, Inc.

Symbol is a registered trademark of Symbol.

TI is a trademark of Texas Instruments Incorporated.

Uniform Code Council, Inc. is a registered trademark of Uniform Code Council, Inc.

Zebra and ZPL are trademarks of Zebra Technologies Corporation.

Zuma is a trademark of Impinj, Inc.

Table of Contents

1 RFID Smart Label Application and Reference Notes

Overview

NOTE: For the latest version of this reference manual, visit the Services & Support page at www.printronix.com.

This manual covers the following products:

- Printronix SL5R Energy Star Multi-protocol RFID printer, Class Gen 2, RFID tags, and labels
- Printronix SL4M multi-protocol RFID printer, supporting Class Gen 2 tags and labels
- Printronix SL4M Short Pitch RFID printer.

What to Expect when Running your RFID Application

Factors Affecting Smart Label Performance

Smart labels are based on an EEPROM technology that requires some time to be programmed. You may notice this minor pause between labels. This time is necessary to better ensure consistent quality and improved reliability.

When dealing with smart labels, it is possible that an occasional RFID tag may need to be written and verified more than once (retry) before being considered acceptable. In this event each retry time will be added to the inter-label pause.

Static electricity can damage the smart labels. Open the media cover of the printer and touch an unpainted metal part of the printer before you handle smart labels. This will discharge any static electricity that may have built up on your hands.

Overstruck Smart Labels

If an RFID tag within a smart label is deemed unacceptable after execution of the defined number of retries, what occurs next depends upon the Error Handling setting. See “Error Handling” on page 24 (SL5R Energy Star) or page 43 (SL4M).

Smart Label Characteristics

IMPORTANT **Purchase additional smart labels directly from Printronix to assure the highest level of performance and reliability. See "How to Order More Smart Labels" on page 13.**

Supported Tag Types

Printronix RFID printers support a number of RFID protocols and coupler configurations.

For a list of Certified RFID Smart Labels available from Printronix, go to http://www.printronix.com/certified-smart-labels.aspx.

For a complete list of tag types supported by Printronix RFID printers, go to http://www.printronix.com/rfid-label-specs.aspx.

These web pages will be updated regularly to include newly supported RFID tag types and newly Certified RFID Smart Labels available from Printronix.

Currently supported smart labels have the following characteristics:

General Tag Type

- UHF 869/915 MHz radio frequency

Technology Tag Class

EPC Class Gen 2 tags – 96 to 256 data bits EPC Read/Write, 512 bits User Memory.

Label Size

Refer to the Printronix web site for the latest specifications (see "Supported Tag Types" on page 11).

Transitioning from UCC/GTIN Applications using Printronix Software Migration Tools (SMT)

It is likely that your software is already set up to create bar codes. You may have also spent a lot of time creating compliance label templates & integrating them into your system. The Smart Label Developer's Kit Software Migration Tools will allow you to effortlessly transition from printing compliance labels to smart labels.

How Printronix Makes it Easy

If you are printing bar codes now, you can print smart labels — no change to your host datastream or existing compliance templates is required.

How it Works

A set of Software Migration Tools has been created to intercept the bar code data in the host datastream and copy the data to a smart label RFID tag according to a set of rules. Each tool has been designed for a specific end-use application. By simply selecting the desired Software Migration Tool from the printer's control panel, you automatically enable the printer to create an RFID smart label from your existing software application even if the software does not have the functionality to program RFID tags. The tools include:

- **GTIN:** Copies the Global Trade Identification Number (GTIN) bar code data for case and pallet labels onto the smart label's RFID tag.
- **EAN-8**, **EAN13**, **UPCA**, and **UCC128:** These tools copy the data from their respective bar code symbologies to a smart label's RFID tag. This enables the achievement of supply-chain efficiencies with RFID-ready trading partners while at the same time remaining compatible with those who are not.

- **EPC:** This tool allows EPC data to be directly encoded into the smart label's RFID tag. Simply have your existing software application write the desired EPC number to a Code 3 of 9 barcode. The printer will then write the EPC data to the RFID tag without printing the bar code.

The existing toolset will meet the needs of many RFID early adopters. If you have a requirement for a Software Migration Tool not included in this kit, feel free to contact Printronix.

To select and use the tools, see "Software Migration Tools (SMT)" on page 97.

Contact Information

How to Order More Smart Labels

Contact the Printronix Supplies Department for genuine Printronix supplies.

Americas	(800) 733-1900
Europe, Middle East, and Africa	(33) 1 46 25 19 07
Asia Pacific	(65) 6548 4116 or (65) 6548 4132
China	(86) 400-886-5598
India	(800) 102-7869

http://www.printronix.com/supplies-parts.aspx

Printronix Customer Support Center

IMPORTANT **Please have the following information available prior to calling the Printronix Customer Support Center:**

- Model number
- Serial number (located on the back of the printer)
- Installed options (i.e., interface and host type if applicable to the problem)
- Configuration printout (see “Printing A Configuration” in the *User’s Manual*)
- Is the problem with a new install or an existing printer?
- Description of the problem (be specific)
- Good and bad samples that clearly show the problem (faxing or emailing samples may be required)

Americas	(714) 368-2686
Europe, Middle East, and Africa	(31) 24 6489 311
Asia Pacific	(65) 6548 4114
China	(86) 800-999-6836

http://www.printronix.com/support.aspx

Corporate Offices

Printronix, Inc.
15345 Barranca Parkway
Irvine, CA 92618
U.S.A.
Phone: (714) 368-2300
Fax: (714) 368-2600

Printronix Inc.
c/o Printronix Nederland BV
Bijsterhuizen 11-38
6546 AS Nijmegen
The Netherlands
Phone: (31) 24 6489489
Fax: (31) 24 6489499

Printronix Schweiz GmbH
42 Changi South Street 1
Changi South Industrial Estate
Singapore 486763
Phone: (65) 6542 0110
Fax: (65) 6546 1588

Printronix Commercial (Shanghai) Co. Ltd
22F, Eton Building East
No.555, Pudong Av.
Shanghai City, 200120, P R China
Phone: (86) 400 886 5598
Fax: (86-21) 5138 0564

Visit the Printronix web site at www.printronix.com

Chapter 1 Contact Information

2 *Smart Label Development*

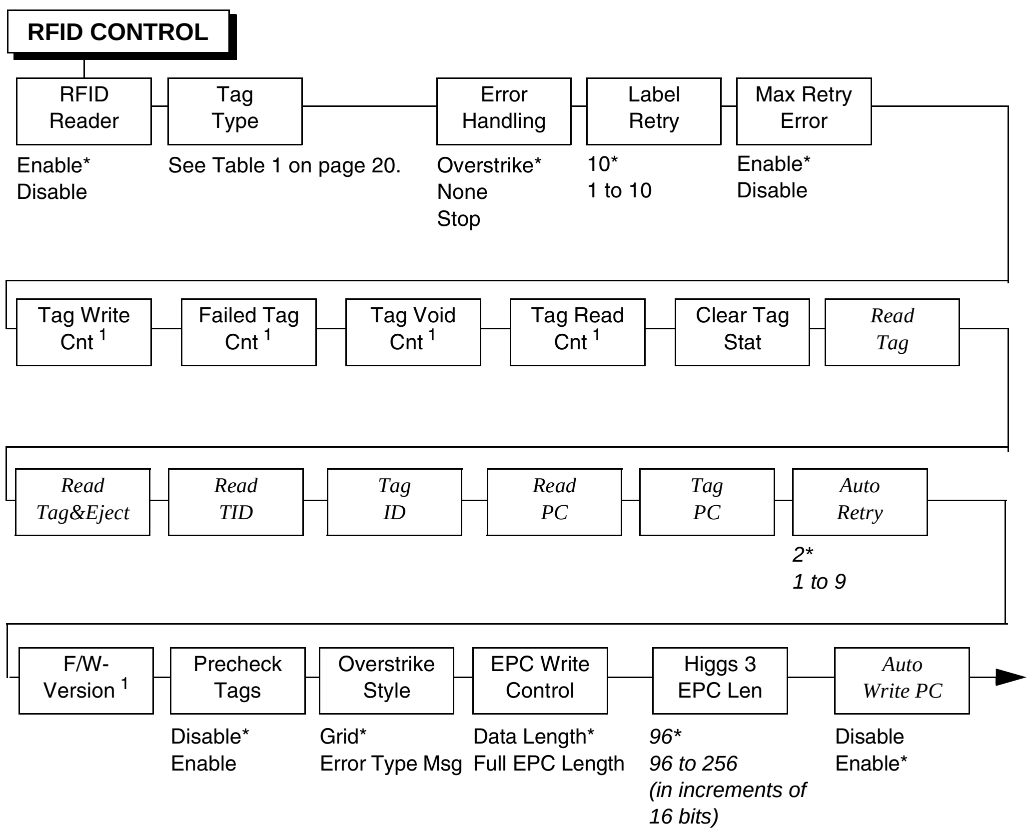
Overview

This chapter describes how to use the RFID encoder. The RFID encoder is designed to be transparent to the printer operation. It provides the capability of programming smart labels (with embedded RFID tags) while printing the label format. The smart labels are provided with the printer or purchased separately from Printronix.

There are several ways to program RFID tags in smart labels:

- Use the Software Migration Tools (SMT) to enable the printer to automatically create RFID commands from your existing bar code commands. These tools are described on page 97.
- Incorporate RFID commands into new or existing Printronix PGL® programs. Command details start on page 55.
- Incorporate RFID commands into new or existing ZPL™ programs. By selecting the Printronix ZGL emulation you can seamlessly upgrade from Zebra™ printers. Command details start on page 83.
- Incorporate RFID commands into new or existing SATO® printer language programs. By selecting the Printronix STGL emulation you can seamlessly upgrade from SATO printers. Command details start on page 95.

RFID CONTROL Menu (SL5R Energy Star)



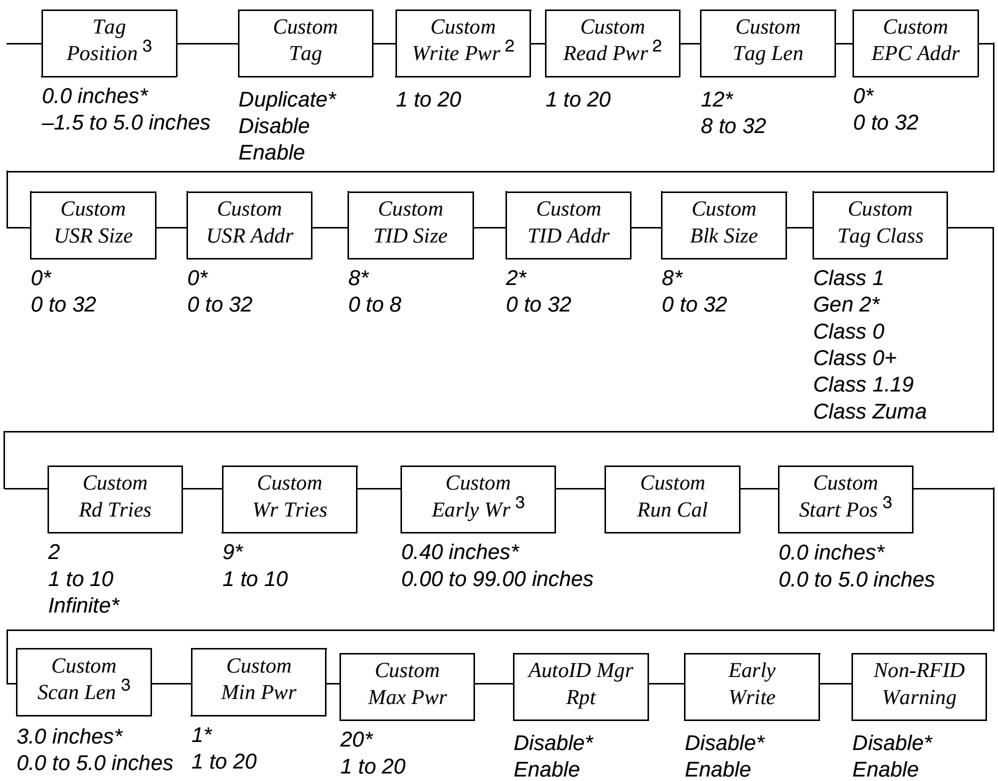
Notes:

* = Default.

Italicized items appear only when Admin User is set to Enable (in the PRINTER CONTROL menu).

[1] Display item only.

RFID CONTROL
(from page 18)



Notes:

* = Default.

Italicized items appear only when Admin User is set to Enable (in the PRINTER CONTROL menu).

[2] Default depends on the type of RFID encoder installed in the printer.

[3] Inches or millimeters, depending on the Units setting (in the MEDIA CONTROL menu).

RFID CONTROL Menu Items (SL5R Energy Star)

RFID Reader

This menu item enables or disables the RFID encoder.
The default is Enable.

Tag Type

This menu item selects the tag type in use. Table 1 lists supported tag types in the order they appear in the menu (alphabetical order). Other types may be added in the future. See "Supported Tag Types" on page 11 for instructions on how to view a current list on the web.

NOTE: For tag type specifications, go to http://www.printronix.com/. Click RFID Printers and Learn More in the RFID Smart Label Specifications section. Select the desired Printronix specification for more information.

Table 1. Supported RFID UHF Gen2 Tag Types (SL5R Energy Star)

Menu Text	EPC Bits	User Bits	TID	Silicon	Antenna Position	PTX Spec
Alien® 9529 SQ	96	0	E2003411	Alien Higgs 2	Yellow	183192
Alien 9534 2x2	96	0	E2003411	Alien Higgs 2	Blue	183049
Alien9540 Squig	96	0	E2003411	Alien Higgs 2	Orange	182328
Alien9554 M-Tag	96	0	E2003411	Alien Higgs 2	Orange	183067
Alien 9562 SH	96	0	E2003411	Alien Higgs 2	Yellow	183190
Alien 9629 SQ	See Table 2 on page 27.		E2003412	Alien Higgs 3	Yellow	184024

Table 1. Supported RFID UHF Gen2 Tag Types (SL5R Energy Star)

Menu Text	EPC Bits	User Bits	TID	Silicon	Antenna Position	PTX Spec
Alien9630 Sqlet	See Table 2 on page 27.		E2003412	Alien Higgs 3	Yellow	184237
Alien 9634	See Table 2 on page 27.		E2003412	Alien Higgs 3	Yellow	184206
Alien9640 Squig	See Table 2 on page 27.		E2003412	Alien Higgs 3	Orange	183260
Alien 9654 G	See Table 2 on page 27.		E2003412	Alien Higgs 3	Orange	183914
Alien9662 Short	See Table 2 on page 27.		E2003412	Alien Higgs 3	Yellow	183955
Alien9720 HiScn	128	128	E2003414	Alien Higgs 4	Yellow	184964
Alien9728 GT	128	128	E2003414	Alien Higgs 4	Yellow	184974
Alien9730 Sqlet	128	128	E2003414	Alien Higgs 4	Yellow	184237
Alien9740 Squig	128	128	E2003414	Alien Higgs 4	Orange	183260
Alien9762 Short	128	128	E2003414	Alien Higgs 4	Yellow	183955
Avery AD224	240	512	E2006003	NXP Ucode G2XM	Orange	183208
Avery AD227	128	0	E2801130	Impinj Monza 5	Orange	184841
Avery AD230	96	0	E200109.	Impinj Monza 3	Yellow	183905

Table 1. Supported RFID UHF Gen2 Tag Types (SL5R Energy Star)

Menu Text	EPC Bits	User Bits	TID	Silicon	Antenna Position	PTX Spec
Avery AD213D	128	32	E280110.	Impinj Monza 4D	Yellow	184731
Avery AD232	128	0	E200680.	NXP Ucode G2iL	Yellow	184310
Avery AD233	128	0	E2801130	Impinj Monza 5	Yellow	184922
Avery AD380iL	128	0	E200680.	NXP Ucode G2iL	Yellow	184649
Avery AD814	96	0	E200109.	Impinj Monza 3	Orange	184018
Avery AD824	240	0	E2006004	NXP Monza G2XL	Yellow	184690
Avery AD826	96	0	E200109.	Impinj Monza 3	Yellow	184690
Avery AD843	96	0	E200109.	Impinj Monza 3	Orange	183939
S/Trac Short M3	96	0	E200109.	Impinj Monza 3	Orange	183300
S/Trac Dogbn M3	96	0	E200109.	Impinj Monza 3	Blue	183877
S/Trac Frog M3	96	0	E200109.	Impinj Monza 3	Red	183866
S/Trac Dogbn M4	128	32	E280110.	Impinj Monza 4D	Blue	184174

Table 1. Supported RFID UHF Gen2 Tag Types (SL5R Energy Star)

Menu Text	EPC Bits	User Bits	TID	Silicon	Antenna Position	PTX Spec
S/Trac Belt iL	128	0	E200680.	NXP Ucode G2iL	Yellow	184230
S/Trac Short M4	128	32	E280110.	Impinj Monza 4D	Orange	184261
S/Trac Web Lite	128	0	E2801130	Impinj Monza 5	Yellow	184871
S/Trac Web M5	128	0	E2801130	Impinj Monza 5	Yellow	184859
Tageos EOS 300	See Table 2 on page 27.		E2003412	Alien Higgs 3	Yellow	184894
Tageos EOS 500	See Table 2 on page 27.		E2003412	Alien Higgs 3	Orange	184852

Error Handling

This menu item selects the error handling mode for RFID failures. The default is Overstrike.

In Overstrike mode, each failed label prints with the Overstrike pattern and the form retries on a new label until the Label Retry count is exhausted. Whether or not an error message will display or the failed label will reprint depends upon the Max Retry Error setting.

In None mode, no specific action is taken when a tag fails to be programmed.

In Stop mode, when a tag fails to be programmed, the printer will halt and display the error message “RFID Error: Check Media.” The label is discarded and reprinting of the label (if desired) must be initiated from the host. When the error is cleared, the label with the failed tag moves forward until the next label is in position to be printed.

Label Retry

NOTE: Label Retry only applies when the Error Handling mode is set to Overstrike.

This menu item selects the number of label retries that the RFID encoder will attempt before declaring a fault. This may indicate a problem with the RFID encoder, the coupler assembly, the printer setup, or the label stock. The default is 10.

