AMTDatasouth

Fastmark 400 Series with PAL™ Print and Program Language

Barcode Label Printer

User's Guide

Part No. 110039 A

AMT Datasouth Corp.

Corporate Headquarters
4765 Calle Quetzal
Camarillo, CA 93012
(805) 388-5799 PH
(805) 484-5282 FX

Charlotte Operation
4216 Stuart Andrew Blvd.
Charlotte, NC 28217
(704) 523-8500 PH
(704) 525 6104 FX

AMT Datasouth International
Unit B, Pinnacle 15
Gowerton Rd, Brackmills
Northampton, NN4 7BW
England
+44 1604 763394 PH
+44 1604 760661 FX

www.amtdatasouth.com

IMPORTANT SAFETY INSTRUCTIONS

AND OTHER NOTICES

- This label printer complies with the requirements in Part 15 of FCC rules for a Class A computing device. Operation of this equipment in a residential area may cause unacceptable interface to radio and TV reception, requiring the operator to take whatever steps are necessary to correct the interference.
- Place the printer on a flat, firm and solid surface.
- Do not place the printer near a heat source or near water.
- Refer to the specification label on the bottom of this printer and ensure that your power source exactly meets these requirements.
- Do not open the printer during operation to avoid electrical shock.
- Do not attempt to disassemble this printer if it malfunctions.
-
- The material in this document is provided for general information and is subject to change without notice.

TRADEMARK CREDITS

Windows ® , MS-Word and MS-DOS are registered trademarks of Microsoft Corporation

PC ® is a registered trademark of International Business Machines

Centronics ® is a registered trademark of Centronics Corporation

PAL is a registered trademark of AMT Datasouth Corporation

COPYRIGHT NOTICES

COMPUTER SOFTWARE LICENSE AGREEMENT

CONVENTIONS

Some of the procedures in this guide contain special notices that highlight important information:

Note	Indicate information that you should know to help your printer run properly and efficiently.
Caution	Indicate guidelines that, if not followed, can cause damage to equipment.
Warning	Indicate a situation where there may be a danger to you.
Important	Indicate that the associated material needs to be done to ensure proper printer operation.

The use of the term's *right* and *left* assume that you are looking at the front of the printer.

TECHNICAL SUPPORT

Please contact your local dealer first for technical support. Your dealer is knowledgeable about driver installation, application software and general printer operation. If you still need factory technical support after contacting your dealer, you may mail any problems through the E-mail account, “www.amtdatasouth.com”. You can also get the most updated driver or application from the web site “http://www.amtdatasouth.com”.

First Edition: January 2004

Table of Contents

TABLE OF FIGURES

INTRODUCTION

The FM412 / FM403 are high-performance, low-cost Direct Thermal/Thermal Transfer labeling printers featuring the PAL™ Print and Program language.

PAL™ Print and Program language is an interpretive page description language that allows printers to move beyond the role of normal printers. In addition to supporting traditional text, bar code, and graphics print sequences common to other printers, PAL™ Print and Program language also serves as a general purpose programming language. This combination of sequence based printing commands and programming ability allows printers to provide unique solutions such as:

- Intelligently read and interpret legacy data streams without host system programming changes. Add or replace printers without changing the data streams. For example, this tremendous flexibility permits changing from dot matrix text or card embosser's to high quality thermal printing with bar codes ***without changing the original data from the host***.
- Store label formats and databases in the printer.
- Store PAL™ programs in the printer to create powerful stand-alone applications that don't require a host or PC connection.
- Create and store PAL™ programs in the printer, which allow it to operate even if the host system goes down.
- Read data from an optional keyboard, scanner, scale, etc. and combine this data with fixed formats to create powerful labeling solutions.
- Perform math calculations and perform logical decisions within the printer.

PAL™ Print and Program presents many exciting possibilities for rethinking the printer's role within any industry setting.

The User's Manual will help you understand basic operations of the printer such as set-up, installation, configuration and maintenance. For detailed information on the PAL™ Print and Program language, please refer to the **PAL™ Print and Program Reference Manual**. Before reading the manual you should first identify your printer model. The printer model name is located on the bottom of the printer on its product label.

MODEL OVERVIEW
Models

The PAL™ Print and Program versions of the Fastmark FM400 series are currently comprised of 2 models:

FM412 (200DPI)

FM403 (300 DPI)

These models are similar in many ways. The FM412 has a print head resolution of 200 DPI versus 300 DPI on the FM403. Throughout this manual instructions and illustrations applying to a particular model will be labeled accordingly otherwise the instructions apply to all models.

Note: *The model number is printed on the compliance label attached to the bottom of the printer. After un-packing please record the model number below for reference.*

MODEL No: _____

SERIAL No:_____

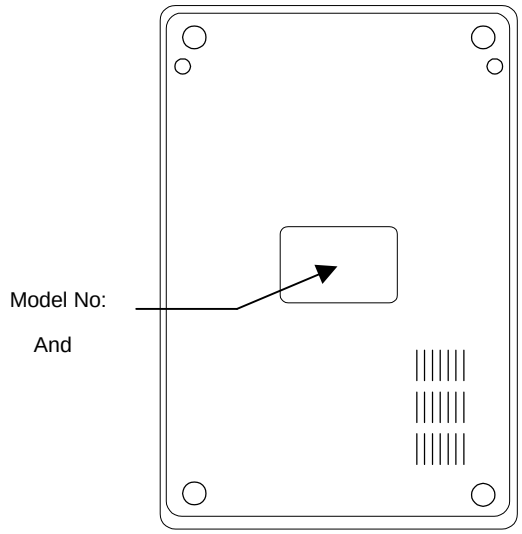


Figure 1 – Model and Serial Number Location

Model Features

For detailed feature specifications, please refer to Appendix A. Below is a brief summary of printer features:

Standard Features

- **PAL™ Print and Program Language**. The PAL™ Print and Programming Language is a powerful printer language combining both exceptional printing abilities with flexible programming abilities. Because it is designed as both a printing and programming language, it is extremely powerful, flexible, and efficient compared to any other thermal printer language on the market today.
  - **PAL™ Print** ability: Free Type font engine with smooth scaling and rotation, graphics with internal scaling, lines, boxes, all popular linear and 2D bar code types. Full rotation and scaling of coordinate system. Ability to define and use print procedures.
  - **PAL™ Programming** ability: General I/O, file handling, loops, procedures, floating point math, logical operators, database access, procedure definitions, string manipulations, time/date functions.
- Ability to store and run printer resident PAL™ programs enabling powerful solutions for a wide variety of print applications.
- Powerful Windows Drivers are included that enable any Windows application to easily access printer resident bar codes and fonts.
- **FeatureMan**(ager) program for quick and easy printer configuration
- All popular linear and 2D bar codes
- Serial and Parallel ports standard
- Clamshell design for simplified media and ribbon loading
- Reflective media detection sensor
- Ribbon out sensor
- Removable media spindle for 1 inch core sizes
- Spring loaded release system for quick print head replacement
- Rugged all metal print mechanism with high impact ABS housing

PAL™ PRINT AND PROGRAM OVERVIEW

Printers featuring PAL™ Print and Program ability can be used in several ways in any given environment. This section describes 3 common ways this advanced capability is used. Details of how to take advantage of this advanced ability can be found in the **PAL™ Print and Program Reference Manual**. For help and assistance determining the best way to use this ability in your situation, please consult your sales representative.

Traditional Printing

This environment represents the most common use of printers. Generally a single print job (PAL™ print sequences) generates a single label. In this role the PAL™ Print and Program interpreter accepts the print job, performs the required operator processing and prints the label, tag, or ticket. Using a Windows driver in conjunction with a Windows application program is a typical way to print in this environment. Alternatively, PAL™ print sequences may also be generated by any host application written to take advantage of this powerful language.

When a PAL™ capable printer is used this way, no special "PAL™ program" must be loaded on the printer. Print sequences generated by a Windows driver or host programs are simply sent to the printer resulting in print output just like traditional printers.

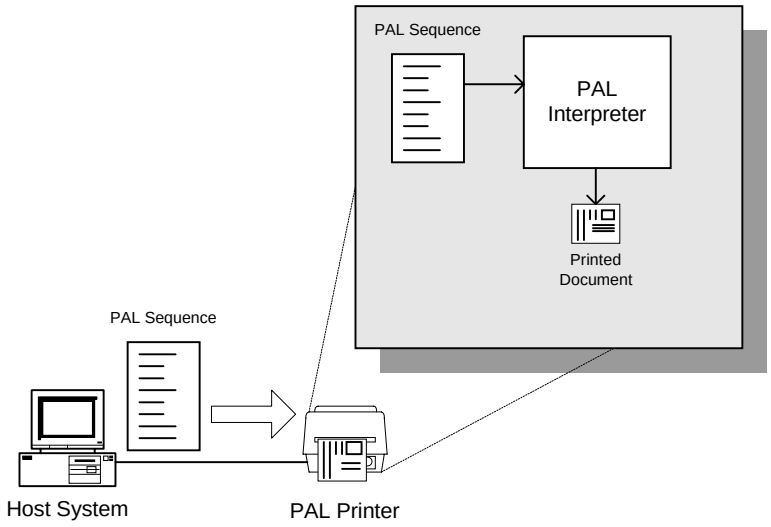


Figure 2 – Traditional Printing

Legacy Data Stream Interpretation

PAL™ Print and Program capable printers uniquely address applications where upgrading to modern cost effective technology is desired. Often cost-prohibitive software reprogramming to change a data stream prevents an organization from moving to new printing technologies.

Using a PAL™ Print and Program capable printer solves this problem. In this case a PAL™ program is written which interprets a data stream normally sent to the legacy device being replaced. This program is stored on the printer and is automatically executed each time the printer is powered on. This program is able to produce a new label format based on this legacy data. Even though the host computer is sending the exact same legacy data to the printer, the label format can be completely different. For example the new format may include bar codes, scaled and/or rotated fonts, lines, logo's etc. Even though the legacy device being replaced does not support these print abilities, the new label format can.

For example, text only outputs such as produced by a dot-matrix printer or card embosser may now be presented in a more functional format. Information in the data stream can be reformatted into any size font in any rotation, or even printed as bar code. This example demonstrates how PAL™ Print and Program capable printer can replace a legacy print device with no host software changes required.

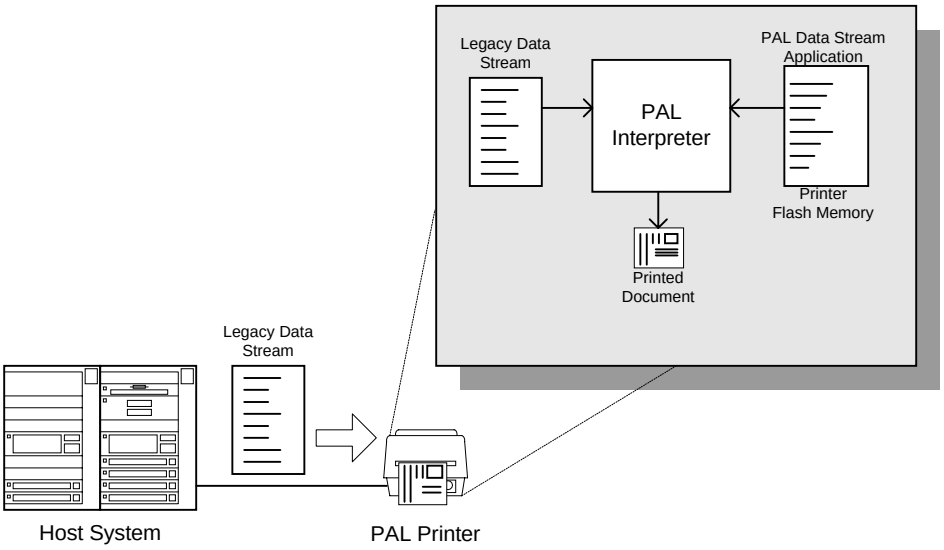


Figure 3 – Legacy Data stream Interpretation

UNPACKING AND INSPECTION

This section is provided to assist you in removing the printer from the shipping container and setting it up in the application environment. Inspect the shipping carton and contact the carrier directly to report any suspected damage.