Max Retry Error

This menu item enables or disables Max Retry Error. If it is set to Disable, errors are not declared and the print content for the current label is discarded. The default is Enable.

Tag Write Cnt

This menu item displays on the control panel’s LCD the number of tags attempted to be written since the last Clear Tag Stat operation has been initiated. (See “Clear Tag Stat” below.)

Failed Tag Cnt

This menu item displays on the control panel's LCD the number of failed tag write attempts since the last Clear Tag Stat operation has been initiated. (See "Clear Tag Stat" below.)

Tag Void Cnt

This menu item always displays 0 unless the RFID encoder is used with an attached online data validator. When used with a validator, Tag Void Cnt represents how many valid RFID tags were overstruck due to bad bar code scanning. Refer to the *Online Data Validator User's Manual*.

Tag Read Cnt

This menu item displays the number of tags read since the last Clear Tag Stat (below).

Clear Tag Stat

This menu item clears the Tag Write Cnt, Failed Tag Cnt, Tag Void Cnt, and Tag Read Cnt menu items.

F/W-Version

This menu item displays the reader firmware version on the control panel's LCD.

Precheck Tags

NOTE: This menu item applies to Class 1 tags only.

When this menu item is set to Enable, the RFID encoder checks the tags for a pre-programmed quality code. If the code is absent, the tag immediately fails and the selected Error Handling mode is performed (Overstrike, None, or Stop). The default is Disable.

Overstrike Style

This menu item selects the style of the overstrike pattern.
The default is Grid.

When it is set to Grid, a grid pattern prints when it overstrikes. When it is set to Error Type Msg, an error message prints that indicates which error occurred (see Table 3).

IMPORTANT **If you are using a validator, set the RFID Overstrike Style different than the validator Overstrike Style (in the VALIDATOR menu). This will help you differentiate between an RFID error and a validator error.**

EPC Write Control

This option controls how the printer encodes the RFID tag EPC field.

When set to Data Length, only the amount of data provided in the application is encoded. When set to Full EPC Length, the maximum EPC length for the particular tag type in use is written to the tag (padded with zeroes if necessary). If Auto Write is enabled, the PC field encodes information about the length of the EPC being written. The default is Data Length.

Higgs 3 EPC Len

Higgs 3 tags differ from other RFID tags in that its memory bank size is not fixed. To accommodate EPC lengths longer than 96 bits, Higgs 3 borrows memory from the USR bank. The default is 96 bits.

When the EPC length is selected, the USR length sets automatically (see Table 2). Since the PC value indicates the length of the EPC in the Higgs 3, the PC value must be programmed when programming the EPC (if the EPC value has changed from its factory state). The PC value to be programmed for each of the supported EPC lengths is shown in Table 2.

Table 2. EPC/USR Lengths and PC Values

EPC Length	USR Length	PC Value
96	512	0x3000
112	448	0x3800
128	448	0x4000
144	448	0x4800
160	448	0x5000
176	384	0x5800
192	384	0x6000
208	384	0x6800
224	384	0x7000
240	320	0x7800
256	320	0x8000

Table 3. Printed Overstrike Error Messages

Error Message	Explanation
Tag R/W Err *x* Check media	The printer software attempted to write to or read from the RFID tag, but the RFID encoder indicated that the tag could not be written to or read from.
Tag Comm Err *x* Check cable	The printer software temporarily lost communication with the RFID encoder, or communication between the printer software and the RFID encoder was not synchronized and had to be forced.
Precheck Fail *x* Check media	This failure occurs only when the Precheck Tags menu item is set to Enable. It indicates that the RFID tag was automatically failed since it did not contain the correct pre-programmed quality code.

NOTE: The *x* in the error messages represents a number code that identifies the area in the printer software or RFID encoder where the failure occurred.

Auto Write PC

This option controls whether the printer automatically writes the RFID tag PC field to encode information about the length of the EPC field being written if a PC is not specified in the application data. If this option is disabled, the PC is not automatically written. The default is Enabled.

Admin User Menu Items (SL5R Energy Star)

To see these menu items, set Admin User to Enable in the PRINTER CONTROL menu. (Refer to the *User's Manual*.)

IMPORTANT **Admin User menu items should only be used by authorized personnel.**

Read Tag

IMPORTANT **This menu item does not position the RFID tag over the coupler. Make sure to position the tag over the coupler to receive an accurate reading.**

This menu item reads the tag in range of the internal RFID coupler and reports the tag data to the debug port and momentarily displays it on the control panel's LCD. It is primarily intended for development verification by checking that the system is working.

Read Tag&Eject

IMPORTANT **This menu item does not position the RFID tag over the coupler. Make sure to position the tag over the coupler to receive an accurate reading.**

The menu item works exactly the same as Read Tag (above), except that after the printer reads the tag, it feeds the label to the next top-of-form.

Read TID

IMPORTANT **This menu item does not position the RFID tag over the coupler. Make sure to position the tag over the coupler to receive an accurate reading.**

This menu reads the TID (Tag ID) from the tag in range of the internal RFID coupler and displays the value read in the Tag ID menu.

Tag ID

This menu item displays the first TID (Tag ID) read since power-up, or if using the Read TID menu, the most recently read TID. If no tag is in range of the internal RFID coupler, “Unknown” displays.

Read PC

IMPORTANT **This menu item does not position the RFID tag over the coupler. Make sure to position the tag over the coupler to receive an accurate reading.**

This menu item reads the PC (Protocol Control) field from an RFID tag in range of the internal RFID coupler and displays the value read in the Tag PC menu.

Tag PC

This menu item displays the last PC (Protocol Control) field read from an RFID tag. If no tag is in range of the internal RFID coupler, “Unknown” displays.

Auto Retry

This menu item selects the number of automatic (internal) retries that the printer will attempt on the same tag before declaring a tag error and performing the Error Handling mode selected (Overstrike, Stop, or None). The default is 2.

Tag Position

This menu determines how far the RFID tag position of the currently installed tag differs from the RFID tag position of the standard Printronix tag. Printronix printers print at a maximum speed with RFID labels that have RFID tags in the standard position. The default is 0.0 inches.

NOTE: The units display in inches or millimeters, depending on the Units setting (in the MEDIA CONTROL menu).

Custom Tag

This menu item enables or disables the custom tag menus (all menu items that begin with Custom or Cust). The default is Disable.

The custom tag menus allow the RFID encoder to work with tag types that are not listed in the Tag Type menu item.

NOTE: Printronix cannot guarantee the performance of tag types not certified by Printronix.

When Custom Tag is set to Disable, the settings in the custom tag menus are ignored by the RFID encoder.

When it is set to Enable, the RFID encoder uses the settings in the custom tag menus, which must be set to match the characteristics of the custom tag.

When it is set to Duplicate, the settings of the selected Tag Type menu item are copied into the custom tag menus, but are ignored by the RFID encoder.

Custom Write Pwr

NOTE: To enable this menu item, set Custom Tag to Enable.

This menu item selects the write power level to be used in the RFID encoder. 1 is the lowest power level setting, and 20 is the highest.

The default depends on the type of RFID encoder installed in the printer.

Custom Read Pwr

NOTE: To enable this menu item, set Custom Tag to Enable.

This menu item selects the read power level to be used in the RFID encoder. 1 is the lowest power level setting, and 20 is the highest.

The default depends on the type of RFID encoder installed in the printer.

Custom Tag Len

NOTE: To enable this menu item, set Custom Tag to Enable.

This menu item selects the number of bytes in the EPC block within the RFID tag memory. The default is 12.

Custom EPC Addr

NOTE: To enable this menu item, set Custom Tag to Enable.

This menu item selects the starting location of the EPC block within the RFID tag memory. The default is 0.

Custom USR Size

NOTE: To enable this menu item, set Custom Tag to Enable.

This menu item selects the size of the USR block within the RFID tag memory. The default is 0.

Custom USR Addr

NOTE: To enable this menu item, set Custom Tag to Enable.

This menu item selects the starting location of the USR block within the RFID tag memory. The default is 0.

Custom TID Size

NOTE: To enable this menu item, set Custom Tag to Enable.

This menu item selects the size of the TID block within the RFID tag memory. The default is 8.

Custom TID Addr

NOTE: To enable this menu item, set Custom Tag to Enable.

This menu item selects the starting location of the TID block within the RFID tag memory. The default is 2.

Custom Blk Size

NOTE: To enable this menu item, set Custom Tag to Enable.

This menu item selects the maximum number of bytes written to the USR block within the RFID tag memory at one time.
The default is 8.

Custom Tag Class

NOTE: To enable this menu item, set Custom Tag to Enable.

This menu item selects the class of the custom tag. Class 1, Class 0+, Class 1.19, Class Gen 2, and Class Zuma tags are read/write. Class 0 tags are read only. The default is Gen 2.

Custom Rd Tries

NOTE: To enable this menu item, set Custom Tag to Enable.

This menu item selects how many times the RFID encoder will try each read command. The default is 2.

Custom Wr Tries

NOTE: To enable this menu item, set Custom Tag to Enable.

This menu item selects how many times the RFID encoder will try each write command. The default is 9.

Cust Early Write

NOTE: To enable this menu item, set both Custom Tag and Early Write to Enable.

IMPORTANT **Change this menu item with caution. If the write is performed too early, the wrong tag will be written.**

This menu item selects how early the RFID encoder will write the next tag before it completes the printing on the current label. Certain tag types are designed to allow early tag writing for maximum print speed. The default is 0.40 inches.

NOTE: The units display in inches or millimeters, depending on the Units setting (in the MEDIA CONTROL menu).

Custom Run Cal

NOTE: To enable this menu item, set Custom Tag to Enable.

This menu item causes the printer to run calibration for the current RFID tags installed in the printer. After the calibration is complete, the custom settings are changed to work with the tags installed. These settings do not take effect until Custom Tag is set to Enable.

Custom Start Pos

NOTE: To enable this menu item, set Custom Tag to Enable.

This menu item determines where on the label the RFID calibration will begin. By default, the calibration procedure will start at the beginning of the label (0.0 inches). To make the calibration work faster, change this value to force the calibration to begin after the beginning of the label.

NOTE: The units display in inches or millimeters, depending on the Units setting (in the MEDIA CONTROL menu).

Custom Scan Len

NOTE: To enable this menu item, set Custom Tag to Enable.

The menu item determines how much of the label will be scanned during the RFID calibration procedure. The default is 3.0 inches.

Custom Min Power

NOTE: To enable this menu item, set Custom Tag to Enable.

The menu item determines the minimum power level that the calibration procedure will use when attempting to find the ideal power level. To make the calibration work faster, increase this value to exclude the lower power levels. The default is 1.

Custom Max Power

NOTE: To enable this menu item, set Custom Tag to Enable.

The menu item determines the maximum power level that the calibration procedure will use when attempting to find the ideal power level. To make the calibration work faster, decrease this value to exclude the higher power levels. The default is 20.

AutoID Mgr Report

This menu item enables AutoID and label information to be sent out the network port. This information can be used by an RFID tag data and labels manager program. The default is Disable.

Early Write

This menu item enables early RFID encoding. If you select a Tag Type that can take advantage of early writing, and if you set Early Write to Enable, print speed will automatically improve. Less time will be spent encoding the RFID between printed forms. Also, if you set Custom Tag to Enable and Cust Early Write to a non-zero value, print speed will improve.

The default is Disable.

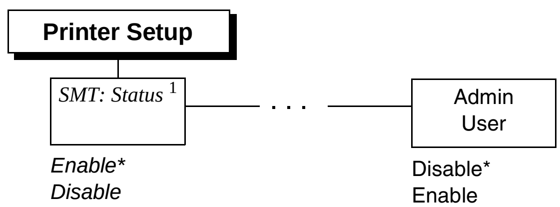
Non-RFID Warning

When this menu item is set to Enable, the printer checks to make sure that non-RFID jobs are not being printed on RFID labels (to prevent RFID labels from being wasted).

If RFID labels are installed in the printer, and a job is printed with at least one form that contains no RFID commands, a fault will be declared and the data for the forms that contain no RFID commands will be absorbed.

The default is Disable.

Printer Setup Menu (SL5R Energy Star)



Notes:

Only a portion of the Printer Setup menu is shown. SMT:Status is a submenu of the Printer Setup menu.

* = Default

Italicized items appear only when Admin User is set to Enable (in the PRINTER CONTROL menu).

[1] The SMT: Status menu item will be hidden when a user-defined CST file is loaded.

Printer Setup Menu Items (SL5R Energy Star)

SMT: Status

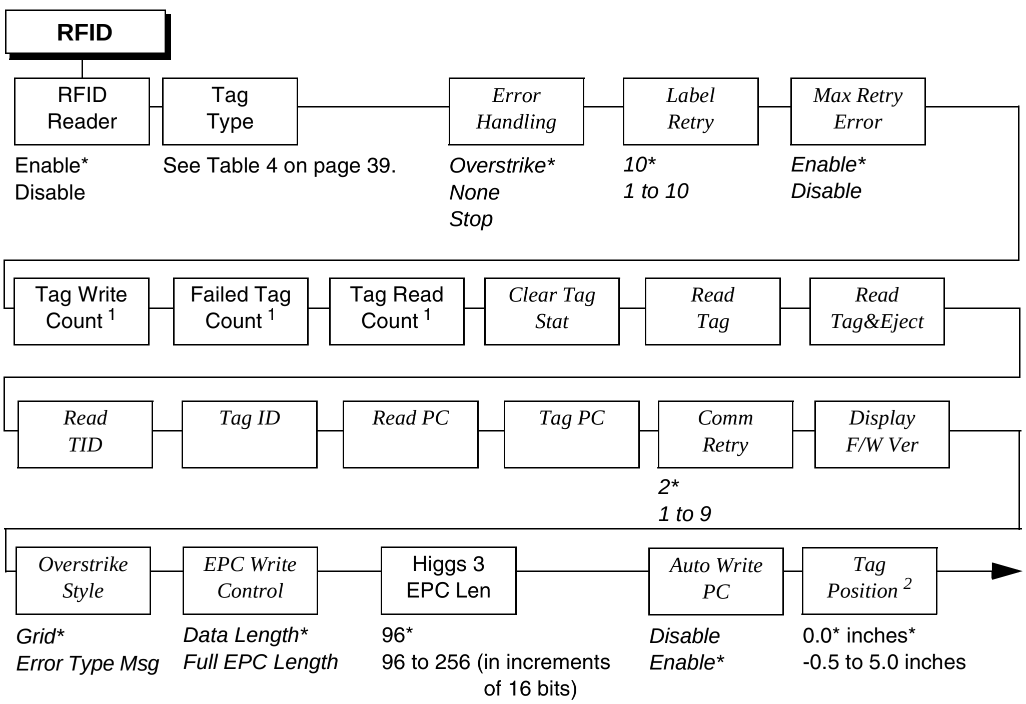
See “Software Migration Tools (SMT)” on page 97.

- **Disable** (factory default). The printer disables the use of the Software Migration Tools functionality.
- **Enable**. The printer enables the use of the Software Migration Tools functionality.

Admin User

- **Disable** (factory default).
- **Enable**. When enabled, this function permits access to submenu items which would not normally be changed by a typical user.

RFID Menu (SL4M)



Notes:

* = Default.

** = Short Pitch tag type, supported by SL4M Short Pitch printers.

Italicized items appear only when Admin User is set to Enable (in the PRINTER SETUP menu).

[1] Display item only.

[2] Available when Short Pitch Coupler is selected (Admin User = Disable) or when Auto Coupler is selected (Admin User = Enable).

RFID
(from page 37)

Custom Setting

- *Custom Tag*
  - *Duplicate**
  - *Disable*
  - *Enable*
- *Write Power* [2]
  - *1 to 20*
- *Read Power* [2]
  - *1 to 20*
- *EPC Byte Length*
  - *12**
  - *8 to 32*
- *EPC Address*
  - *0**
  - *0 to 32*
- *USR Byte Length*
  - *0**
  - *0 to 64*
- *USR Address*
  - *0**
  - *0 to 32*
- *TID Byte Length*
  - *8**
  - *0 to 8*
- *TID Address*
  - *2**
  - *0 to 32*
- *Block Write Len*
  - *8**
  - *0 to 32*
- *Tag Class*
  - *Class 1*
  - *Gen 2**
  - *Class 0*
  - *Class 0+*
  - *Class 1.19*
  - *Class Zuma*
- *Read Tries*
  - *2**
  - *1 to 10, Infinite*
- *Write Tries*
  - *9**
  - *1 to 10*
- *RFID Calibrate*
  - *To Run Press ↵*
- *Scan Start Pos* [3]
  - *0.0 inches**
  - *0.0 to 5.0 inches*
- *Scan Length* [3]
  - *3.0 inches**
  - *0.0 to 5.0 inches*
- *Cal Min Power*
  - *1**
  - *1 to 20*
- *Cal Max Power*
  - *20**
  - *1 to 20*

AutoID Mgr Rpt

- *Disable**
- *Enable*

Non-RFID Warning

- Disable*
- Enable

Submenu End:/ To Exit Press X

Notes:

* = Default.

Italicized items appear only when Admin User is set to Enable (in the PRINTER SETUP menu).

[2] Default depends on the type of RFID encoder installed in the printer.

[3] Inches or millimeters, depending on the Units setting (in the MEDIA CONTROL menu).

RFID Menu Items (SL4M)

RFID Reader

This menu item enables or disables the RFID encoder.
The default is Enable.

Tag Type

This menu item selects the tag type in use. Table 4 lists supported tag types in the order they appear in the menu (alphabetical order). Other types may be added in the future. See “Supported Tag Types” on page 11 for a current list.

NOTE: For tag type specifications, go to http://www.printronix.com/. Click RFID Printers and Learn More in the RFID Smart Label Specifications section. Select the desired Printronix specification for more information.

Table 4. Supported RFID UHF Gen2 Tag Types (SL4M)

Menu Text	EPC Bits	User Bits	TID	Silicon	Antenna Position	PTX Spec
Alien® 9529 SQ	96	0	E2003411	Alien Higgs 2	Yellow	183192
Alien 9534 2x2	96	0	E2003411	Alien Higgs 2	Blue	183049
Alien9540 Squig	96	0	E2003411	Alien Higgs 2	Orange	182328
Alien9554 M-Tag	96	0	E2003411	Alien Higgs 2	Orange	183067
Alien 9562 SH	96	0	E2003411	Alien Higgs 2	Yellow	183190
Alien 9629 SQ	See Table 2 on page 27.		E2003412	Alien Higgs 3	Yellow	184024
Alien9630 Sqlet	See Table 2 on page 27.		E2003412	Alien Higgs 3	Yellow	184237
Alien 9634	See Table 2 on page 27.		E2003412	Alien Higgs 3	Yellow	184206

Table 4. Supported RFID UHF Gen2 Tag Types (SL4M)

Menu Text	EPC Bits	User Bits	TID	Silicon	Antenna Position	PTX Spec
Alien9640 Squig	See Table 2 on page 27.		E2003412	Alien Higgs 3	Orange	183260
Alien 9654 G	See Table 2 on page 27.		E2003412	Alien Higgs 3	Orange	183914
Alien9662 Short	See Table 2 on page 27.		E2003412	Alien Higgs 3	Yellow	183955
Alien9720 HiScn	128	128	E2003414	Alien Higgs 4	Yellow	184964
Alien9728 GT	128	128	E2003414	Alien Higgs 4	Yellow	184974
Alien9730 Sqlet	128	128	E2003414	Alien Higgs 4	Yellow	184237
Alien9740 Squig	128	128	E2003414	Alien Higgs 4	Orange	183260
Alien9762 Short	128	128	E2003414	Alien Higgs 4	Yellow	183955
Avery™ AD224	240	512	E2006003	NXP Ucode G2XM	Orange	183208
Avery AD227	128	0	E2801130	Impinj Monza 5	Orange	184841
Avery AD230	96	0	E200109.	Impinj Monza 3	Yellow	183905
Avery AD231D	128	32	E280110.	Impinj Monza 4D	Yellow	184731
Avery AD232	128	0	E200680.	NXP Ucode G2iL	Yellow	184310
Avery AD233	128	0	E2801130	Impinj Monza 5	Yellow	184922
Avery AD380iL	128	0	E200680.	NXP Ucode G2iL	Yellow	184649
Avery AD814	96	0	E200109.	Impinj Monza 3	Orange	184018
Avery AD843	96	0	E200109.	Impinj Monza 3	Orange	183939
S/Trac Short M3	96	0	E200109.	Impinj Monza 3	Orange	183300

Table 4. Supported RFID UHF Gen2 Tag Types (SL4M)

Menu Text	EPC Bits	User Bits	TID	Silicon	Antenna Position	PTX Spec
S/Trac Dogbn M3	96	0	E200109.	Impinj Monza 3	Blue	183877
S/Trac Frog M3	96	0	E200109.	Impinj Monza 3	Red	183866
S/Trac Dogbn M4	128	32	E280110.	Impinj Monza 4D	Blue	184174
S/Trac Belt iL	128	0	E200680.	NXP Ucode G2iL	Yellow	184230
S/Trac Short M4	128	32	E280110.	Impinj Monza 4D	Orange	184261
S/Trac Web Lite	128	0	E2801130	Impinj Monza 5	Yellow	184871
S/Trac Web M5	128	0	E2801130	Impinj Monza 5	Yellow	184859
Tageos EOS 300	See Table 2 on page 27.		E2003412	Alien Higgs 3	Yellow	184894
Tageos EOS 500	See Table 2 on page 27.		E2003412	Alien Higgs 3	Orange	184852

Label Retry

NOTE: Label Retry only applies when the Error Handling mode is set to Overstrike.

This menu item selects the number of label retries that the RFID encoder will attempt before declaring a fault. This may indicate a problem with the RFID encoder, the coupler assembly, the printer setup, or the label stock. The default is 10.

Tag Write Count

This menu item displays on the control panel's LCD the number of tags attempted to be written since the last Clear Tag Stat operation has been initiated. (See "Clear Tag Stat" on page 43.)

Failed Tag Count

This menu item displays on the control panel's LCD the number of failed tag write attempts since the last Clear Tag Stat operation has been initiated. (See "Clear Tag Stat" on page 43.)

Tag Read Count

This menu item displays on the control panel's LCD the number of tags attempted to be read since the last Clear Tag Stat. (See "Clear Tag Stat" on page 43.)

Non-RFID Warning

When this menu item is set to Enable, the printer checks to make sure that non-RFID jobs are not being printed on RFID labels (to prevent RFID labels from being wasted).

If RFID labels are installed in the printer, and a job is printed with at least one form that contains no RFID commands, a fault will be declared and the data for the forms that contain no RFID commands will be absorbed.

The default is Disable.

Admin User Menu Items (SL4M)

To see these menu items, set Admin User to Enable in the PRINTER SETUP menu. (Refer to the *User's Manual*.)

IMPORTANT **Admin User menu items should only be used by authorized personnel.**

Error Handling

This menu item selects the error handling mode for RFID failures. The default is Overstrike.

In Overstrike mode, each failed label prints with the Overstrike pattern and the form retries on a new label until the Label Retry count is exhausted. Whether or not an error message will display or the failed label will reprint depends upon the Max Retry Error setting.

In None mode, no specific action is taken when a tag fails to be programmed.

In Stop mode, when a tag fails to be programmed, the printer will halt and display the error message "RFID Error: Check Media." The label is discarded and reprinting of the label (if desired) must be initiated from the host. When the error is cleared, the label with the failed tag moves forward until the next label is in position to be printed.

Max Retry Error

This menu item enables or disables Max Retry Error. If it is set to Disable, errors are not declared and the print content for the current label is discarded. The default is Enable.

Clear Tag Stat

This menu item clears the Tag Write Cnt, Failed Tag Cnt, Tag Void Cnt, and Tag Read Cnt menu items.

Read Tag

IMPORTANT **This menu item does not position the RFID tag over the coupler. Make sure to position the tag over the coupler to receive an accurate reading.**

This menu item reads the tag in range of the internal RFID coupler and reports the tag data to the debug port and momentarily displays it on the control panel's LCD. It is primarily intended for development verification by checking that the system is working.

Read Tag & Eject

IMPORTANT **This menu item does not position the RFID tag over the coupler. Make sure to position the tag over the coupler to receive an accurate reading.**

The menu item works exactly the same as Read Tag (above), except that after the printer reads the tag, it feeds the label to the next top-of-form.

Read TID

IMPORTANT **This menu item does not position the RFID tag over the coupler. Make sure to position the tag over the coupler to receive an accurate reading.**

This menu reads the TID (Tag ID) from the tag in range of the internal RFID coupler and displays the value read in the Tag ID menu.

Tag ID

This menu item displays the first TID (Tag ID) read since power-up, or if using the Read TID menu, the most recently read TID. If no tag is in range of the internal RFID coupler, "Unknown" displays.

Read PC

IMPORTANT **This menu item does not position the RFID tag over the coupler. Make sure to position the tag over the coupler to receive an accurate reading.**

This menu item reads the PC (Protocol Control) field from an RFID tag in range of the internal RFID coupler and displays the value read in the Tag PC menu.

Tag PC

This menu item displays the last PC (Protocol Control) field read from an RFID tag. If no tag is in range of the internal RFID coupler, “Unknown” displays.

Comm Retry

This menu item selects the number of automatic (internal) retries that the printer will attempt on the same tag before declaring a tag error and performing the Error Handling mode selected (Overstrike, Stop, or None). The default is 2.

Display F/W-Ver

This menu item displays the reader firmware version on the control panel’s LCD.

Overstrike Style

This menu item selects the style of the overstrike pattern.
The default is Grid.

When it is set to Grid, a grid pattern prints when it overstrikes. When it is set to Error Type Msg, an error message prints that indicates which error occurred (see Table 5 on page 46).

Table 5. Printed Overstrike Error Messages

Error Message	Explanation
Tag R/W Err *x* Check media	The printer software attempted to write to or read from the RFID tag, but the RFID encoder indicated that the tag could not be written to or read from.
Tag Comm Err *x* Check cable	The printer software temporarily lost communication with the RFID encoder, or communication between the printer software and the RFID encoder was not synchronized and had to be forced.

NOTE: The *x* in the error messages represents a number code that identifies the area in the printer software or RFID encoder where the failure occurred.

EPC Write Control

This option controls how the printer encodes the RFID tag EPC field.

When set to Data Length, only the amount of data provided in the application is encoded. When set to Full EPC Length, the maximum EPC length for the particular tag type in use is written to the tag (padded with zeroes if necessary). If Auto Write is enabled, the PC field encodes information about the length of the EPC being written. The default is Data Length.

Higgs 3 EPC Len

Higgs 3 tags differ from other RFID tags in that its memory bank size is not fixed. To accommodate EPC lengths longer than 96 bits, Higgs 3 borrows memory from the USR bank. The default is 96 bits.

When the EPC length is selected, the USR length sets automatically (see Table 2). Since the PC value indicates the length of the EPC in the Higgs 3, the PC value must be programmed when programming the EPC (if the EPC value has changed from its factory state). The PC value to be programmed for each of the supported EPC lengths is shown in Table 2.

Table 6. EPC/USR Lengths and PC Values

EPC Length	USR Length	PC Value
96	512	0x3000
112	448	0x3800
128	448	0x4000
144	448	0x4800
160	448	0x5000
176	384	0x5800
192	384	0x6000
208	384	0x6800
224	384	0x7000
240	320	0x7800
256	320	0x8000

Table 7. Printed Overstrike Error Messages

Error Message	Explanation
Tag R/W Err *x* Check media	The printer software attempted to write to or read from the RFID tag, but the RFID encoder indicated that the tag could not be written to or read from.
Tag Comm Err *x* Check cable	The printer software temporarily lost communication with the RFID encoder, or communication between the printer software and the RFID encoder was not synchronized and had to be forced.
Precheck Fail *x* Check media	This failure occurs only when the Precheck Tags menu item is set to Enable. It indicates that the RFID tag was automatically failed since it did not contain the correct pre-programmed quality code.

NOTE: The *x* in the error messages represents a number code that identifies the area in the printer software or RFID encoder where the failure occurred.

Auto Write PC

This option controls whether the printer automatically writes the RFID tag PC field to encode information about the length of the EPC field being written if a PC is not specified in the application data. If this option is disabled, the PC is not automatically written. The default is Enabled.

Tag Position

This menu determines how far the RFID tag position of the currently installed tag differs from the RFID tag position of the standard Printronix tag. Printronix printers print at a maximum speed with RFID labels that have RFID tags in the standard position. The default is 0.0 inches.

NOTE: The units display in inches or millimeters, depending on the Units setting (in the Media Control menu).

Custom Setting

This menu item contains submenus that allow the RFID encoder to work with tag types that are not listed in the Tag Type menu item.

NOTE: Printronix cannot guarantee the performance of tag types not certified by Printronix.

Custom Setting Submenus

Custom Tag

This menu item enables or disables the Custom Setting submenus. The default is Disable.

When Custom Tag is set to Disable, the settings in the Custom Setting submenus are ignored by the RFID encoder.

When it is set to Enable, the RFID encoder uses the settings in the Custom Setting submenus, which must be set to match the characteristics of the custom tag.

When it is set to Duplicate, the settings of the selected Tag Type menu item are copied into the Custom Setting submenus, but are ignored by the RFID encoder.

NOTE: Changes made to Custom Tag menu items are not preserved in a saved configuration unless the Custom Tag option is set to Enable.

Write Power

This menu item selects the write power level to be used in the RFID encoder. 1 is the lowest power level setting, and 20 is the highest.

The default depends on the type of RFID encoder installed in the printer.

Read Power

This menu item selects the read power level to be used in the RFID encoder. 1 is the lowest power level setting, and 20 is the highest.

The default depends on the type of RFID encoder installed in the printer.

EPC Byte Length

This menu item selects the number of bytes in the tag.
The default is 12.

EPC Address

This menu item selects the starting location of the EPC block within the RFID tag memory. The default is 0.

USR Byte Length

This menu item selects the size of the USR block within the RFID tag memory. The default is 0.

USR Address

This menu item selects the starting location of the USR block within the RFID tag memory. The default is 0.

TID Byte Length

This menu item selects the size of the TID block within the RFID tag memory. The default is 8.

TID Address

This menu item selects the starting location of the TID block within the RFID tag memory. The default is 2.

Block Write Len

This menu item selects the maximum number of bytes written to the USR block within the RFID tag memory at one time.
The default is 8.

Tag Class

This menu item selects the class of the custom tag. Class 0+, Class 1.19, Gen 2, and Class Zuma tags are read/write. Class 0 tags are read only. The default is Gen 2.

Read Tries

This menu item selects how many times the RFID encoder will try each read command. The default is infinite, which causes the encoder to try until the operation times out.

Write Tries

This menu item selects how many times the RFID encoder will try each write command. The default is 9.

RFID Calibrate

This menu item causes the printer to run calibration for the current RFID tags installed in the printer. After the calibration is complete, the custom settings are changed to work with the tags installed. These settings do not take effect until Custom Tag is set to Enable.

Scan Start Pos

This menu item determines where on the label the RFID calibration will begin. By default, the calibration procedure will start at the beginning of the label (0.0 inches). To make the calibration work faster, change this value to force the calibration to begin after the beginning of the label.

NOTE: The units display in inches or millimeters, depending on the Units setting (in the MEDIA CONTROL menu).

Scan Length

The menu item determines how much of the label will be scanned during the RFID calibration procedure. The default is 3.0 inches.

NOTE: The units display in inches or millimeters, depending on the Units setting (in the MEDIA CONTROL menu).

Cal Min Power

The menu item determines the minimum power level that the calibration procedure will use when attempting to find the ideal power level. To make the calibration work faster, increase this value to exclude the lower power levels. The default is 1.

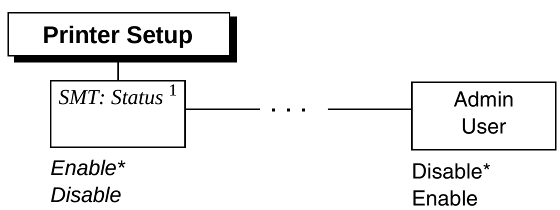
Cal Max Power

The menu item determines the maximum power level that the calibration procedure will use when attempting to find the ideal power level. To make the calibration work faster, decrease this value to exclude the higher power levels. The default is 20.

AutoID Mgr Report

This menu item enables AutoID and label information to be sent out the network port. This information can be used by an RFID tag data and labels manager program. The default is Disable.

Printer Setup Menu (SL4M)



Notes:
Only a portion of the Printer Setup menu is shown. SMT:Status is a submenu of the Printer Setup menu.
* = Default
Italicized items appear only when Admin User is set to Enable (in the PRINTER CONTROL menu).
[1] The SMT: Status menu item will be hidden when a user-defined CST file is loaded.

Printer Setup Menu Items (SL4M)

SMT: Status

See “Software Migration Tools (SMT)” on page 97.

- **Disable** (factory default). The printer disables the use of the Software Migration Tools functionality.
- **Enable**. The printer enables the use of the Software Migration Tools functionality.

Admin User

- **Disable** (factory default).
- **Enable**. When enabled, this function permits access to submenu items which would not normally be changed by a typical user.

Requesting an RFID Report

This procedure prints a summarized RFID report. (This report also includes validator data if the printer has a validator.)

SL5R Energy Star

1. Press **PAUSE** to take the printer offline.
2. Press ↓ and ↵ at the same time until ENTER SWITCH UNLOCKED displays.
3. Press **TEST PRINT**. Printer Tests displays.
4. Press **+** until RFID/ODV Report displays.
5. Press ↵ to print the report.
6. Press ↓ and ↵ at the same time to lock the ↵ key, then press **PAUSE** to take the printer offline.
7. Press **PAUSE** again to put the printer online.

SL4M

1. Press ☰ to enter Menu mode.
2. Press the Down and ↵ keys at the same time until THE ↵ KEY IS UNLOCKED displays.
3. Press the Right key until DIAGNOSTICS displays.
4. Press ↵ to enter the DIAGNOSTICS menu.
   Make sure Printer Tests is selected.
5. Press the Left key until RFID Report displays.
6. Press ↵ to print the report.
7. Press the Down and ↵ keys at the same time to lock the ↵ key, then press ⏸ to take the printer offline.
8. Press ⏸ again to put the printer online.

RFID PGL Commands

IMPORTANT **For all examples make sure Label Length in the QUICK SETUP menu matches the physical length of the installed media.**

RFWTAG

Purpose The RFWTAG command is used to program an RFID tag (embedded in a smart label) using structured data format. The data structure of an RFID tag can consist of one or more bit fields. Each bit field specifies its own field length, the data format, the field type plus additional options if the type is incremental, and finally the field value.

Mode CREATE

Format RFWTAG[;LOCK*n[;format]];size[;mem bank]****[;start block]***
[;byte length]
(Bit Field)+
STOP

RFWTAG Specifies the RFWTAG command, enter RFWTAG;

LOCK*n[;format]* or PERMALOCK*n[;format]* ***or BLOCKPERMALOCKn[;format]***

Optional parameter to lock the data block to prevent it from being overwritten. By default, the data are not locked initially. n is the passcode. The acceptable values for n are 1 to FFFFFFFF in hex, a 4 bytes data. When the LOCKn option is used to lock any memory bank, which at the same time is programmed with the write data, the same passcode will be written on ACS memory bank. The ACS memory bank will also be locked if ACS is not locked at the time of the operation. If ACS is already locked at the time of the operation, the passcode needs to match the current content of ACS so that the memory bank lock takes effect. The passcode (n) can also be in dynamic format. For dynamic format, enter LOCK<DFn>, where DFn is the dynamic field defined in EXECUTE mode. LOCK, PERMALOCK, and BLOCKPERMALOCK share the same syntax. BLOCKPERMALOCK applies only to the USR memory area. For differences in functionality, see Note 13 on page 62.

format An optional parameter to specify the format for the passcode data. Enter B for binary, D for decimal, and H for hexadecimal. The default is decimal if format is not specified.

size A decimal number specifying the overall bit length of the memory bank.

mem bank Specifies which tag logical memory area that this command will be applied. If omitted, it defaults to the EPC memory area. Other areas include Identification, User Data, Access area and Kill area. Enter one of the following values:
‘EPC’ – EPC 12 bytes data area (default)
‘TID’ – Tag identification 8 bytes area (currently not applicable for RFWTAG)
‘USR’ – User 32 bytes area
‘ACS’ – 4 bytes access code area
‘KIL’ – 4 bytes kill code area
‘PC’ – 2 bytes PC code area (Gen 2 tags only)

start block An optional decimal number that identifies the block to begin the write. If this parameter is omitted, then zero will be assumed to be the start block, or the beginning of the logical memory area specified by ‘mem bank’.

byte length — A decimal number that indicates the byte length of the write when the starting block is not zero. Note: This field is required if the ‘start block’ is used, unless ‘start block’ is zero then this field is ignored.