1. With the shipping container in the upright position, remove the top foam packing piece.
2. Carefully, lift the printer straight up out of the box.
3. Remove the printer from the plastic bag and place the printer on a flat stable surface.
4. Remove the power supply from the separate enclosed box.
5. Remove the accessory kit and supplies.
6. Inspect the shipping container and the printer for any damage that may have occurred during shipping.

   Note: *Save the box and all packing materials for future use, in the event the printer needs to be shipped. Units returned for service in non-approved packaging may void the warranty or increase repair costs due to shipping damage.*

Verify that the printer box contains the following materials when unpacking:

a. Printer
b. Quick Start Up Guide
c. Media spindle (with retainer disk)
d. Power adapter (AC to AC)
e. CD or disks with User's manual and Windows drivers
f. A *sample* media roll (not pictured)
g. A *sample* ribbon roll and a take-up ribbon core (not pictured, Thermal Transfer printers only)

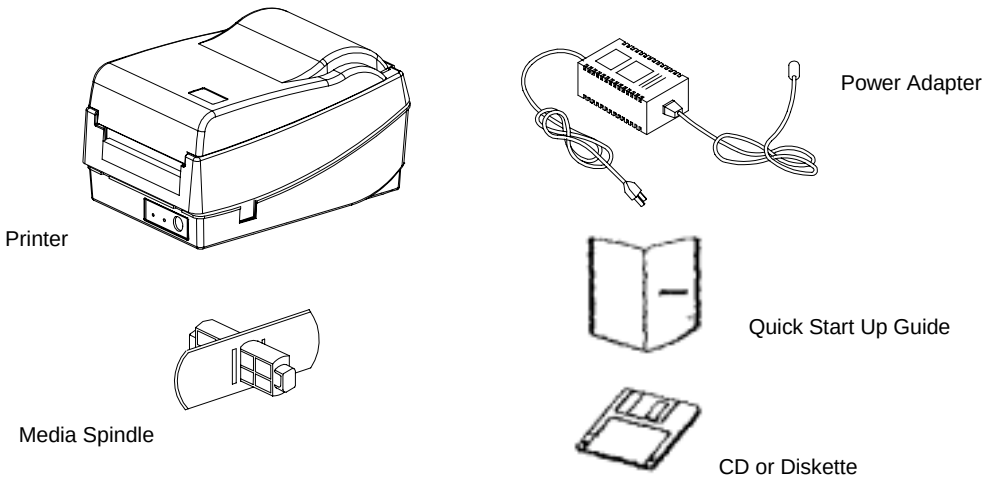


Figure 4 – Shipped with Printer

INSTALLATION AND CONFIGURATION
Finding a Location for the Printer

Determine a suitable location for the printer and power supply brick with the following requirements:

- Find a flat stable surface with sufficient clearance to allow for interface cables and media loading.
- The location should be near the host or terminal. Consider the distance between the host and printer for the communication cable (serial or parallel cable).
- The location should be free from excessive direct sunlight, temperature, humidity, dust, dirt, and debris.
- The location should be near a grounded AC power receptacle wired in compliance with local ordinances.

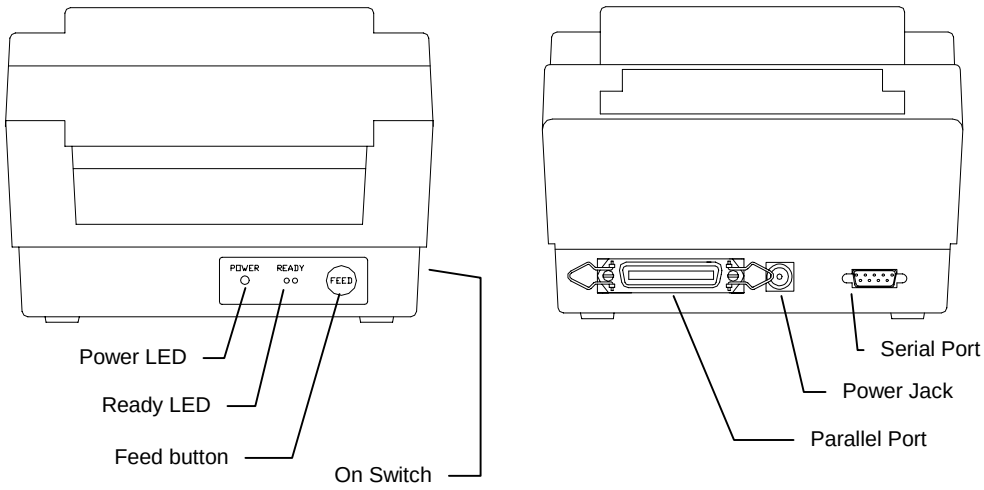


Figure 5 – Switches, Indicators and Connections

Connecting the Power Cord

1. Make sure that the source voltage matches the input voltage of the power adapter.

   Caution: Incorrect source voltage could cause damage to the printer and/or the power adapter.

2. Ensure the printer power switch is Off, “O”.

3. Connect the power plug to the **Power Jack** on the back of the printer. Avoid touching the parallel connector.

4. Connect AC power plug to a suitable AC source.

5. Connect either a Centronics Parallel or RS-232 Cable.

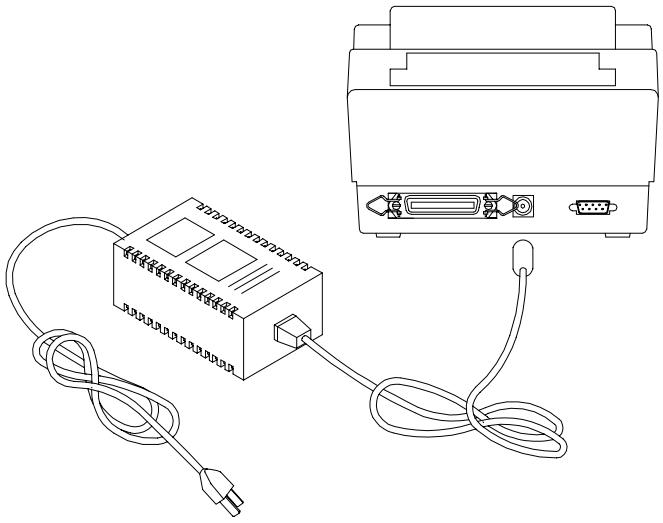


Figure 6 – Power Connection

Connecting the Printer to Your Host

1. You can connect the printer with any standard Centronics cable to the parallel port of the host computer or network print server.

2. Alternatively, you can connect the printer with a serial cable to the RS-232C port of your computer or terminal. (For PC compatibles, the RS-232C port is COM1, COM2 or COM3.)

   ***Note**: Using the Centronics interface allows for higher communication speed than the serial interface.*

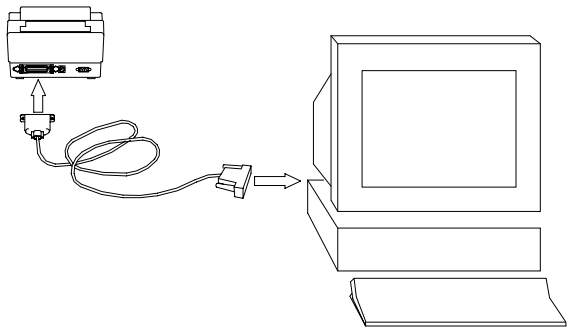


Figure 7 – Communication Cable

3. If you use the serial port with your own cable, refer to the **Appendix B** and check the pin connection.

   Caution: Pin 9 on the serial port is directly connected to +5volts DC. Do not connect this pin in your cable.

4. Be sure that the speed (baud rate) and protocol are the same between printer and host.

   ***Note:** Refer to the section **Feature Management Mode** for instructions on how to change communication features.*

   Default serial port settings:

Speed (baud rate)	9600
Data format	1 start bit, 8 data bits and 1 stop bit.
Parity	None
Handshaking (Flow control)	XON/XOFF and RTS/CTS

Loading the Ribbon

Thermal Transfer Media only

If Direct Thermal Media is used, skip to the section **Loading Media**.

1. Open the **Media Access Cover** by lifting it up until it rests in the vertical position.
2. Slide the two **Print Head Latches** toward the back of the printer to unlock the print head module.

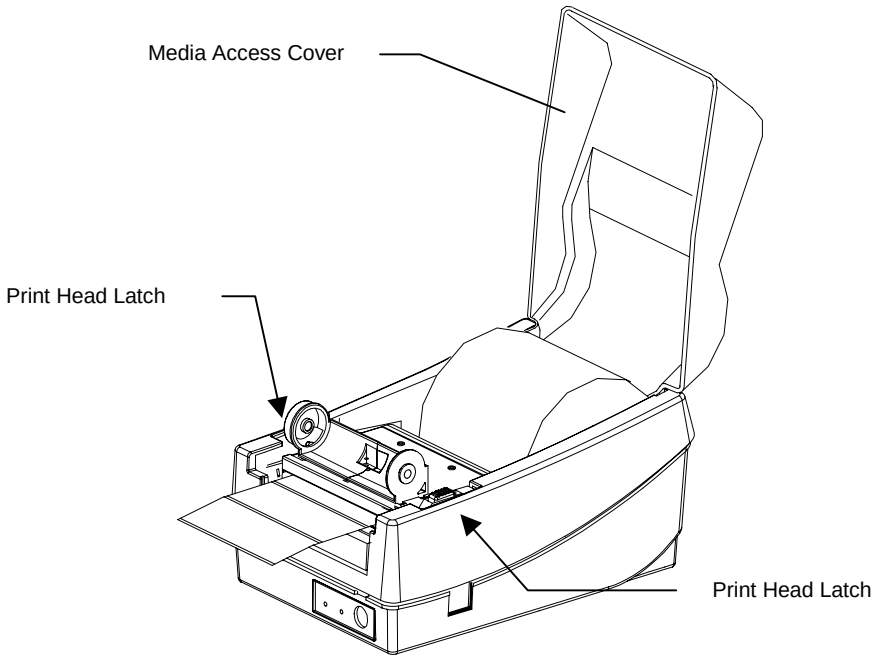


Figure 8 – Print Head Latches

3. Raise the print head module to the vertical position.

4. Verify that the **Ribbon Supply Core** and the **Take-up Core** have two slots on the left side of the core when the ribbon is positioned to go into the printer. These slots will be mated to the notches on the **Left Ribbon Holders**.

   ***Note**: The notches are the drive mechanism for the ribbon. If the slots in the core are not present or if they are in the wrong position, contact your ribbon supplier to obtain a correct ribbon.*

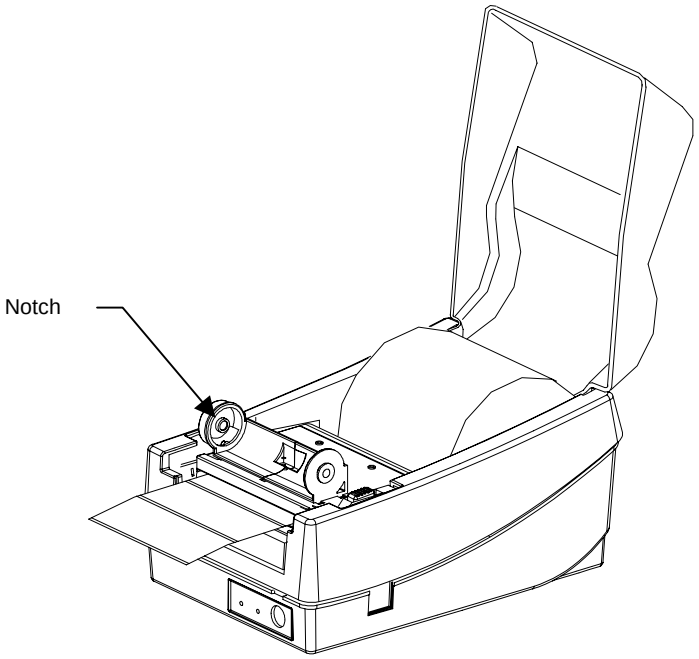


Figure 9 – Ribbon Holder Notch Location

5. Unwrap the **Ribbon Supply Roll** and place it into the **Supply Holder** of the print head module. Insert the left end of the **Ribbon Supply Roll** (end with slots) into the **Supply Holder** first then snap in the right end. Make sure that the ribbon core slots are mated with the notches on the ribbon drive mechanism.