NOTE: 1. If the optional parameters’start block’; and ‘byte length’ are used, then the ‘mem bank’ must be specified.

2. The size of the blocks in the USR area on Gen 2 tags supporting Block Permalock are vendor defined. Specifying a start block and byte length that does not conform to the selected tag type will result in a syntax error. Not all Gen 2 tags support Block Permalock. Attempting to Block Permalock a non-supporting tag will result in an error.

3. New tags, such as RSI IN47 Crkscr, support 240 bits of EPC memory and 512 bits of USR memory.

Bit Field — A line description of a bit field and must have one of the following syntax formats:
1. For non-incremental data (both static and dynamic)
length;[**DF***n*;]*format*;(D)*datafield*(D)
2. For incremental fixed data
length;**I**;*format*;**STEP**[*idir*]*step*;[**RPT***n*;]
[**RST***n*;](D)*startdata*(D)
3. For dynamic incremental data
length;**IDF***n*;*format*;

length — A decimal number specifying the bit length of a field within a tag. The maximum length for each DFn field is 64 bits for binary or decimal format. For hexadecimal format, the bit length can be up to the maximum bit length specified for the corresponding memory bank.

DF*n* — Optional parameter to indicate this field has dynamic data. Replace n with a number ranging from 1 to 512 to identify the field number of this particular field. If this option is used, datafield is ignored, and dynamic data must be entered via the DF command in the EXECUTE mode.

IDF*n* — Enter **IDF** to indicate this field is a bit field with dynamical assignment of increment (or decrement) data. The step and startdata parameters will be supplied by the IDF command in the EXECUTE mode. Replace n with a number ranging from 1 to 512 to identify the field number of this bit field. Dynamically enter the step and startdata parameters using the IDF command in the EXECUTE mode.

NOTE: 1. The same field number cannot be used in both DFn and IDFn.
2. If a field is defined as IDFn, it must be referenced as IDFn later for consistency. The same applies for DFn.
3. If <IDFn> syntax is used for merging data into AFn or BFn, neither DFn, AFn, or BFn will be incremented. The increment only takes place in the ~DFn command where the STEP is specified.

format — A letter specifying the format of the data field.
B – binary, **D** – decimal, **H** – hexadecimal

(D) — Delimiter designating the start and end of static data for this bit field. Replace (D) with any printable character, except the SFCC and the slash character (/).

datafield — The static data of this static field. It is a mandatory parameter of bit field with static data.

I — Identifies this field is an incremental bit field.

STEP	Specifies that the incremental data field will use the step method. Enter **STEP;**. The STEP option replaces the STEPMASK option that is used in Alpha and Barcode.
idir	Enter a plus sign (+) or leave the field blank to increment (default). Enter a minus sign (–) to decrement.
step	A decimal number specifies the amount to increment/decrement each time the form is executed. The increment is at bit level and will automatically wrap based on the field size.
RPT*n*	The optional incremental repeat count parameters to specify the number of times a particular field value is repeated before it is incremented. The default repeat count parameter n is 1, which will increment the field value each time it prints. The repeat count can range from 1 to 65535.
RST*n*	The optional incremental reset count parameter to specify the number of times an incremented field is printed before it is reset to the starting value. By default, there is no reset count. The reset count parameter n can range from 1 to 65535.
startdata	Defines the value of the field or the starting value of the incremented field. If the field is dynamic, the value will be specified later in the EXECUTE mode. The data must be specified within a pair of delimiters (D). The delimiter (D) cannot be a “/” or SFCC character since the “/” will comment out the rest of the line and SFCC is reserved for PGL commands. If “R” or “S” is used as delimiters, the data pattern must not comprise of the keywords in the incrementing options. Since the delimiters could be different

from one value to another, proper care must be taken to avoid one of the letters mentioned above.

NOTE: 1. The RFWTAG command cannot be mixed with RFWRITE in the same form.

2. Each field structure must be specified in a single line and in the order it appears in the RFID tag from MSB bits to LSB bits (left to right). The sum of all the field lengths must match the size of the tag.

3. The host data are read in as ASCII characters. They would be converted to binary representation for the base field on the field format. Therefore, if the converted value is larger than the maximum value that a field can hold, an error will be reported. If the data value is smaller than the specified field length, on the other hand, the field will be padded to the left with zero bits.

4. Unlike the Alpha and Barcode command which use STEPMASK for incremental data, RFWTAG uses the STEP which will increment or decrement at bit level.

5. 432 IGP dots in the ~CREATE line specifies a 6 inch label. 6 inches = 432 (IGP dots)/72 (dpi). Use 144 for 2 inch labels and 288 for 4 inch labels.

6. ACS and KIL are similar to other memory banks. ACS contains the passcode which is used for LOCK and UNLOCK operations. KIL contains the killcode which is used to kill a tag. The user can write to or read from KIL memory bank, but the functionality of killing a tag is not currently applicable. Also, once ACS and KIL are locked, both cannot be written to or read from. For other memory banks, EPC, USR, and TID, once locked, they can be read from but not written to.

7. There are two ways to program the ACS memory area. One is to write to the ACS memory area directly with RFWTAG. The other is to use the LOCK option while writing to other memory banks. If ACS is not previously locked, then LOCK option will lock the memory bank and also write the passcode to ACS and lock ACS. When write to ACS with RFWTAG, ACS is not automatically locked. To lock ACS, use LOCKn with RFWTAG, where the passcode (n) should be the same as the write data to ASC.

8. There is only one passcode, the content of ACS memory bank, for each tag. The same passcode is used to lock or unlock any memory bank in that tag.

9. For LOCKn and UNLOCKn, the passcode (n) (which includes the dynamic format <DFn>) does not accept incremental data. This also applies to the ACS and KIL memory banks. The write data to the ACS and KIL memory banks do not accept incremental data because the ACS memory bank contains passcodes for LOCK and UNLOCK operations, and the KIL memory bank contains a killcode to kill a tag. Incremental data do not apply to passcodes or killcodes.

10. When LOCK<DFn> and UNLOCK<DFn> are used in the same form with the same dynamic data (the passcode), the dynamic format <DFn> needs to be a different dynamic number for LOCK and UNLOCK since it is designed with a unique dynamic number can be linked to only one object type. In this case, LOCK is linked to RFWTAG object and UNLOCK is linked to RFRTAG object. Although both options use the same passcode, the dynamic format needs to be in a different dynamic number in the same form.

11. Because PC field is related to EPC field, when PC RFWTAG is used in the form, it must be followed immediately by EPC RFWTAG, or else an error will be reported. Also, by specification, the first 5 bits of PC data need to comply with the length of EPC data, or else an error will be reported. For example, for 96 bits EPC, the 5 bits of PC data is 00110. For 64 bits EPC, the first 5 bits of PC data is 00100. Also, LOCK option is not and will not be supported for PC field, since PC field works with EPC field (which already supports LOCK option).

12. The NOMOTION parameter of the CREATE command is used primarily in RFID applications. Refer to “CREATE” in the *IGP/PGL Programmer’s Reference Manual*.

13. Both LOCK and PERMALOCK requires the user to enter the password. Once the tag is permanently locked with the PERMALOCK command, it cannot be unlocked again; the tag can only be read from and never be written to once it is permanently locked. On the other hand, after the tag is locked with the LOCK command, it can be unlocked again with the same password.

For PERMALOCK (ex, EPC), the password must match the current content of ACS bank for PERMALOCK to work. If the current content of ACS bank is null (0x0) which could be the case for the brand new tag, the password for PERMALOCK EPC will be 0x0. If you use a different password for PERMALOCK, you need to write (RFWTAG) the new content (password) to ACS first, and then use this new password to PERMALOCK EPC.

For LOCK (ex, EPC), the password may be different from the current content of ACS. When a new password is used to lock EPC where ACS is not locked, this new password is written to ACS and locks ACS at the same time while locking EPC. For new tags where ACS is not locked and has all null data, you can lock EPC with a new password directly without writing to ACS first.

For BLOCKPERMALOCK (USR only), the passcode is one previously written to the ACS. Only the USR blocks specifically block permalocked based on the ‘start block’ and ‘byte length’ fields will be permanently locked. Other blocks in the USR memory area can still be written to.

Example 1

The following example programs an SGTIN–64 value into the RFID tag that is embedded in a 4x6 smart label. Assume that the SGTIN–64 value is provided as a single number.

```
~CREATE;SGTIN-64;432
RFWTAG;64
64;H;*87D0034567ABCDEF* /EPC number
STOP
END
~EXECUTE;SGTIN-64;1
~NORMAL
```

Example 2

Same as Example 1, except the EPC number is broken into its component parts. Assume that the SGTIN–64 value has the Header = 2d,
Filter Value = 5d, EPC Manager Index = 15383d, Object Class = 703710d or 0xABCDE, and the Serial Number = 0123456d.

```
~CREATE;SGTIN-64;432
RFWTAG;64
2;B;*10*               /Header
3;D;*5*                /Filter Value
14;D;*15383*           /EPC Manager Index
20;H;*ABCDE*           /Object Class
25;D;*0000123456*      /Serial Number
STOP
END
~EXECUTE;SGTIN-64;1
~NORMAL
```

Example 3

Same as Example 2, except it uses a dynamic method. This example also shows how to program another RFID tag without redefining the data structure of the SGTIN–64.

```
~CREATE;SGTIN-64;432
RFWTAG;64
2;DF1;B                 /Header
3;DF2;D                 /Filter Value
14;DF3;D                /EPC Manager Index
20;DF4;H                /Object Class
25;DF5;D                /Serial Number
STOP
ALPHA
AF1;18;10;5;3;3
STOP
END
~EXECUTE;SGTIN-64
~DF1;*10*               /Header
~DF2;*5*                /Filter Value
~DF3;*15383*            /EPC Manager Index
~DF4;*ABCDE*            /Object Class
~DF5;*0000123456*       /Serial Number
~AF1;<DF5>              /Print serial number on
                        label
~NORMAL
                        ~EXECUTE;SGTIN-64
~DF1;*10*               /Header
~DF2;*5*                /Filter Value
~DF3;*15383*            /EPC Manager Index
~DF4;*ABCDE*            /Object Class
~DF5;*0000123456*       /Serial Number
~AF1;<DF5>              /Print serial number on
                        label
~NORMAL
```

Example 4

This example shows how to program a roll of 1500 smart labels with SGTIN–64 values, where the Header = 2d, Filter Value = 5d, EPC Manager Index = 15383d, Object Class = 703710d or 0xABCDE, and the Serial Number starting from 0000000 to 0001499d.

```
~CREATE;SGTIN-64;432
RFWTAG;64
2;B;*10*         /Header
3;D;*5*          /Filter Value
14;D;*15383*     /EPC Manager Index
20;H;*ABCDE*     /Object Class
25;I;D;STEP1;*0* /Serial Number
STOP
END
~EXECUTE;SGTIN-64;ICNT1500
~NORMAL
```

Example 5

This example shows how to program a 96 bit RFID tag. A SGTIN–96 format is used and the EPC number is broken into its component parts. Assume that the SGTIN–96 value has the Header = 48, Filter Value = 5d, EPC Manager Index = 123456d, Object Class = 777777d or 0xBDE31, and the Serial Number = 123456d.

NOTE: 96 bit tags must be broken up as in Examples 2, 3, and 4, and no field can be more than 64 bits in length if the format is binary or decimal. There is no restriction on the bit length if the format is hexadecimal.

```
~CREATE;SGTIN-96;432
RFWTAG;96
8;B;*00110000*   /Header
3;D;*5*          /Filter Value
3;D;*6*          /Partition
20;D;*123456*    /EPC Manager Index
24;D;*777777*    /Object Class
38;D;*123456*    /Serial Number
STOP
END
~EXECUTE;SGTIN-96;1
~NORMAL
```

Example 6

This example shows memory bank usage, where multiple RFWTAG and RFRTAG can be used.

```
~CREATE;SGTIN;216
SCALE;DOT;203;203
RFWTAG;96;EPC
96;IDF1;H
STOP
RFRTAG;96;EPC
96;DF3;H
STOP
RFWTAG;256;USR
256;IDF2;H
STOP
RFRTAG;256;USR
```

```
256;DF4;H
STOP

ALPHA
IAF1;24;POINT;90;60;16;6
IAF2;64;POINT;130;60;16;4
STOP

BARCODE
C3/9;X1;IBF1;64;170;60
PDF
STOP

VERIFY;DF1;H;*EPC      W= *;*\r\n*
VERIFY;DF3;H;*EPC      R= *;*\r\n*
VERIFY;DF2;H;*USR      W= *;*\r\n*
VERIFY;DF4;H;*USR      R= *;*\r\n*

END
~EXECUTE;SGTIN;ICNT4
~IDF1;STEP+1;*313233343536373839414243*
~IDF2;STEP+1;*3132333435363738394142434445464748494A4B4
C4D4E4F*
~IAF1;<DF3>
~IAF2;<DF4>
~IBF1;<DF3>
~NORMAL
```

Example 7

This example shows memory bank usage with LOCK and UNLOCK option, where multiple RFWTAG and RFRTAG can be used, and the passcode for lock and unlock can be in dynamic format.

```
~CREATE;SGTIN;432
SCALE;DOT;203;203
RFWTAG;LOCK<DF6>;D;96;EPC
96;DF1;H
STOP
RFRTAG;UNLOCK<DF6>;D;96;EPC
96;DF2;H
STOP
FWTAG;LOCKA1B2C3;H;32;KIL
32;DF3;H
STOP
RFRTAG;UNLOCKA1B2C3;H;32;KIL
32;DF4;H
STOP
RFWTAG;LOCK<DF7>;H;32;ACS
32;DF6;D
STOP
RFRTAG;UNLOCK<DF7>;H;32;ACS
32;DF8;H
STOP

ALPHA
AF1;24;POINT;400;60;16;6
AF2;7;POINT;600;60;16;6
AF3;6;POINT;800;60;16;6
AF4;8;POINT;1000;60;16;6
STOP
```

```
VERIFY;DF1;H;*DF1 = *;*\r\n*
VERIFY;DF2;H;*DF2 = *;*\r\n*
VERIFY;DF4;H;*DF4 = *;*\r\n*
VERIFY;DF5;H;*DF5 = *;*\r\n*
VERIFY;DF6;H;*DF6 = *;*\r\n*
VERIFY;DF7;H;*DF7 = *;*\r\n*
VERIFY;DF8;H;*DF8 = *;*\r\n*
END

~EXECUTE;SGTIN;FCNT3
~DF1;*313233343536373839414243*
~DF3;*3435363738*
~DF6;*3224115*
~DF7;*A1B2C3*
~AF1;<DF2>
~AF2;<DF6>
~AF3;<DF7>
~AF4;<DF8>
~NORMAL
```

Example 8

This example shows the usage of RFWTAG with PC field which needs to be followed immediately by RFWTAG with EPC field. There is no restriction for RFRTAG with PC field.

```
~NORMAL
~CREATE;TEST1;432
RFWTAG;16;PC
16;H;*3000*
STOP
RFWTAG;96;EPC
96;H;*313233343536373839414243*
STOP
RFWTAG;256;USR
256;H;*3132333435363738394142434445464748494A4B*
STOP
RFRTAG;16;PC
16;DF1;H
STOP
RFRTAG;96;EPC
```

```
96;DF2;H
STOP
VERIFY;DF1;H;*DF1 = *;*\r\n*
VERIFY;DF2;H;*DF2 = *;*\r\n*
END
~EXECUTE;TEST1
~NORMAL
```

Example 9

This example shows the usage of PERMALOCK.

```
~NORMAL
~CREATE;RFID;432
ALPHA
IAF1;24;POINT;4;5;10;10
STOP
RFWTAG;32;ACS
32;H;*ABC*
STOP
RFWTAG;PERMALOCKABC;H;96;EPC
96;IDF1;H
STOP
RFRTAG;96;EPC
96;DF2;H
STOP
VERIFY;DF2;H;* *
END
~EXECUTE;RFID;ICNT5
IDF1;STEP+1;*222222222222222220011*
IAF1;<DF2>
~NORMAL
```

Example 11

This example shows the writing of 112 bits of EPC at start block 2.

```
~CREATE;X;H;NOMOTION
RFWTAG;128;EPC;2;16
128;H;*305A4C4138343430303030313036373 8*
STOP
END
~EXECUTE;X
~NORMAL
```

Example 12

This example shows writing and Block Permalocking 128 bits of USR beginning at start block 2. The size of the blocks in Gen 2 tags supporting Block Permalock are vendor defined. This example assumes a tag embedded with a Monza 4QT chip. The USR area of this chip is divided into 4 blocks of 128 bits (total 512 bits of USR memory). In this example, after the Block Permalock completes, block 2 of the USR area will be permanently locked. Blocks 1,3, and 4 will remain unlocked and able to be written.

```
~CREATE;X;H;NOMOTION
RFWTAG;LOCK0C0D0E0F;H;32;ACS
32;H;*0C0D0E0F*
STOP
RFWTAG;BLOCKPERMALOCK0C0D0E0F;128;USR;2;16
128;H;*3038CE1CC3CAB40000000001000577EA*
STOP
END
~EXECUTE;X

~NORMAL
```

RFRTAG

Purpose To read the content of an RFID tag (embedded in a smart label) into a dynamic field. This command cannot be mixed with the RFREAD command.

Mode CREATE

Format RFRTAG[;UNLOCKn*[;format]*];*size[;mem bank]*
(*Bit Field*)+
STOP

RFRTAG Specifies the RFRTAG command, enter **RFRTAG;**

size A decimal number specifying the overall bit length of the RFID tag memory bank.