6. Place the **Take-up Core** into the **Take-up Holder** of the print head module. Insert the left end of the **Take-up Core** into the **Take-up Holder** first then snap in the right end. Make sure that the **Take-up core** slots are mated with the notches on the ribbon drive mechanism.

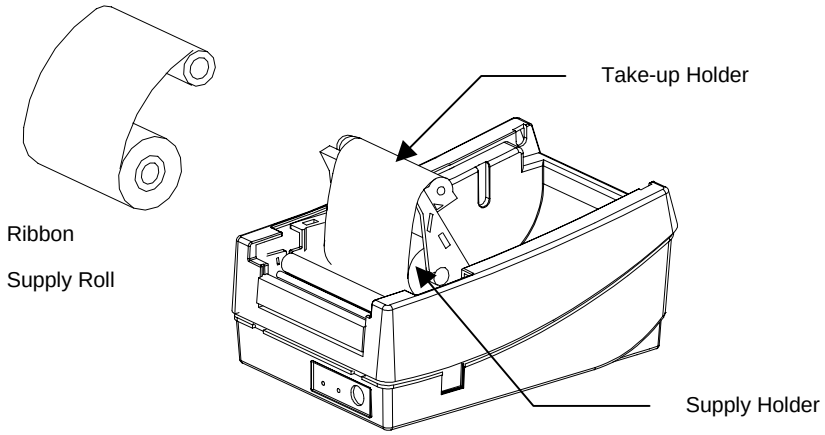


Figure 10 – Ribbon Loading

7. Manually rotate the **Take-up Core** until the transfer (typically black) portion of the ribbon, from the **Supply Holder** start onto the **Take-up Core**.

8. Close and latch the print head module.

Note: *The printer must be set to the Thermal Transfer mode to ensure the end of ribbon is detected. Refer to the section* ***Feature Management Mode*** *for instructions on how to change the Media Type feature.*

Loading Media

1. Open the **Media Access Cover** by lifting it up until it rests in the vertical position.
2. Slide the two **Print Head Latches** toward the back and unlock the print head module.
3. Raise the print head module.

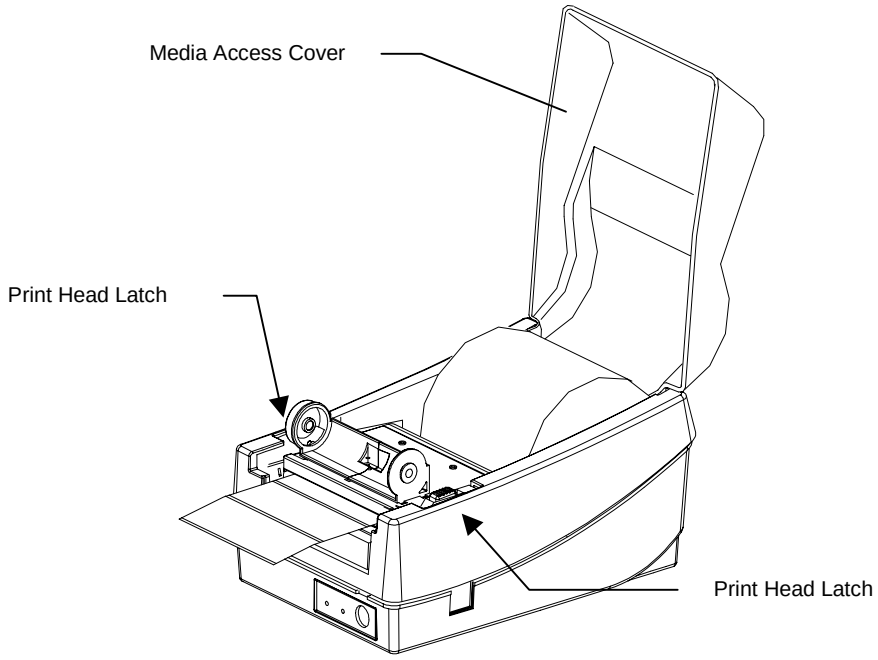


Figure 11 – Open Media Access Cover

4. Insert the **Media Spindle** into the core of the label media. The **Retainer Disk** should be on the right of the media with the smooth side toward the media.

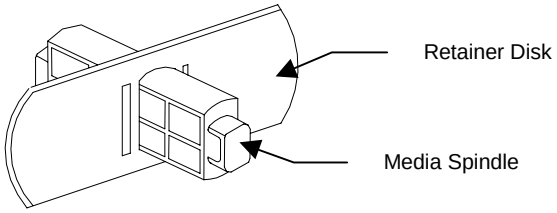


Figure 12 – Media Spindle and Retainer Disk

5. Insert the **Media Spindle** and media assembly into the spindle holder slots inside the printer. The labels should be face out feeding off the top of the roll.
6. Slide the media to the far left and then slide the **Retainer Disk** up against the media until it is snug.
7. In the base of the printer locate the **Right and Left Media Guides**.

Note: *The Right and Left Media Guides are 'U' shaped parts that are located at the bottom of the paper path. Only the Right Media Guide can be moved. The media should be snugly positioned in the 'U' portion of the guides.*

8. Slide the adjustable **Right Media Guide** to the far right of the printer.

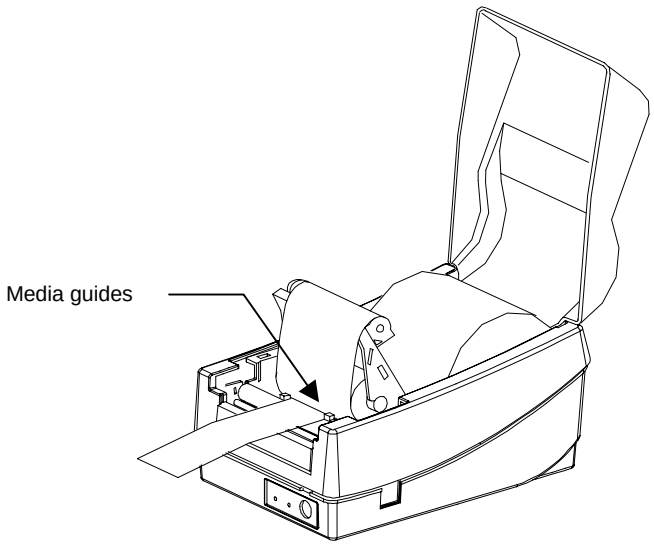


Figure 13 – Loading Media

9. Pull out 6 inches of media and thread the end of the media under the **Left Media Guide** and over the platen roller.
10. Slide the adjustable **Right Media Guide** to the left until it is gently touching the media.