UNLOCK*n[;format]*

Optional parameter to unlock the data block so it can be overwritten later. n is the passcode. The acceptable values for n are 1 to FFFFFFFF in hex, a 4 bytes data. The value of n should be the same passcode used for the LOCK option to unlock the protected data block. When the UNLOCKn option is used to unlock any memory bank, which at the same is programmed to read the tag, the operation UNLOCKn will not unlock ACS memory area. The passcode (n) can also be in dynamic format. For dynamic format, enter LOCK<DFn>, where DFn is the dynamic field defined in EXECUTE mode.

format is the optional parameter to specify the format for the passcode data. Enter B for binary, D for decimal, and H for hexadecimal. The default is decimal if *format* is not specified.

mem bank Specifies which tag logical memory area that this command will be applied. If omitted, it defaults to the EPC memory area. Other areas include Identification, User Data, Access area, and Kill area. Enter one of the following values:
'EPC' – EPC 12 bytes data area (default)
'TID' – Tag identification 8 bytes area
'USR' – User 32 bytes area
'ACS' – 4 bytes access code area
'KIL' – 4 bytes kill code area
'PC' – 2 bytes PC code area (Gen 2 tags only)

Bit Field A line description of a bit field; must have one of the following syntax formats:
length;**DF***n***;***format*

length A decimal number specifying the bit length of a field within a tag. The maximum length is 64 bits for binary or decimal format. For hexadecimal format, the bit length can be up to the maximum bit length specified for the corresponding memory bank.

DF*n* Indicate dynamic data field to store the read result. Replace *n* with a number ranging from 1 to 512 to identify the field number of this particular field.

format A letter specifying the representation format of the field data.
B – binary, **D** – decimal,
H – hexadecimal

NOTE: 1. Multiple RFRTAG commands are allowed in the same form but the same DFn field cannot be defined multiple times.
2. The DF field length is restricted to 64 bits for binary or decimal format and must be a multiple of 8 bits. The sum of all field lengths must be equal to the tag size.
3. The first field always start at the MSB bit. The bit length of a field dictates the start bit of the next field, etc. As a result, DF fields will not overlap each other.
4. RFRTAG does not allow incremental fields (with the “I” prefix).

5. 432 IGP dots in the ~CREATE line specifies a 6 inch label. 6 inches = 432 (IGP dots)/72 (dpi)
Use 144 for 2 inch labels and 288 for 4 inch labels.

Example

Same as Example 4 on page 65, except the increment is dynamic and the result is merged into Alpha to print on the smart label.

```
~CREATE;SGTIN–64;432
RFWTAG;64
2;B;*10*                      /Header
3;D;*5*                       /Filter Value
14;D;*15383*                  /EPC Manager Index
20;D;*123456*                 /Object Class
25;IDF1;H                     /Serial Number
STOP
RFRTAG;64
64;DF2;H;
STOP
ALPHA
IAF1;16;3;12;0;0
STOP
END
~EXECUTE;SGTIN–64;ICNT1500
~IDF1;STEP+1;*0*
~IAF1;<DF2>
~NORMAL
```

NOTE: 1. The <IDF1> usage does not increment the DF1 field. It merges the DF1 content into the AF1 field, keeping the same representation previously defined for IDF1.

2. The use of IAF1 is to print alpha on every label. If AF1 is used instead, only the first label is printed. The AF1 field is not incremented either since it is using the result from the DF1 merge.

3. UNLOCK option is not and will not be supported for PC field, since PC field works with EPC field (which already supports UNLOCK option).

VERIFY

IMPORTANT **This command requires the use of the Return Status port. See** **“Return Status Port” on page 96.**

Purpose Request the printer to send to the host the ASCII representation of a dynamic field. The dynamic field could be one of AFn, BFn, or DFn, but cannot be RFn.

Mode CREATE

Format VERIFY**;field;***format***;**(D)*ASCIIheader*(D)[;(D)*ASCIITrailer*(D)]

VERIFY The command to verify data of a dynamic field, enter VERIFY;

field The dynamic field AFn, BFn, or DFn that contains the data to be sent to the host.

format A letter specifying the format of the outgoing data to be sent to the host.
B – binary, **D** – decimal, **H** – hexadecimal, **S** – string
Based on the incoming format of the data field, a format conversion may be performed if the outgoing format is not the same. The AFn and BFn format is always S type. The DFn format could be either B, D, or H. Due to the possible conversion the outgoing datastream could be longer than the incoming one. The maximum length for the outgoing data is 512 bytes. If the

format request will result in a datastream exceeding the maximum length, an error would be reported.

ASCIIheader

A mandatory parameter to specify an ASCII string of characters, which is followed by the RFID data, to be sent by the printer to the host.

(D) Delimiter designating the start and end of a character string. Replace (D) with any printable character, except the SFCC and the slash character (/). The string could be empty, i.e. there are not headers preceeding the field data.

ASCIITrailer

Optional parameter to append an ASCII string of characters to the RFID data. You can insert the LF/CR characters \r\n into the string.

NOTE: 1. The DFn field must be defined previously in the CREATE mode before it can be specified in the VERIFY command otherwise it will be considered as a syntax error and the VERIFY command will abort.

2. All RFID Read/Write commands are executed first in the order they appear in CREATE mode, followed by Alpha and Barcode commands, and finally VERIFY commands. The VERIFY commands are always executed last although they may appear before other commands in the CREATE mode. The reason for this is to make sure the data are sent back to the host only if other commands are completed and the form is not aborted.

3. If the data comes from a DFn field, the DFn format is the original format before any conversion. If the VERIFY command specifies a different format, the data would then be converted to the new format. If the data comes from an AFn or BFn, the original format is S format.

4. 432 in the ~CREATE line specifies a 6 inch label. Use 144 for 2 inch labels and 288 for 4 inch labels.

5. Below is the possible syntax for header and trailer string:

1. VERIFY;DF2;H;*Head = * //Header only
2. VERIFY;DF2;H;*Head = *; *Tail* //Header & trailer
3. VERIFY;DF2;H;**;*Tail* //Trailer only
4. VERIFY;DF2;H;*Head = *;** //Header only

To insert the CR/LF character, add “\r” and “\n” as CR/LF characters, such as

VERIFY;DF2;H;*Head=*; *Tail\r\n* //this will display “Head=<tag data>Tail<CR><LF>”

If the user wants to display “\r” or “\n” as normal text character, do the following:

VERIFY;DF2;H;*Header\\r\\n* //this will display “Header\r\n” on the screen, where double back slash “\\” (0x5C0x5C) will be replaced with one back slash “\” (0x5C).

The characters \r and \n can be inserted anywhere in the header string and trailer string.

To summarize,
\r –> 0x0D //CR
\n –> 0x0A //LF
\\ –> \ //one back slash

Example 1

This example requests the printer to send to the host the content of the RFID tag, in hexadecimal format, both before and after the RFWTAG command writes data to the tag. Also, the label is not moved.

```
~CREATE;VERIFY;432;NOMOTION
RFRTAG;64
64;DF1;H
STOP
VERIFY;DF1;H;*TagBefore=*
RFWTAG; 64
2;B;*01*
6;D;*29*
24;H;*466958*
17;H;*ABC*
15;D;*1234*
STOP
RFRTAG;64
64;DF2;H
STOP
VERIFY;DF2;H;*TagAfter=*
END
~EXECUTE;VERIFY;1
~NORMAL
```

TagBefore=A5A500005D055E04	<== Whatever data inside the tag before
TagAfter=5D466958055E04D2	<== Should match with RFWTAG command

Example 2

This example reads a roll of 1500 pre-programmed smart labels.

```
~CREATE;READONLY;432
RFRTAG;64
64;DF1;H
STOP
VERIFY;DF1;H;**
END
~EXECUTE;READONLY;1500
~NORMAL
```

A5A500005D055E04	<== Whatever data.... another 1498 lines of RFID data................
A5A50000000550D4	<== Whatever data

Example 3

This example requests the printer to program a roll of 2000 smart labels using the RFWTAG command with incremental field. Then, it sends the actual data from each of the 2000 tags to the host.

```
~CREATE;SIMPLE;432;NOMOTION
RFWTAG;64
2;B;*01*
6;D;*29*
24;H;*466958*
17;H;*ABC*
15;I;D;STEP+1;*0000*
STOP
RFRTAG; 64
64;DF1;H
STOP
VERIFY;DF1;H;*Data=*
END
~EXECUTE;SIMPLE;ICNT2000
~NORMAL
```

Data=5D466958055E0000	<== Should be the newly programmed data.
Data=5D466958055E0001	....another 1996 lines of RFID data................
Data=5D466958055E07CE	
Data=5D466958055E07CF	<== Should be the newly programmed data.

Write Tag

IMPORTANT **This command is still supported but no longer in development. We recommend you develop your application using the RFWTAG command as defined on page 55.**

Purpose To program non-incremental data into an RFID tag (embedded in a smart label).

Mode CREATE

Format

RFWRITE;[HEX;][EPC*m*;][RF*n*;L;][LOCK;]AT*p*;[(D)*datafield*(D)]

RFWRITE;	The RFID Write Tag command.
HEX;	Optional parameter to indicate that the text in *datafield* is in hexadecimal format and that it will be converted to binary format.
EPC*m*;	Optional parameter to indicate that the data in *datafield* should be converted to an EPC number. When this parameter is used, the HEX option is automatically enabled and the data field is limited to a maximum of 14 digits. The AT parameter is ignored. The tag is then programmed as follows: **Bits 0 to 1** are programmed with the EPC value 0 to 3, specified in *m*. **Bits 2 to 57** are programmed with the hexadecimal characters in the data field (14 maximum). If the data field has less than 14 hexadecimal characters, zeros are assumed for the remaining digits. **Bits 58 to 63** are set to zero.

RF*n*;*L*;	Optional parameter to indicate that this field has dynamic data. Replace *n* with a number ranging from 1 to 512 to identify the field number of this RFWRITE field. Replace *L* with the length of the dynamic data string. If this option is used, the *datafield* is ignored, and dynamic data must be entered via the RF command in the EXECUTE mode. The length of the dynamic data must be equal to *L*.
LOCK;	Optional parameter to write-protect the data.
AT*p*;	*p* specifies the decimal start position where data will be written to the tag. Subsequent bits will be shifted and previous bits are nulled.
(D)	Delimiter designating the start and end of static data for the RFWRITE field. Replace (D) with any printable character, except the SFCC and "/" (the slash character).
datafield	The static data of the RFWRITE field.

NOTE: RFWRITE fields are not expandable in VDUP and/or HDUP sections.

Read Tag

IMPORTANT **This command is still supported but no longer in development. We recommend you develop your application using the RFRTAG command as defined on page 72.**

Read Tag is not a command, but an element of the ALPHA and BARCODE commands. See "Alphanumerics" and "Bar Codes" in the *IGP/PGL Programmer's Reference Manual* for more information.

Purpose Embed RFID data into an ALPHA or BARCODE data field.

Format <RDI>*position,length[,format];*

<RDI>	The RFID Data Indicator character, as defined by the RFREAD parameter in the ALPHA or BARCODE commands. See the ALPHA and/or BARCODE command description for details.
position	The decimal number that specifies the starting position of the data inside the transponder.
length	The decimal number that specifies the length of the data to be read.
format	Replace the optional *format* parameter with any non-zero number to convert the data to hexadecimal format.

RFID ZGL Commands

IMPORTANT **For all examples make sure Label Length in the QUICK SETUP menu matches the physical length of the installed media.**

Read Tag

Purpose This command allows data from the RFID tag (embedded in the smart label) to merge into any previously defined dynamic data field. It is equivalent to the Field Number command (^FN) except that the data come from the RFID tag.

Format ^RT *x*, *start*, *length*, *hex*, *retries*, *motion*, *reserved*

^RT Read Tag command.

x Specified Field Number (value assigned to the field). The default is 0. The acceptable value range is 0 to 9999.

start Location where data will be read from the RFID tag. The ZGL only supports Alien Technology Class 1a tags, which have only one 8–byte or 12–byte block. Therefore, *start* will be set to 0, regardless of the specified value.

length The number of blocks to be read from the RFID tag. The ZGL only supports Alien Technology Class 1a tags, which have only one 8–byte or 12–byte block. Therefore, *length* will be set to 1, regardless of the specified value.

hex This flag indicates whether the data, after being read from the RFID tag, should be translated into hexadecimal format. The default is 0, meaning the data will not be translated. The other acceptable value is 1, meaning the data will be translated into hexadecimal format.

retries The number of automatic attempts to read data from the tag if previous reads failed. The ZGL absorbs the number and uses the value on the control panel's LCD.

motion	Set this flag to 1 to read data from the tag without moving the label. The printer may adjust the label position while it reads data from the tag, but this adjustment will reverse before any subsequent normal label movement. Even if this flag is set to 1, other commands (i.e., alpha or barcode) may move the label. The default is 0.
reserved	This is a reserved flag. The ZGL absorbs this number.

Comments

This command is only executed by the demand for data from any dynamic field. The ZGL absorbs this command if there are no demands for the data.

Write Tag

Purpose This command programs data into an RFID tag (embedded in the smart label).

Format ^WT *start*, *retries*, *motion*, *protect*, *data format, reserved*

^WT	Write Tag command.
start	Starting block location where data will be programmed into the RFID tag. The ZGL only supports Alien Technology Class 1a tags, which have only one 8–byte or 12–byte block. Therefore, *start* will be set to 0, regardless of the specified value.
retries	The number of automatic attempts to write data into the tag if previous writes failed. The ZGL absorbs the number and uses the value on the control panel's LCD.

motion	Set this flag to 1 to program data into the tag without moving the label. The printer may adjust the label position while it writes data into the tag, but this adjustment will reverse before any subsequent normal label movement. Even if this flag is set to 1, other commands (i.e., alpha or barcode) may move the label.
protect	This flag indicates whether the data should be protected from being overwritten later. The default is 0, meaning the data are not protected. Other acceptable values are 1 to 255, meaning the data are protected using this number as the LOCK password.
data format	0 (ASCII) or 1 (hex). The default is 0.
reserved	This is a reserved flag. The ZGL absorbs this number.

Write or Read RFID Format

Purpose This command allows you to write or read to an RFID tag.

Format ^RF*a*,*b*,*c*,*d*,*e*

^RF	Write or Read RFID command.
a	Specifies the read or write option. The default is W. W = write to the tag L = write with LOCK R = read the tag P = read password (Gen 2 tags only; used when *c* is set to K or A)
b	Specifies the data format. The default is H. A = ASCII H = Hex E = EPC format

c	Specifies the starting block number. The default is 0. Since there are currently only 8–byte or 12–byte blocks, the starting block number can only be 0. Or, specifies which password to read (Gen 2 tags only; used when *a* is set to P): K = kill password A = access password
d	Specifies the number of blocks to read. This option is valid only for the read operation. Since there are currently only 8–byte or 12–byte blocks, the number of blocks to be read can only be 1.
e	Specifies the memory bank to write to or read from. The default is E. E = EPC 0 = Reserved 1 = EPC 2 = TID (only for read) 3 = USER

Calibrate RFID Transponder Position

Purpose This command initiates an RFID RFID transponder calibration for a specific RFID label and returns the results to the host computer.

Format ^HR*a*,*b*

^HR	Calibrate RFID command.
a	The start string to appear before the returned result. The default is “start”. The acceptable value is any string less than 65 characters.
b	The end string to appear after the returned result. The default is “end”. The acceptable value is any string less than 65 characters.

Define EPC Data Structure

Purpose This command defines the structure of EPC data, which can be read from or written to an RFID transponder.

Format ^RB*p0*,*p1*,*p2*...,*p15*

^RB	EPC Data command.
n	Total bit size of the field. The default is 96. The acceptable value range is 1 to *n*, where *n* is the total bit size of the tag.
p1...*p15*	Specifies each partition size. These must add up to the total bit size. The default is 1. The acceptable value range is 1 to 64 bits for each partition.

Enable RFID Motion

Purpose This command enables or disables RFID paper motion. Be default, labels automatically print at the end of the format. This command allows you to inhibit the label from moving.

Format ^RM*a*

^RM	Enable RFID Motion command.
a	The default is Y. The acceptable values are Y (Yes, move the label) or N (No, do not move the label).

Specify RFID Retries for a Block

Purpose This command specifies the number of times that the printer attempts to read from or write to a particular block of a single RFID tag. The number will reflect in the Auto Retry menu.

Format ^RR*a*

^RR	Specify RFID Retries command.
a	The default is 2. The acceptable value range is 1 to 9.

RFID Setup

Purpose This command sets up parameters including tag type, read/write position of the transponder, and error handling.

Format ^RS*a*,*b*,*c*,*d*,*e*,*f*,*g*,*h*

^RS	RFID Setup command.
a	Selects the tag type. The acceptable values range is 0 to 5. (This option is currently not supported.)
b	Sets the read/write position of the transponder in the vertical (Y axis) in dot rows from the top of the label. Set to 0 if the transponder is already in the effective area without moving the media. The default value is label length minus 1 mm. The acceptable value range is 0 to label length.
c	Sets the length of the void printout in dot rows. The acceptable value range is 0 to label length. (This option is currently not supported.)
d	Sets the number of retries that will be attempted in case of read/write failure. The number will reflect in the Label Retry menu.
e	Error handling. Enter N for no action. Enter P to place the printer in Pause mode. Enter E to place the printer in Error mode. (This option is currently not supported.)
f	Signals on applicator. Enter S to single signal. Enter D for double signal. (This option is currently not supported.)
g	Certify tag with a pre-read. (This option is currently not supported.)
h	Sets the print speed at which “VOID” will be printed across the label. (This option is currently not supported.)

Set RFID Tag Password

Purpose This command defines the password for the tag during writing.

With Gen 2 tags you can lock a tag's memory bank with an access password, or define a kill password that can permanently disable a tag.

Format ^RZ*a*,*b*,*c*

^RZ	Set RFID Tag Password command.
a	Sets a password. Gen 2 tags use a 32–bit password and they specify the memory bank and lock style. Other tags use 8 bits and they ignore the memory bank and lock style. To read the password, see "Write or Read RFID Format" on page 85. The default is 00. The acceptable value range is 00 to FF (hexadecimal).
b	Specifies the memory bank (Gen 2 tags only). There is no default value. K = kill password A = access password E = EPC T = tag identifier (TID) U = user
c	Specifies the lock style (Gen 2 tags only). There is no default value. U or O = unlocked L = locked P = permalocked W = write value (used only when *b* is set to K)

NOTE: Tags that have been permalocked cannot be unlocked or rewritten.

Example of Use

```
^XA
^RZA1B2C3D4,K,W
            //Write “A1B2C3D4” to the kill memory
            bank to set the kill password.
^RZ1234ABCD,K,L
            //Use the access password “1234ABCD” to
            lock (make unreadable) the kill memory
            bank (which contains the kill password).
^XZ
^XA
^RZ1234ABCD,A,U
            //Unlock the access memory bank.
^RZ1234ABCD,K,U
            //Unlock the kill memory bank.
^FO50,550^A0N,50^FN1^FS
^FN1^RFP,H,K^FS
            //Read from the kill memory bank.
^FO50,650^A0N,50^FN2^FS
^FN2^RFP,H,A^FS
            //Read from the access memory bank.
^HV1,16,KIL=^FS
^HV2,16,ACS=^FS
^XZ
```

Host Verification

IMPORTANT **This command requires the use of the Return Status port. See** **“Return Status Port” on page 96.**

Purpose This command sends back the data in a ^FN (Field Number) field to the host.

Format ^HV*x*,*y*,<*ASCII*>

^HV	Host Verification command.
x	Specified Field Number. The default is 0. The acceptable value range is 0 to 9999.
y	Number of characters to be returned. The default is 64. The acceptable value range is 0 to 256.
<*ASCII*>	Header (in uppercase ASCII characters). The default is None. The acceptable value range is 0 to 256 characters.

Example of Use

```
^XA
^WT0^FDHELLOTAG^FS
^RT3,0,1,1^FS
^FO100,100^A0N,60^FN3^FS
^HV3,16,TAGNO = ^FS
^XZ
```

Example of Response

```
TAGNO = 48454C4C4F544147
```

ZGL EPC Programming Examples

IMPORTANT **For all examples make sure Label Length in the QUICK SETUP menu matches the physical length of the installed media.**

Example 1

This programming example programs data into an RFID tag and prints the encodation onto a smart label.

^XA

//Begin ZPL form.

^WT0^FH^FD_87_D0_03_45_67_AB_CD_EF^FS

//Write Tag with data = “87D0034567ABCDEF”
//(hex format).

^RT1,0,1,1^FS
//Read Tag into data element 1, 8–byte (16 characters)
//long (hex format).

^FO100,100^A0N,60^FN1^FS
//Print data in element 1.

^XZ
//End and print label.

Example 2

Same as Example 1, except an alternative ZGL syntax that does not require underscores between the hex characters is used.

^XA
//Begin ZPL form.

^WT0,,,,1FDN^FD87D0034567ABCDEF^FS
//Write Tag with data = "87D0034567ABCDEF"
//(hex format).

^RT1,0,1,1^FS
//Read Tag into data element 1, 8–byte (16 characters)
//long (hex format).

^FO100,100^A0N,60^FN1^FS
//Print data in element 1.

^XZ
//End and print label.

Example 3

This example uses the ^RF command to write and read the tag.

^XA
//Begin ZPL form.

^RFW,H,0^FD31323334^FS
//Write tag data 31323334 in hex.

^FO100,100^A0N,60,60^FN1^FS
//Print tag data in FN1.

^FN1^RFR,H,0^FS
//Read tag data and store into FN1.

^XZ
//End and print label.

Example 4

This example uses the ^RF command to write and read the tag with EPC format.

```
^XA
^RMY
^RB64,16,16,16,16
^RZ01^RR3^RFW,E^FD12594,13108,13622,14136^FS
^FO50,150^A0N,50^FN0^FS
^FN0^RR4^RFR,E^FS
^XZ
```

Example 5

On a Gen 2 tag, this example:

- writes EPC data “112233445566778899001122” to the tag in hexadecimal format
- locks the tag’s EPC data with the password “1234ABCD”
- renders the tag’s access password unreadable

```
^XA
^RFW,H^FD112233445566778899001122^FS
^RZ1234ABCD,E,L^FS
^RZ1234ABCD,A,L^FS
^XZ
```

This example:

- unlocks EPC data “112233445566778899001122” using the password “1234ABCD”
- writes EPC data “newdata” to the tag in ASCII format
- locks the tag’s new EPC data

Since the access password and its lock state are not changed, the access password remains unreadable.

```
^XA
^RZ1234ABCD,E,U^FS
^RFW,A^FDnewdata^FS
^RZ1234ABCD,E,L^FS
^XZ
```

Example 6

This example shows the access of 240 bits EPC and 512 bits USR.

```
^XA
^RZ31323334,K,W
^RZ1234ABCD,K,L
^RFW,H,1,30,1^FD0102030405060708091011121314
151617181920212223242526272829 30^FS
^RFR,H,1,30,1^FN0^FS^HV0,128,#EPC240:^FS
^RZ1234ABCD,E,L
^RFW,H,0,64,3^FD0102030405060708091011121314
1516171819202122232425262728293031323334 35
3637383940414243444546474849505152535455 56
5758596061626364^FS
^RFR,H,0,64,3^FN1^FS^HV1,128,#USR512:^FS
^RZ1234ABCD,U,L
^XZ
^XA
^RZ1234ABCD,A,U
^RZ1234ABCD,K,U
^RZ1234ABCD,U,U
^RZ1234ABCD,E,U
^FN2^RFP,H,A^FS
^FN3^RFP,H,K^FS
^HV2,16,#ACS=^FS
^HV3,16,#KIL=^FS
^XZ
```

RFID STGL Commands

RFID Write

Purpose This command specifies data to be written into RFID tags.

Format <ESC>RK 1,a,b,D16,c..c

a	RFID tag Error Ignore. 0 = Disable (default when value is omitted), 1 = Enabled, 2 to 9 = Auto retry on tag error. This command is ignored for STGL. The error handling for all RFID commands on all supported emulations is set according to the RFID menu on the front panel. Using the RFID menu, the user can set the error handling, number of retries, and tag type.
b	Write Protector Designation. Valid range is 0 to 1. 0 = Fixed (default).
D	Writes data size in number of characters. Valid data size is 16 characters.
16 or 24	Specification of Writing Data Size. Valid data size is 16 or 24 characters.
c..c	EPC data (fixed at 16 characters). Valid range is 0 to 9 or A to F only.

Example <ESC>RK1,0,0,D16,ABCDEF1234567543

RFID Write (IP0), RFID Read (IP1)

Refer to your SATO programmer's reference manual for a description of the RFID command syntax for IP0 and IP1.

Return Status Port

The PGL VERIFY command (page 75) and ZGL ^HV command (page 91) require the use of the Return Status port. Set this port using Ret. Status Port in the PRINTER SETUP menu.

NOTE: If you are using the PRINTER SETUP menu, you must set Admin User to Enable in the PRINTER CONTROL menu.

If you set Ret. Status Port to Serial, you must set all SERIAL PORT menu settings (i.e., Port Type, Baud Rate, Stop Bits, Parity, etc.) to match the serial port settings in the application.

If you set Ret. Status Port to E-NET Data Port or E-NET Stat Port, you must set the application to connect using TCP/IP. The Host Address must match the IP Address SEG 1 through IP Address SEG 4 settings in the ETHERNET ADDRESS menu. Set the Port Number to 9100 for E-NET Data Port, or 3002 for E-NET Stat Port.

Refer to the User's Manual, under the PRINTER SETUP menu for Ret. Status Port options and description.

Software Migration Tools (SMT)

There are SMTs for six separate end-use applications supporting both PGL and ZGL datastreams with 64 and 96 bit tag options for a total of 24 tools. Each tool intercepts bar code data in a host datastream and copies the data to an RFID tag (embedded in a smart label) according to a set of rules as defined below. SMTs assume that only one bar code of the type being processed is present. In the event that there is more than one of a given type of barcode present, only the first is processed.

Bar code information encoded as dynamic data is supported. To avoid ambiguity, where bar code data is provided in the form of dynamic data, the RFID tag will be encoded with only the contents of the first variable bar code field. It is your responsibility to ensure that the first variable bar code is the desired bar code.

NOTE: Dynamic data is variable data entered into specific locations on each form definition. Each time the form prints, a single command enters new data into those locations supplied in the datastream after form definition has been completed.

Tools List

- **GTIN (64 bit) / GTIN_96 (96 bit):** According to Uniform Code Council standards there are two permissible bar codes on standard case labels: UCC-128 and Interleaved Two of Five (ITF14). These are the typical bar code carriers for the GTIN (Global Trade Identification Number). This tool copies data from either an ITF14, or from a UCC-128 barcode with an Application Identifier of 01 (which indicates an SCC-14) to an RFID tag. If barcode checksum data is included in your datastream, it will be encoded onto the tag. If your datastream requests the printer to calculate the bar code checksum, it will not be encoded onto the tag. In the case of the UCC bar code, the (01) application identifier is not written to the tag. Data written to the RFID tag is right justified and zero padded.

- **UCC128 (64 bit) / UCC128_96 (96 bit):** Copies data from a UCC-128 bar code with an application identifier (AI) in the range of 90-99 to an RFID tag. These AI's are reserved for internal applications. The AI is not written to the RFID tag. Data written to the RFID tag is right justified and zero padded. Checksum data calculated by the printer is not encoded onto the tag. Bar code data beyond the 16th digit is truncated without an error message.
- **EAN8 (64 bit) / EAN8_96 (96 bit):** Copies data from an EAN8 bar code to an RFID tag. EAN 8+2 and EAN 8+5 variants are both supported. Data written to the RFID tag is right justified and zero padded. Checksum data calculated by the printer is not encoded onto the RFID tag.
- **EAN13 (64 bit) / EAN13_96 (96 bit):** Copies data from an EAN13 bar code to an RFID tag. EAN 13+2 is also supported but EAN 13+5 variant is not supported. Data written to the RFID tag is right justified and zero padded. Checksum data calculated by the printer is not encoded onto the RFID tag.
- **UPC-A (64 bit) / UPC-A_96 (96 bit):** Copies data from a UPC-A, UPC-A+2 or UPC-A+5 bar code to an RFID tag. Data written to the RFID tag is right justified and zero padded. Checksum data calculated by the printer is not encoded onto the RFID tag.
- **EPC (64 bit) / EPC_96 (96 bit):** This tool allows EPC data carried by a Code 3 of 9 bar code to be encoded onto an RFID tag. Data beyond the 16th digit is not allowable for an EPC and is truncated. Data must be numeric only.
- **zGTIN (64 bit) / zGTIN_96 (96 bit)**, **zEPC (64 bit) / zEPC_96 (96 bit)**, **zUCC128 (64 bit) / zUCC_96 (96 bit)**, **zEAN8 (64 bit) / zEAN8_96 (96 bit)**, **zEAN13 (64 bit) / zEAN13_9 (96 bit)**, and **zUPCA (64 bit) / zUPCA_96 (96 bit):** These are all ZGL emulation specific tools identical in function to those of their corresponding names above.

NOTE: SMTs are available only for RFID enabled printers. SMTs and CSTs are mutually exclusive: the loading of any CST will cause the SMTs to be ignored. For a description of CSTs, refer to the *Remote Management Software Advanced Tool Kit User's Manual*.

Selecting the Tools

SL5R Energy Star

1. Press ⁝☰ until QUICK SETUP displays.
2. Press ↓ and ↵ at the same time until ENTER SWITCH UNLOCKED displays.
3. Press ↑ until SMT: Status displays.
4. Press **+** until Enabled displays.
5. Press ↵ to select it. An asterisk (*) appears next to Enabled.
6. Press ↓ until SMT: Sel Toolset displays.
7. Press **–** or **+** until the desired toolset displays.
8. Press ↵ to select it. An asterisk (*) appears next to the toolset.
9. Press ↓ until SMT: Select Tool displays.
10. Press **–** or **+** until the desired tool displays.
11. Press ↵ to select it. An asterisk (*) appears next to the tool.
12. Press ↓ and ↵ at the same time to lock the ↵ key, then press **PAUSE** to take the printer offline.
13. Press **PAUSE** again to put the printer online.

SL4M

1. Press ⋮☰ to enter Menu mode.
2. Press the Down and ↵ keys at the same time until THE ↵ KEY IS UNLOCKED displays.
3. Press the Right key until PRINTER SETUP displays.
4. Press ↵ to enter the PRINTER SETUP menu.
5. Press the Down key until SMT: Status displays.
6. Press the Right key until Enabled displays.
7. Press ↵ to select it. An asterisk (*) appears next to Enabled.
8. Press the Down key until SMT: Sel Toolset displays.
9. Press the Right or Left keys until the desired toolset displays.
10. Press ↵ to select it. An asterisk (*) appears next to the toolset.
11. Press the Down key until SMT: Select Tool displays.
12. Press the Right or Left keys until the desired tool displays.
13. Press ↵ to select it. An asterisk (*) appears next to the tool.
14. Press the Down and ↵ keys at the same time to lock the ↵ key, then press ⏸ to take the printer offline.

Press ⏸ again to put the printer online.

Error Messages

The RFID encoder can detect a number of errors. When one of these errors occurs, the RFID encoder alerts the printer to perform the currently selected error action (see “Error Handling” on page 24) and display the appropriate error message on the control panel’s LCD (see Table 8).

Table 8. Control Panel Error Messages

Error Message	Explanation	Solution
NON-RFID DATA On Rfid Tag	A job was printed that had no RFID commands on at least one form of the job while RFID tags were installed in the printer and the Non-RFID Warning menu item is set to Enable.	Press **PAUSE** to clear the message. Set Non-RFID Warning to Disable, print a job with RFID commands on every form, or install non-RFID labels in the printer.
RFID Comm Err Check Cable	RFID error: communication cannot be established between the printer and the RFID encoder.	Press **PAUSE** to clear the message. Set RFID Reader = Disable in the RFID (or RFID CONTROL) menu. See “Troubleshooting” on page 103.
RFID FW ERR: Version Mismatch	The RFID encoder firmware version is not capable of operating with the printer software.	Press **PAUSE** to clear the message. Redownload the program file to the printer.
RFID LOCK CMD: Not supported!	A lock command was executed on a tag which does not support locking. All Class 1 tags and most Gen 2 tags support locking. Other tag classes such as Class 0+, Class 1.19, and Class Zuma do not support locking.	Press **PAUSE** to clear the message. Remove the lock command from the application.

Table 8. Control Panel Error Messages

Error Message	Explanation	Solution
RFID MAX RETRY Check System	Error Handling = Overstrike in the RFID (or RFID CONTROL) menu, and the Label Retry count has been exhausted.	Press **PAUSE** to clear the message. See “Troubleshooting” on page 103.
RFID TAG ERR: Read-Only Tag	A write was attempted on a read-only tag.	Press **PAUSE** to clear the message. Change media to writable tags or remove the write command from the application.
RFID TAG FAILED Check Media	Error Handling = Stop in the RFID (or RFID CONTROL) menu, and the RFID encoder could not read the RFID tag.	Press **PAUSE** to clear the message. See “Troubleshooting” on page 103.
RFID UNLOCK CMD: Not Supported!	An unlock command was executed on a tag which does not support locking.	Press **PAUSE** to clear the message. Remove the unlock command from the application.
RFID ACS FIELD: Not Supported!	The ACS field was accessed on a tag which does not support the ACS field.	Press **PAUSE** to clear the message. Remove references to the ACS field from the application.
RFID KIL FIELD: Not Supported!	The KIL field was accessed on a tag which does not support the KIL field.	Press **PAUSE** to clear the message. Remove references to the KIL field from the application.
RFID PC FIELD: Not Supported!	The PC field was accessed on a tag or RFID encoder which does not support the PC field.	Press **PAUSE** to clear the message. Remove references to the PC field from the application.

Troubleshooting

If you are having trouble with the RFID encoder, consult Table 9 for a list of symptoms and possible solutions.

Table 9. Troubleshooting the RFID Encoder

Symptom	Solution
No communication between the printer and the RFID encoder	1. Make sure Reader = Enable in the RFID (or RFID CONTROL) menu. 2. Use the RFID Test option in the RFID (or RFID CONTROL) menu (Admin User enabled) to read and display the current RFID tag content. Class 1 RFID tags usually contain a valid entry due to the pre-test process. See “Read Tag” on page 29 (SL5R Energy Star) or page 44 (SL4M). 3. If the problem persists, your RFID encoder may be disconnected or defective. Contact your authorized service representative.
Tag failed	1. The label could be misaligned. Perform the Auto Calibrate procedure to ensure the label is at top-of-form. See “Running Auto Calibrate” in the *User’s Manual*. 2. Make sure the media are smart labels with RFID tags located in the correct position. 3. The RFID tag could be defective. Try another tag. 4. Make sure the application does not send too few or too many digits to the RFID tag.
Inconsistent results	Make sure the media is loaded correctly. See “Loading Media And Ribbon” in the *Quick Setup Guide*.

Table 9. Troubleshooting the RFID Encoder

Symptom	Solution
The RFID encoder works, but it does not meet expectations	Make sure that both Error Handling and Label Retry are set to desired values in the RFID (or RFID CONTROL) menu.
The RFID (or RFID CONTROL) menu does not appear	The printer did not detect the RFID encoder at power-up. Your RFID encoder may be disconnected or defective. Contact your authorized service representative.

3 MP2 RFID

Coupler System

The MP2 RFID has a coupler design that supports a greater variety of tag types. You can move the MP2 coupler horizontally by using the coupler handle. See figures on page 106 and page 108.