    Note: *If the Media Guides are too loose the media may pull out from them and result in false media out errors. If the Media Guides are too tight the media may buckle and result in media jams.*

11. Close and lock the print head module by pressing firmly until the right and left **Print Head Latches** snap shut.
12. Close the **Media Access Cover**.

    Note: *The first time media is installed, the Media Sensor must be calibrated. After the first calibration no further calibration is required unless the media type (length, color, backing material, etc.) is changed or irregular feeding occurs. Refer to the section* ***Calibrating Media Sensors*** *for instructions on how to calibrate the media sensor.*

Loading Media when Peel and Present Option is Installed

1. Follow the same procedures in "**Loading Media**" up until step 11, close and lock the print head module.
2. Peel off 6 inches of labels from its backing.
3. Thread the label backing over the platen roller, over the **Peel and Present Bar** then back under the **Peel and Present Bar** towards the platen.
4. Turn on the power to "**1**" position.
5. With the print head module still open, press the **FEED** key. The printer will advance the backing. Once the label backing comes out of the front of the printer, turn off the power to "**O**" position.
6. Close and lock the print head module by pressing firmly until the right and left **Print Head Latches** snap shut.
7. Close the **Media Access Cover**.
8. Turn on the power to "**1**" position.
9. Press the **FEED** key to feed out the first label in the printer.

Note: *For the Peel and Present mode to function properly the Present Sensor must be enabled. Refer to the section* ***Feature Management Mode*** *for instructions on how to change the Present Sensor feature.*

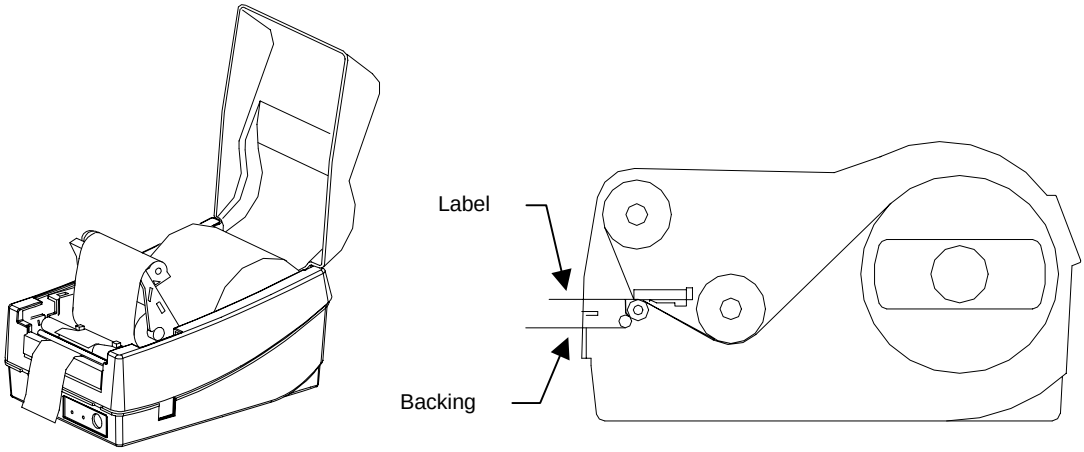


Figure 14 – Loading Media - Peal and Present

Calibrating Media Sensors

Important: The first time media is installed, the **Media Sensor** must be calibrated. After the first calibration no further calibration is required unless the media type (length, color, backing material, etc.) is changed or irregular feeding occurs.

1. Ensure the printer is powered off.
2. Verify that the media is properly loaded and routed as detailed in **Loading Media** section.
3. While pressing ***and holding*** the **FEED** key, power on the printer.
4. The **READY LED** (right most LED) will blink twice.
5. Continue to hold the **FEED** key until the printer begins to feed the media.
6. Release the **FEED** key.
7. When feeding stops the printer has completed the Media Sensor Calibration procedure. The print head module can be opened and the media may be manually reversed back to the first label to save label stock.
8. After closing the print head module, press the **FEED** key again to re-align the media to the top of the label.

Note: *For the Calibration procedure to function properly the proper Media Sensing Type (Gap or Black Bar) must be selected. This setting may be made using the FeatureMan program supplied.*

Printing the Configuration Label

1. Ensure the printer is powered off.
2. Verify that the media is properly loaded and routed as detailed in **Loading Media** Section.
3. While pressing ***and holding*** the **FEED** key, power on the printer.
4. The **READY LED** (right most LED) will blink twice.
5. Continue holding the **FEED** key while the media feeds for several label lengths.
6. When the printer begins to print the configuration label you may release the **FEED** key.

Note: *Media width at least 3 inches wide should be used for the configuration print out. The following figure is an example configuration printout. The feature settings on your printer may vary based on any setup changes made or firmware version installed in the printer.*

Media Type	**Thermal Transfer**
Media Sensing	**Gap**
Sensor Threshold	**70**
Media Length	**4.00 Inches**
Media Width	**4.00 Inches**
Present Distance	**+0.24 Inches**
Present Sensor	**Disabled**
Vert Print Align	**0.00 Inches**
Horz Print Align	**+0.20 Inches**
Vert Size Adjust	**0**
Print Darkness	**-8**
Print Speed	**6**
Interface Select	**Auto Select**
COM1: Baud Rate	**9600**
COM1: Parity	**None**
COM1: Data Bits	**8**
COM1: Handshake	**RTS & XON**
COM1: PAL Xmit	**Disabled**
Emulation Mode	**PAL Emulation**
Date	**Not Installed**
Time	**Not Installed**
Daylight Saving	**Disabled**
Firmware Rev.	**110156 A**
PAL Boot Drive	**Auto Detect**
Max Media Length	**12.00 Inches**
Keypad Lockout	**Disabled**
Label Count	**582**
Drive A: (131072)	**Empty**
Drive B: (262144)	**Empty**
Drive C: (0)	**Empty**
Drive D: (32768)	**Empty**

Figure 15 – Configuration Print Sample

KEYPAD OPERATION

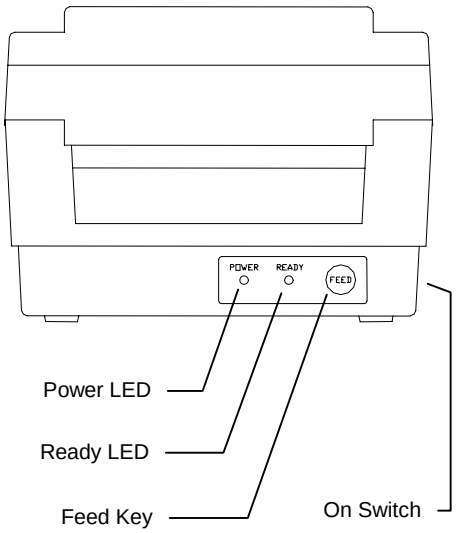


Figure 16 – Fastmark 400 Series Front Panel

LED Description

LED	*Function*
❍ POWER	**ON:** Printer is on **OFF:** Printer is off
❍ READY	**ON:** Printer is online **OFF:** Printer is either offline or in setup mode. (This mode is only available only when the printer is in the Feature Management mode.) **Steady Blinking:** System error occurred. (Refer to the section **Trouble Shooting and Maintenance** for information on errors.) **Flickering**: Printer is receiving data from serial or parallel interface

FEED Key Operation

Pressing the **FEED** key causes the printer to feed one label. During error conditions, when the **READY LED** is blinking, the **FEED** key will cancel the error.

Power up key functions

Several different functions can be selected by holding the **FEED** key down during power up. The table below indicates the function performed when the **FEED** key is pressed and held for different lengths of time during power up.

FEED Key Duration	***Power Up Function***
FEED key is released after the **READY LED** flashes once	The printer enters the Feature Management mode. Placing the printer in this mode while running the FeatureMan program, included on the product CD, provides an easy way to configure printer features.
FEED key is released after the **READY LED** flashes twice	**PAL™ program loaded:** When a PAL™ program is loaded it runs automatically on power up. Pressing this key bypasses the program and places the printer in normal mode. The most common reason to bypass a PAL™ program on power up is to allow a new or updated program to be loaded in the printer. **No PAL™ program loaded:** No function.
FEED key is released after the calibration sequence starts	The printer performs a Media Calibration test, which adjusts the sensor sensitivity, measures the label length, and measures gap/notch/hole. These values are stored in non-volatile memory.
FEED key is held down until the printer starts printing the configuration label	The printer generates a configuration label showing current feature settings, firmware revision, and PAL™ drive storage capacity.

Feature Management Mode

The printer can be easily configured using the Feature Management Mode. When this mode is enabled the printer uses the serial interface to communicate feature settings to the **FeatureMan** program running on the PC. The printer remains fully functional while in the Feature Management Mode with the exception that the serial interface is dedicated to the **FeatureMan** program and cannot be used for host communication. Once features such as baud rate or media type are configured, the values are retained in non-volatile memory (NVM). Refer to the **Setup Feature and Value List** for a description of the printer features and their valid range of values.

If the serial interface is used for host communication the printer must be powered off after con figuring the features, reconnected to the host, and powered back on to resume normal printing.

If the parallel interface is used for host communication the printer may be operated directly from the Feature Management Mode. In this mode of operation the **FeatureMan** program will continue to provide front panel control and will display all On line, Off line, PAL programming and error messages.

Use the following procedure to enable the Feature Management Mode and configure the printer features.

1. Install the **FeatureMan** program included on the product CD.
2. Attach the printer to the PC using the included serial cable. Be sure to note which COM port is used on the PC.
3. Run the **FeatureMan** program on the PC. Select the COM port used as noted in the previous step. The simulated printer LCD should display "*Connecting*".
4. Power on the printer while holding down the **FEED** key.
5. Release the **FEED** key after the **READY LED** flashes once.
6. The printer should now begin communicating with the **FeatureMan** program. The printer will run through a series of power up messages ending with an Off line message.

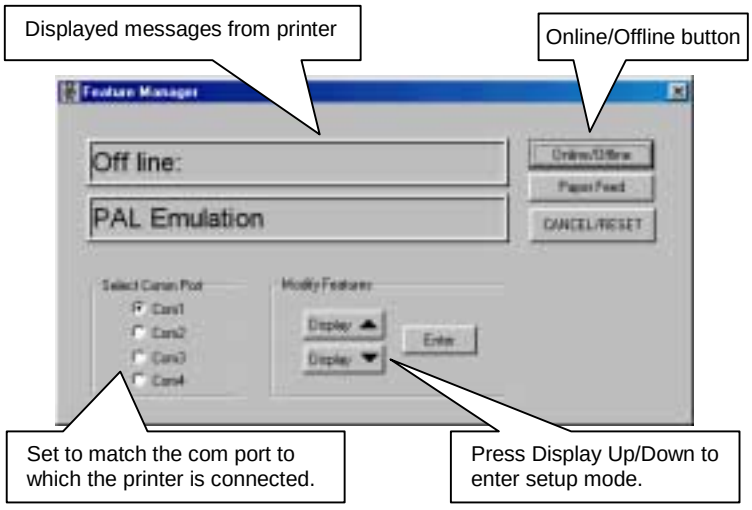


Figure 17 – FeatureMan Program

7. Click the Display Up/Down buttons to enter the setup mode.

8. Continue to click the Display Up/Down buttons as needed until the feature to be modified is displayed on the top line of the display. (ex. Baud Rate)

Figure 18 – Changing Features

9. Click the Enter button to enter the *Change* mode. The top line of the display should start blinking to indicate the *Change* mode is active.
10. Click the Display Up/Down buttons as needed to select the new value.
11. Click the Enter button to save the new value and exit the *Change* mode. The top line of the display should no longer be blinking.