The coupler has four positions on a four inch printer and five positions on a six inch printer. The possible positions moving from inboard (nearest the electronic bay) to outboard (nearest the window) are as follows:

Yellow: 1st Position (furthest inboard)

Orange: 2nd Position

Red: 3rd Position

Blue: 4th Position (furthest outboard on a 4 inch printer)

Green: 5th Position (this uses a second coupler position indicator available on six inch printers only)

Once you select a tag type from the front panel, the following message will display:

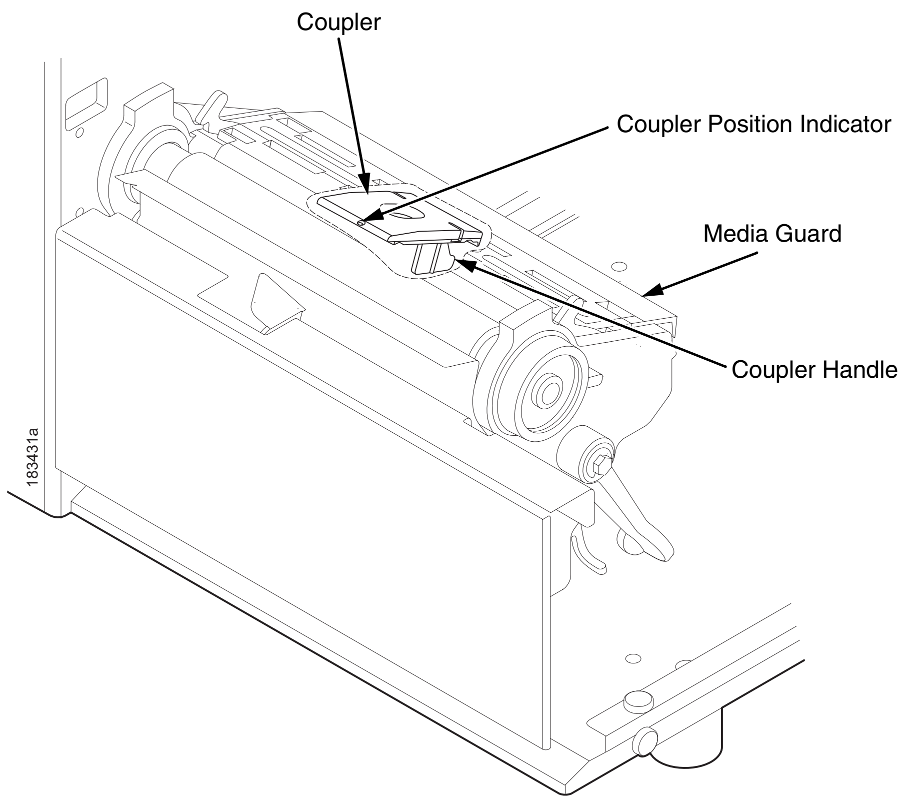
SL5R Energy Star

Ant Pos *x*
(where *x* is Yellow, Orange, Red, or Blue)

SL4M

Set Antenna Pos
to *x*
If Done Press ↵
(where *x* is Yellow, Orange, Red, or Blue)

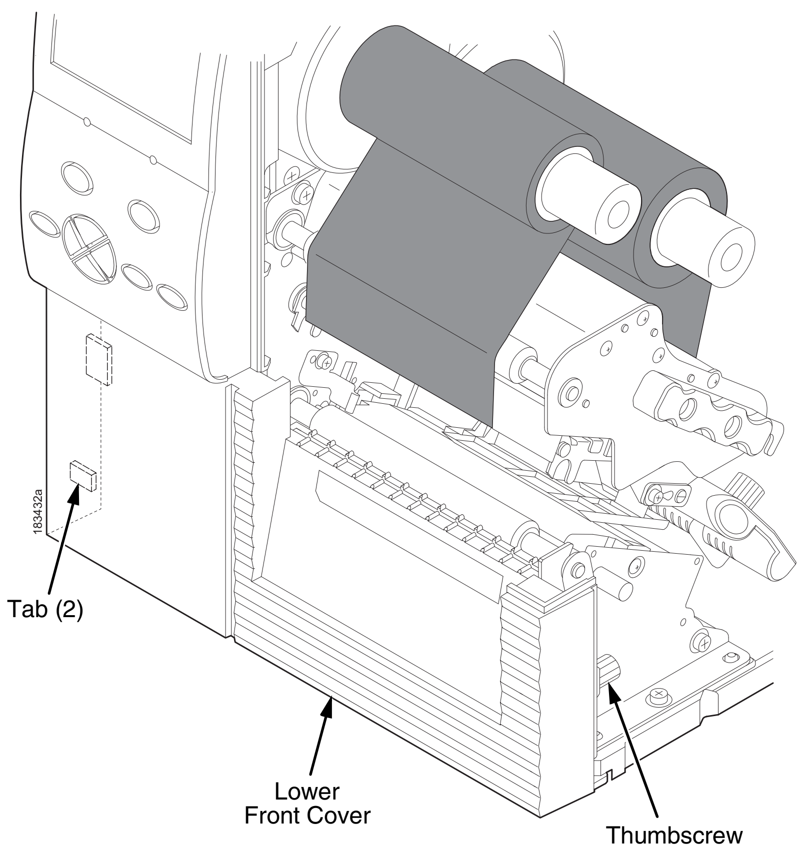
Adjusting the Coupler Position (SL5R Energy Star)



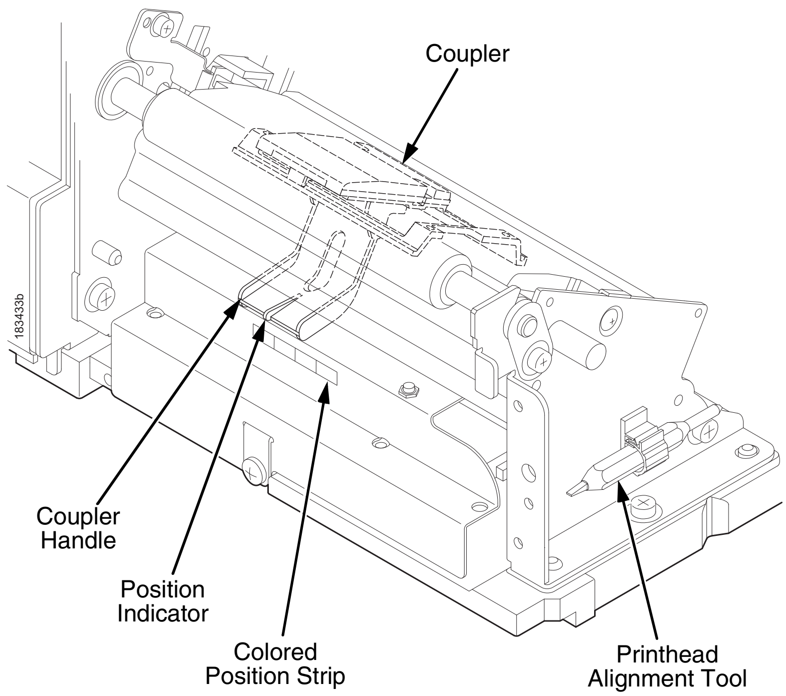
Reach under the media guard to grasp the coupler handle. Slide the coupler until the correct color displays in the coupler position indicator.

Four and six inch printers have yellow, orange, red, and blue coupler positions. Six inch printers have an additional coupler position indicator (not shown) to accommodate the green coupler position.

Adjusting the Coupler Position (SL4M)



Remove the thumbscrew that secures the lower front cover to the printer. Slide the cover to the left to remove it.



NOTE: To eliminate flexing of the coupler handle, use the printhead alignment tool (or a pencil or pen) to push against the side of the handle in the direction you need.

Slide the coupler handle so that the position indicator points to the correct color on the colored position strip.

Install the lower front cover (see page 107) by aligning the tabs on the left side. Secure the lower front cover to the printer using the thumbscrew.

64 Bit and 96 Bit EPC Data Formats

According to the EPC code standard there are two specific data type formats: 64 bit and 96 bit. The type of format is defined by the first two bits of the EPC Header. When the first two bits are set to 00, the EPC format is interpreted as a 96 bit data format. When the first two bits are not 00, the EPC format is interpreted as a 64 bit data format.

Each tag class handles this situation differently.

Class 1 Gen 1

The original Class 1 Gen 1 tag was a 64 bit memory designed prior to the EPC standard. Therefore despite a newer 96 bit tag, the data dependent indication was ignored. This is true today and therefore as long as the data fits into the tag memory no check is made of its format.

Gen 2

The Gen 2 protocol manages data size differently and does not use the data format to identify the data size. The Protocol Control (PC) bits (a separate entry in the tag) manages the data size. Therefore the data format is not restricted to the EPC data format.

Class 0+, Class Zuma, and Class 1.19

These Classes were developed subsequent to the EPC standard and have 96 bit memories for the EPC code. To distinguish between 64 bit data and 96 bit data, they conform to the EPC code format standard.

Three parameters should match for error free operation:

1. EPC Format
2. Selected Tag Data Length
3. Size of Data Request

IMPORTANT **When any of these three parameters are inconsistent then confusion is likely.**

The following tables (Table 10 on page 110 for PGL and Table 11 on page 111 for ZGL) identify the consequences of mismatched criteria.

Table 10. PGL EPC Format Handling

EPC Format (based on header)	Selected Tag Data Length	Size of Data Request (from program)	Result	Comment
64 bit	64 bit	< 64 bit	OK	Pad 0s to left for 64 bit
64 bit	64 bit	= 64 bit	OK	As is
64 bit	64 bit	> 64 bit	Error	Data too long
64 bit	96 bit	< 64 bit	Read 96 bit	Pad 0s to left for 96 bit
64 bit	96 bit	= 64 bit	Read 96 bit	Pad 0s to left for 96 bit
64 bit	96 bit	64 bit <> 96 bit	Read 96 bit	Pad 0s to left for 96 bit
64 bit	96 bit	= 96 bit	Error	EPC incompatible with length
64 bit	96 bit	> 96 bit	Error	Data too long
96 bit	64 bit	< 64 bit	Error	EPC incompatible with length
96 bit	64 bit	= 64 bit	Error	EPC incompatible with length
96 bit	64 bit	> 64 bit	Error	Data too long
96 bit	96 bit	< 96 bit	OK	Pad 0s to left for 96 bit
96 bit	96 bit	= 96 bit	OK	As is
96 bit	96 bit	> 96 bit	Error	Data too long

Table 11. ZGL EPC Format Handling

EPC Format (based on header)	Selected Tag Data Length	Size of Data Request (from program)	Result	Comment
64 bit	64 bit	< 64 bit	OK	Pad 0s on right for 64 bit
64 bit	64 bit	= 64 bit	OK	As is
64 bit	64 bit	> 64 bit	Error	Data too long
64 bit	96 bit	< 64 bit	Read 96 bit	Pad 0s on right for 64 bit
64 bit	96 bit	= 64 bit	Read 96 bit	Pad 0s on right for 64 bit
64 bit	96 bit	64 bit <> 96 bit	Read 96 bit	Pad 0s on right for 64 bit
64 bit	96 bit	= 96 bit	Error	EPC incompatible with length
64 bit	96 bit	> 96 bit	Error	Data too long
96 bit	64 bit	< 64 bit	Error	EPC incompatible with length
96 bit	64 bit	= 64 bit	Error	EPC incompatible with length
96 bit	64 bit	> 64 bit	Error	Data too long
96 bit	96 bit	< 96 bit	OK	Pad 0s on right for 64 bit
96 bit	96 bit	= 96 bit	OK	As is
96 bit	96 bit	> 96 bit	Error	Data too long

Moving from 64 Bit Tags to 96 Bit Tags

When the time comes to upgrade from 64 bit data to 96 bit data the best solution is to select the 96 bit tag type on the menu (which is mandatory) and modify the host datastream to write the full 96 bits.

When 64 Bit Data is Sent to a 96 Bit Tag: PGL

Both the old (RFWRITE) and the new (RFWTAG) commands will pad zeroes to the right on the physical tag. When the tag is read back, both the old (RFREAD) and the new (RFRTAG) commands will recover the correct 64 bits of data. This will then be printed or verified (sent back to host) correctly.

Example 1

```
~NORMAL
~CREATE;test1;216
RFWRITE;HEX;RF3;16;AT1;
FONT;FACE 93952;SLANT 0;BOLD 1
ALPHA
RFREAD@;AF1;25;2;2;0;0
STOP
END
~EXECUTE;test1
~RF3;"68656C6C6F746167"
~AF1;*DATA = @1,16,1;*
~NORMAL
```

Result: printed 68656C6C6F746167

Example 2

```
~NORMAL
~CREATE;TEST1;216
RFWTAG;64
64;H;*3246494454414744*
STOP
RFRTAG;64
64;DF1;H
STOP
VERIFY;DF1;H;*DF1 = *
END
~EXECUTE;TEST1
~NORMAL
```

Result: returned DF1 = 3246494454414744

When 64 Bit Data is Sent to a 96 Bit Tag: ZGL

The data will be written with zeroes padded to the right. However, when you use the ^HV command to send the data back to the host, only 16 characters should be sent.

Example

```
^XA
^WT0,,1^FH^FD_40_3E_3D_3C_3B_00_00_11^FS
^RT0,,,1^FS
^HV0,16,EPC DATA11=
^XZ
```

Result: returned DATA11=403E3D3C3B000011

PGL

The VERIFY Command is not RFID Specific

Although the VERIFY command was added to PGL to enable the sending of RFID data back to a host, it is not actually an RFID command, since:

1. It does not cause any RFID activity
2. It is not restricted to RFID data.

The VERIFY command can be used to send any data expressed in a variable (such as bar code data) back to a host.

Splitting the EPC

Customer Scenario

The customer intended to write 362501031109 to the tag as a decimal number, but when they read the tag back they received 155693006861632597 (not what they expected).

What They Did

```
RFWTAG;96
64;D;*36250103*
32;D;*1109*
STOP
```

The problem is the way in which the decimal number was divided up. Position matters in arithmetic. One cannot ignore the implied leading zeros in the 32bit quantity as they are significant when the 64 bit value is non zero.

For example, 002000 is the same value as 2000, since the leading two zeroes are insignificant. However, 2002 is not the same as 22, since the zeroes are significant.

So when the customer chose 1109 as the LSB 32 bits, the leading zeros were padded to the left until 32 bits were filled, resulting in 00001109. This converted to hex so that 00000455 was written into those bits.

When the customer chose 36250103 as the MSB 64 bits, the leading zeros were padded to the left until 64 bits were filled, resulting in 0000000036250103. This converted to hex so that 00000000022921F7 was written into those bits.

This means the full number (minus the insignificant leading zeros) was hex 22921F700000455 (decimal 155693006861632597), which is not the number the customer meant.

Simplest Solution

Use the 32 bits first, let it hold the leading zeros, then set the 64 bit to the desired decimal number.

NOTE: This will only work for numbers less then decimal 18446744073709551615 (hex FFFFFFFFFFFFFFFF).

Example

```
RFWTAG;96
32;D;*0 *
64;D;*362501031109*
STOP
```

For numbers greater than this, care must be taken to split the number in the correct fashion. The easiest method is to use hex (or at least convert to hex and then back again into decimal).

Using the Advanced RFID Calibration

Tag Profiler

The Tag Profiler maps the tag position with optimized read and write power settings.

Before running the Tag Profiler, it is important that the proper Gap Sensing procedure has been followed. (Refer to “Calibrating The Printer” in the *User’s Manual*.)

To use the Tag Profiler, first ensure that the tag type that you have selected from the Tag Type menu (see “Tag Type” on page 20 [SL5R Energy Star] or page 39 [SL4M] for a list of supported tag types) either matches the tag type you are about to calibrate or is at least of the same Class and data length (i.e. 64 or 96 bits). Next, check that Custom Tag is set to Duplicate. The correct defaults will then be set for Custom Tag Class and Tag (EPC Byte) Length.

Prior to initiating the calibration cycle, the Tag Profiler can be optimized by setting appropriate limits on the following four custom entries:

- **Custom (Scan) Start Pos.** Identifies the starting position of the calibration scan. The default will start at the Top Of Form (TOF). To avoid inefficient scanning at points far away from the target tag, set the (Scan) Start Pos within one inch of the center of the physical tag. E.g., if the center of the tag is physically three inches from the TOF, set (Scan) Start Pos to 2 inches (one inch before the center of the tag).
- **Custom Scan Length.** The distance the Tag Profiler will scan to determine the optimum tag position. For improved performance, set Custom Scan Length to 2 inches or less. This will prevent the printer from looking for a tag far beyond its actual location.

- **Custom (Cal) Min Power.** Sets the lower level that will be tested during calibration. To speed up calibration, set Custom Min Power to two points lower than the Custom Read Power that was set prior to initiating calibration.
- **Custom (Cal) Max Power.** Sets the upper level that will be tested during calibration. To speed up calibration, set Custom (Cal) Max Power to two points higher than the Custom Write Power that was set prior to initiating calibration.

Once the four custom entries have been set, initiate the calibration cycle: access the Custom Run Cal (SL5R Energy Star) or RFID Calibrate (SL4M) menu and press ↵ (Enter). The calibration will proceed using the first three good tags. A calibration progress indicator will update on the display. At the end of the calibration cycle, the Tag Profiler will update the Custom Write Power, Read Power, and Tag Position.

Custom Tag Configurator

When Custom Tag is set to Duplicate, you can manually edit all the custom entries. This allows you to overwrite the values discovered by the calibration in case you want to experiment further. It is generally best to accept the calibration values as is unless you are intimately familiar with the printer and its RFID processes.

Before you leave the Custom Tag Configurator, record the result from Custom Tag Position. This will be useful when deriving the optimum position for your tag with your converter. Tell the converter to move the tag from the current position by the amount in Custom Tag Position. A positive value means move toward TOF, a negative value means move away from TOF.

Auto Inlay Locater

After you have run the Tag Profiler (using Custom Run Cal or RFID Calibrate) and recorded the Custom Tag Position (offset from optimum position), you may now set Custom Tag to Enable in preparation to use the media with the Auto Inlay Locator.

When Custom Tag is set to Enable, the Auto Inlay Locator uses the results of the Tag Profiler calibration cycle to automatically advance the label to the correct encoding position, encode the tag with the correct write/read power, back-feed the label to the TOF, and proceed normally to print the full label without interruption.

4 SL4M RFID Short-Pitch Printer

SL4M RFID Short-Pitch Printer

This printer specifically encodes inlays for item level applications and supports RFID labels with one inch pitch as compared to the standard two inch pitch on the SL4M MP2 product. The SL4M Short-Pitch printer has a new RFID reader, coupler, and software. The printer provides improved RF power, dynamic range, and inlay isolation, making it ideal for Short-Pitch applications.

RFID Inlay Pitch

Pitch is defined as the distance from one point on an inlay to the same point on the next inlay. The reference point can be any point on the inlay: leading (or trailing) edge of the antenna (often described as the foil), leading (or trailing) edge of the antenna substrate, or the distance between ICs. Use the RFID Inlay Reference Point illustration on the next page for a clearer understanding of the various points that can be used to determine pitch.

Standard-Pitch RFID Labels

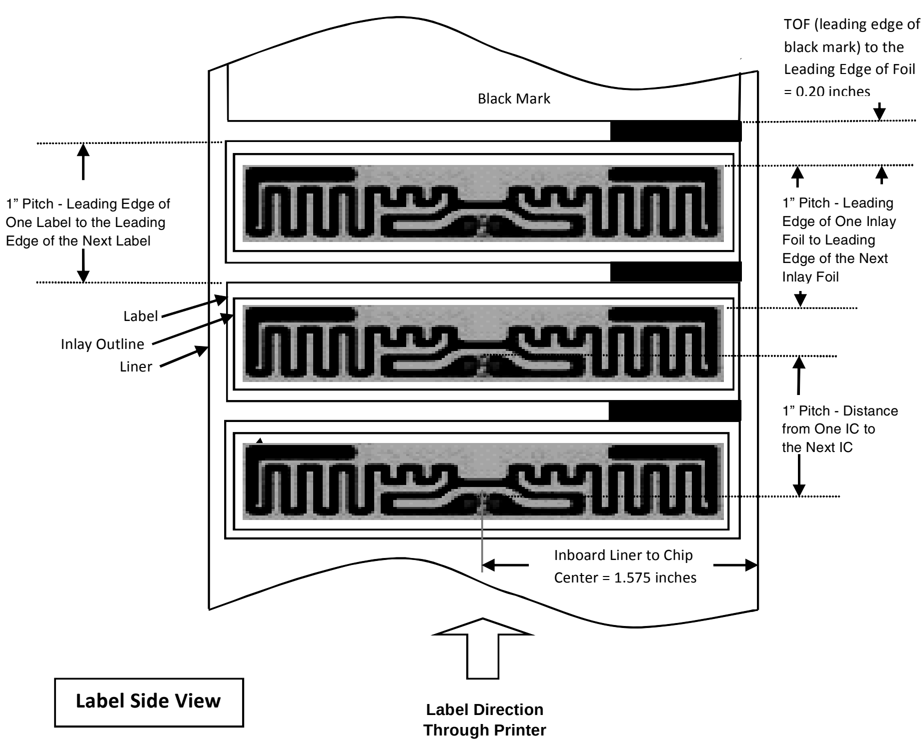
The RFID inlay is constructed into a standard paper label with a predefined length to support tag encoding and provide ample space for a significant amount of printed information in the form of text, graphics, barcodes or logos. These labels are typically two, four, or six inches in length and are usually used on shipping cartons or pallets.

Short-Pitch RFID Labels

Printronix defines Short-Pitch labels as those with RFID inlays that have a pitch from 1.0 to 2.0 inches. The RFID inlay is short in length, and is constructed into an item level label that permits inlay encoding and provides the required but limited space to print text, graphics, barcodes or logos.

NOTE: Figure 1 on page 121 shows a section from a roll of Short-Pitch labels and the variety of reference points that can be used to determine the pitch (in this case one inch pitch).

RFID Inlay Position & Pitch Reference Points



Short-Pitch Label Configuration Using

Avery Dennison AD-230 Inlays

Figure 1. Sample Short-Pitch Label Section

Identifying the SL4M Short-Pitch Printer

An SL4M Short-Pitch printer can be identified:

- by the RFID SMART Short-Pitch logo located directly below the control panel.
- on the control panel display. In ONLINE mode, “Short Pitch” displays below SL4M.

SL4M Short-Pitch Configuration Menu Setup

NOTE: Short-Pitch components and software must be installed into an SL/T4M printer prior to starting any configuration setup procedures.

1. Set the SL4M power switch to 1 (On). Wait until the printer has completed the media auto calibration process and “‘ONLINE” displays on the LCD.
2. Press the Menu key. MEDIA SETUP displays and the Media Roll icon is highlighted.
3. Press the Right key and then the Down key. RFID displays and the RFID icon is highlighted.
4. Press the ↵ key. RFID Reader: Enable* is highlighted.
5. Press the Up key until “Display F/W Ver:” displays. Verify AWID1980 29.51Pf (SP) displays for Europe or AWID1910 25.51Pf (SP) displays for other countries. The (SP) indicates the SL4M is configured for Short-Pitch.
6. Press the Down key and ↵ key at the same time until “THE ↵ KEY IS UNLOCKED” displays.
7. Press the Menu key and then press the Right key until “PRINTER SETUP”displays. Press the ↵ key to enter the PRINTER SETUP menu.
8. Press the Up key until “Admin User:” displays and then press the Right key until “Enable” displays. Press the ↵ key to select Enable. An asterisk appears after Enable.

9. Press the Menu key. “MEDIA SETUP” displays.
10. Press the ↵ key to enter the MEDIA SETUP menu. Perform the required MEDIA SETUP, SENSOR SETUP and RFID menu changes described in the next sections.

MEDIA SETUP Menu

NOTE: The menu options described below are those that could affect Short-Pitch performance.

Media Handling

- **Continuous**. Only forward media motion occurs. When the print job ends the trailing edge of the last label printed remains at the TOF position under the printhead (not aligned at the Tear Bar). If the RFID menu has Tag Position set at a negative value, (ex., -0.2 inches), the printer will move in reverse for 0.2 inch distance as each tag is encoded. The last label printed will still remain at the TOF position under the printhead (not aligned at the Tear Bar).
- **Tear-Off Strip**. When a print job is sent, the leading edge of the first label will be pulled back to the TOF position under the printhead. If the RFID menu has Tag Position set at a negative value, (ex., -0.2 inches), the printer will move in reverse for 0.2 inch distance as each tag is encoded. When the print job is complete the SL4M will place the trailing edge of the last printed label at the tear bar for easy removal.

SENSOR SETUP Menu

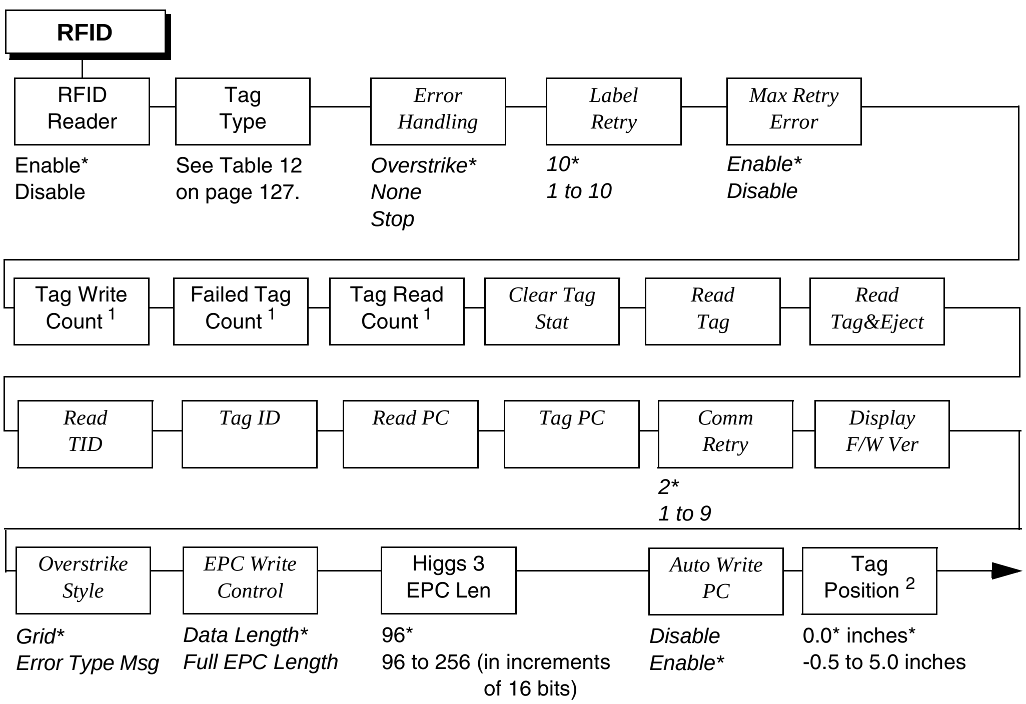
- **Gap/Mark Sensor**. Set the sensor to Gap when using media with liner gaps. Set the sensor to Mark (default) when using media with black marks located on the underside of the liner.

IMPORTANT **Although the media in use may have liner gaps and not black marks, there is an advantage to using Mark sensing and Mark TOF Detect set at Mark Lead Edge instead of Gap sensing. Mark sensing provides an additional 0.100 to 0.125 inches of distance from the label TOF to the leading edge of the inlay antenna that can create added distance which may be needed to prevent reading and writing to nearby tags.**

- **Mark TOF Detect = Mark Lead Edge** (default).

NOTE: This forces the printer to use the leading Edge of the Mark instead of the trailing edge. See above IMPORTANT notice under Gap/Mark Sensor.

RFID Menu



Notes:

* = Default.

** = Short Pitch tag type, supported by SL4M Short Pitch printers.

Italicized items appear only when Admin User is set to Enable (in the PRINTER SETUP menu).

[1] Display item only.

[2] Available when Short Pitch Coupler is selected (Admin User = Disable) or when Auto Coupler is selected (Admin User = Enable).

RFID
(from page 125)

Custom Setting

- *Custom Tag*
  - *Duplicate**
  - *Disable*
  - *Enable*
- *Write Power* [2]
  - *1 to 20*
- *Read Power* [2]
  - *1 to 20*
- *EPC Byte Length*
  - *12**
  - *8 to 32*
- *EPC Address*
  - *0**
  - *0 to 32*
- *USR Byte Length*
  - *0**
  - *0 to 64*
- *USR Address*
  - *0**
  - *0 to 32*
- *TID Byte Length*
  - *8**
  - *0 to 8*
- *TID Address*
  - *2**
  - *0 to 32*
- *Block Write Len*
  - *8**
  - *0 to 32*
- *Tag Class*
  - *Class 1*
  - *Gen 2**
  - *Class 0*
  - *Class 0+*
  - *Class 1.19*
  - *Class Zuma*
- *Read Tries*
  - *2**
  - *1 to 10, Infinite*
- *Write Tries*
  - *9**
  - *1 to 10*
- *RFID Calibrate*
  - *To Run Press* ↵
- *Scan Start Pos* [3]
  - *0.0 inches**
  - *0.0 to 5.0 inches*
- *Scan Length* [3]
  - *3.0 inches**
  - *0.0 to 5.0 inches*
- *Cal Min Power*
  - *1**
  - *1 to 20*
- *Cal Max Power*
  - *20**
  - *1 to 20*

AutoID Mgr Rpt

- *Disable**
- *Enable*

Non-RFID Warning

- Disable*
- Enable

Notes:

* = Default.

Italicized items appear only when Admin User is set to Enable (in the PRINTER SETUP menu).

[2] Default depends on the type of RFID encoder installed in the printer.

[3] Inches or millimeters, depending on the Units setting (in the MEDIA CONTROL menu).

Tag Type

Select the tag type that is in the actual inlay. After selecting a Tag Type, the display prompts you to Set Antenna Pos (Yellow, Orange, Red or Blue) or if Done Press Enter.

Table 12 lists the Tag Type selections available in the SL4M Short-Pitch printer and the PTX specification for details on tag placement for 1.0 inch pitch.

Table 12. Currently Supported RFID UHF Gen2 Tag Types (SL4M Short Pitch)

Tag Name (Tag Type)	EPC Bits	User Bits	TID	Silicon	Antenna Position	PTX Spec
Alien9630 Sqlet	See Table 2 on page 27.		E2003412	Alien Higgs 2	Yellow	184237
Alien9640 Squig	See Table 2 on page 27.		E2003412	Alien Higgs 3	Orange	183260
Alien9662 Short	See Table 2 on page 27.		E2003412	Alien Higgs 3	Yellow	183955
Alien9720 HiScn	128	128	E2003414	Alien Higgs 4	Yellow	184694
Alien9728 GT	128	128	E2003414	Alien Higgs 4	Yellow	184974
Alien9730 Sqlet	128	128	E2003414	Alien Higgs 4	Yellow	184237
Alien9740 Squig	128	128	E2003414	Alien Higgs 4	Orange	183260
Alien9762 Short	128	128	E2003414	Alien Higgs 4	Yellow	183955
Avery AD224	240	512	E2006003	NXP Ucode G2XM	Orange	183208
Avery AD227	128	0	E2801130	Impinj Monza 5	Orange	184841
Avery AD230*	96	0	E200109.	Impinj Monza 3	Yellow	183905
Avery AD231D	128	32	E280110.	Impinj Monza 4D	Yellow	184731

Table 12. Currently Supported RFID UHF Gen2 Tag Types (SL4M Short Pitch)

Tag Name (Tag Type)	EPC Bits	User Bits	TID	Silicon	Antenna Position	PTX Spec
Avery AD232	128	0	E200680.	NXP Ucode G2iL	Yellow	184310
Avery AD233	128	0	E2801130	Impinj Monza 5	Yellow	184922
S/Trac Belt iL	128	0	E200680.	NXP Ucode G2iL	Yellow	184230
S/Trac Short M4	128	32	E280110.	Impinj Monza 4D	Orange	184261
S/Trac Web Lite	128	0	E2801130	Impinj Monza 5	Yellow	184871
S/Trac Web M5	128	0	E2801130	Impinj Monza 5	Yellow	184859
Tageos EOS 300	See Table 2 on page 27.		E2003412	Alien Higgs 3	Yellow	184894
Tageoa EOS 500	See Table 2 on page 27.		E2003412	Alien Higgs 3	Orange	184852

NOTE: New tag types will be added to the Tag Type menu as they are qualified.

NOTE: Labels constructed for use on the standard SL4M MP2 or SL5000r MP2 series printers may not be compatible with the SL4M Short-Pitch printer.

Error Handling

- **Overstrike** (default). When detected, each failed tag will have the overstrike pattern (Grid or Error Type message) printed on it and the SL4M will retry encoding the next tag with the same data.

  Example:
  When encoding tags with serialized data and one tag has failed, you should have the exact number of good serialized tags that the print job specified with one bad tag (label). The

bad tag will have an overstrike pattern printed on it, indicating that it should not be used.

- **Stop**. When a bad tag is detected while encoding and printing serialized tags, the printer stops, goes offline, and displays “RFID Error: Check Media”. The bad tag will not get overstruck. If the printer is placed back online and receives the remaining data, it will not do a Retry on the next tag. As a result, one serialized tag in the print job will be missing and the failed (bad) tag will not have an overstrike pattern on it that would have allowed for easy identification.
- **TAG POSITION =** - 0.3 inches (example). This negative Tag Position indicates that the label will be pulled back so that the inlay will be at its optimum position over the coupler to write and verify the tag. A setting of 0.0 inches indicates that the inlay is ideally positioned and no reverse motion will occur.

Custom Settings/Custom Tag

- **Duplicate** (default). The settings of the selected Tag Type menu item are copied into the custom tag menus, but are ignored by the RFID encoder.
- **Disable**. The settings in the custom tag menus are ignored by the RFID encoder.
- **Enable**. The RFID encoder uses the settings in the custom tag menus, which must be set to match the characteristics of the custom tag.

IMPORTANT **When Custom Tag = Enable you will not be able to use the Read TID feature in the RFID menu. However, the Read Tag, Read Tag & Eject, and Read PC features will still be supported. The Read TID feature is currently only supported when Custom Tag = Duplicate or Disable.**

Also, the RFID Calibrate feature is not currently supported in the Custom Tag menu.

For additional support, please contact your local Printronix Support Center (page 14).

A PTX_Setup Option with RFID

The PTX_SETUP commands are a superset of commands which allow the printer to perform several tasks by parsing commands either stored in flash or sent to the printer by the host. Commands range from re-routing debug statements to downloading complete printer configurations.

This appendix describes the PTX_SETUP commands specific to RFID operation.

Concepts to Note

1. PTX_SETUP commands are not emulation specific. In a system with an IGP, the IGP level emulation will process the PTX_SETUP commands. In a system without an IGP, the PTX_SETUP commands will be processed by the base emulation. The CTHI emulation will not process PTX_SETUP commands.
2. The PTX_SETUP command set is case sensitive; all PTX_SETUP commands are in uppercase characters only.
3. The white space separating commands may be any number of spaces and tabs. This allows a PTX_SETUP file to be formatted for easier readability.
4. Any unknown command will terminate the PTX_SETUP processing. The offending command will be the first line of printed text.

Each emulation has modes in which the PTX_SETUP commands could get missed. It is highly recommended that all PTX_SETUP commands be placed between print jobs, rather than attempting to embed them within jobs.

PTX_SETUP commands have the following format:

(SFCC)PTX_SETUP
Command-Sub Command; Value
PTX_END

For example, if the SFCC assigned to PTX_SETUP is the default value of the exclamation mark (!, hex 21), and you want to change the EPC Length for a Higgs-3 RFID tag to 256, use the following command sequence:

```
!PTX_SETUP
RFID;EPC_LENGTH;256
PTX_END
```

Table 13 shows the PTX_SETUP options for RFID

Table 13. RFID PTX_SETUP Options

Command	Sub-Command	Parameter	Description
RFID	OVERSTRIKE_REPORT	0	When set to 0 (OFF), an RFID overstrike occurs then it is not reported to the host.
		1	When set to 1 (ON), an RFID overstrike occurs then it is reported to the host.
	STATISTICS_REPORT	0	When set to 0 (OFF), RFID statistics are not reported to the host.
		1	When set to 1 (ON) RFID overstrikes are reported to the host when an alert is processed.
	STATISTICS_CLEAR	None	When this command is processed the RFID statistics are cleared.

Table 13. RFID PTX_SETUP Options

Command	Sub-Command	Parameter	Description
	EPC_LENGTH	EPC field length	Specifies the EPC Length for RFID tag types that have a variable length EPC field (e.g. higgs-3). EPC field length can be one of (96, 112, 128, 144, 160, 176, 192, 208, 224, 240, 256) **NOTE:** When the EPC length is selected with the command, the USR field is automatically set to the corresponding size as defined by the EPC Global Class-1 Generation -2 UHF RFID Specification. When the EPC length is selected with the command, the PC field must be programmed with the correct value as defined by the EPC Global Class-1 Generation-2 UHF RFID Specification.

Appendix A

B Notes

SL4M printer operation using the USB host interface results in slower RFID operations with an overall decrease in system performance.

Appendix B

Index

Index

Index

178424-001L