Figure 19 – Changing Feature Values

12. When all features have been adjusted, click the Online/Offline button and the printer is now ready for use. If a PAL program is loaded, the message now displayed on the simulated printer LCD will vary depending on the program.

Setup Feature and Value List

FEATURE NAME	VALUE RANGE	DESCRIPTION
Media Type	[Direct Thermal, Thermal Transfer]	Set to Thermal Transfer if ribbon is used.
Media Sensing	[Gap, Continuous, Black Bar]	Set to match media sensing method.
Calibrate Media	(Form Length / Gap Length) automatically displayed and are not adjustable from this feature.	Click the **Enter** button to initiate the media calibration. The detected media length and Gap are displayed. Not required when Media Sensing is set to Continuous
Sensor Threshold	[0-255]	Automatically set by Calibration mode.
Media Length	[0.25 - 12.00] (Inches)	Automatically set by Calibration mode
Media Width	[0.5 - 4.05] (Inches, 4602) [0.5 - 4.25] (Inches, 4603)	Set to media width used.
Present Distance	[0.00 - 1.00] (Inches)	Adjust to position label at tear bar. If optional Peel and Present kit is installed, this feature will specify how far the label is presented. After setting this feature the printer will feed to the top of the next label.
Present Sensor	[Enable, Disable]	This feature controls the operation of the optional present sensor. When installed and enabled, the printer suspends printing after each label until it is removed by the operator. This is typically used when the peel and present option is installed but could also be used with the tear bar.

Setup Feature and Value List (continued)

Vert Print Align	[-0.50 - +0.50] (Inches)	Adjust to move printed image up or down on label. Positive values move image up. Negative values move image down. After setting this feature the printer will feed to the top of the next label.
Horz Print Align	[0.00 - 1.00] (Inches)	Adjust to move printed image left or right. Larger values move the image to the right.
Vert Size Adjust	[-60 - + 60]	Vertically expands or compresses print image. Negative values are compressed, positive values are expanded.
Print Darkness	[-12 - +12]	Adjust for optimal print darkness. Positive values are darker.
Print Speed	[2, 3] (IPS)	Adjusts print speed.
Interface Select	[Parallel Only, Serial Only, Auto Select]	Selects active interface while ignoring non-selected interface. Setting to Auto Select enables both interfaces and performs automatic port arbitration.
COM1: Baud Rate	[1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600]	Set to match host.
COM1: Parity	[None, Odd, Even]	Set to match host.
COM1: Data Bits	[7, 8]	Set to match host.
COM1: Handshake	[RTS, XON/XOFF, RTS & XON, None]	Set to match host.
COM1: PAL Xmit	[Enabled, Disabled]	Enables or disables trans-mission of PAL™ messages over serial interface.

Setup Feature and Value List (continued)

Emulation Mode	[PAL, ASCII, Hex, Display]	Selects active emulation. ASCII emulation is a basic text emulation. Hex and Display emulations are used for printing data in a format that shows the exact data being received by the printer. This is useful trouble shooting communications or host programming issues.
Date	[MM/DD/YYYY]	If RTC option is installed, this feature allows the date to be set. Click the **Enter** button to select Month/Date/Year to modify. Click the **Display Up/Down** buttons to modify then click the **Enter** button to select next parameter. When the full date is displayed the change is complete.
Time	[HH:MM:SS]	If RTC option is installed, this feature allows the time to be set. The hour is set in 24 hour format (0-23). Click the **Enter** button to select Hour:Minutes:Seconds to modify. Click the **Display Up/Down** buttons to modify then click the **Enter** button to select next parameter. When the full time is displayed the change is complete.
Daylight Savings	[Enabled, Disabled]	If RTC option is installed, this feature specifies whether the time is automatically updated for Daylight Savings time.
Print Features	N/A	Click the **Enter** button to print the feature list.
Print Test Label	N/A	Click **Enter** button to print a test label.
Firmware Rev.	N/A	Firmware P/N and revision

PAL™ PRINT LANGUAGE INTRODUCTION

This section provides an introduction to basic PAL™ print language abilities including fonts and bar codes. For information regarding PAL™ programming abilities, creating stand-alone applications, and other advanced topics please refer to the Fastmark PAL™ Print and Program Reference Manual.

The Windows driver included with the printer is an excellent method to generate PAL™ print sequence based commands. For example, to easily determine which PAL™ print sequences are used to produce a given label format, the Windows driver can be used to generate the necessary commands. In this case the basic label format would be generated using a Windows program, then the "print to file" option is selected. This will produce a file containing the exact commands required to produce a given label format. Using this file as a template a programmer can incorporate the necessary commands into the host or Windows based application. For more information refer to the section titled **Using the Windows Driver To Produce PAL™ Print Command Examples.**

Smooth Scalable Fonts

PAL™ Print and Program capable printers allow a font to be selected by name, scaled, rotated, and placed on the drawing service. The table below lists the unique names used to select the fonts and a print sample showing a specific point size. Please refer to the PAL™ Print and Program Reference manual for detailed information on the use of fonts.

Font	Point Size	PAL™ Identifier	Sample
Sans Serif	14	SansSerif	ABCDEabcde01234
OCRB	10	OCRB	ABCDEFabcdef012345

Table 1 – PAL™ Font List and Samples

Supported Bar Codes

PAL™ Print and Program capable printers allow a bar code to be selected by name, rotated if needed, and placed on the drawing surface. All popular linear and 2D bar codes are supported. Depending on bar code type, a number of parameters may be adjusted, as needed for example human readable, height, X dimension, check digits. Please refer to the PAL™ Print and Program Reference manual for detail information on the use of bar codes.

Bar Code	PAL™ Identifier	Sample
Code 39	/Code39	*123456*
Code 93	/Code93	1234567890
Code 128 A, B and C	/Code128	12345678
Interleave 2 of 5	/I2of5	1234567890

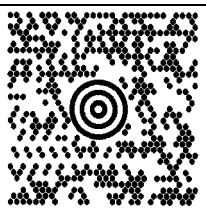
UPC-A	/UPCA	
UPC-E	/UPCE	
EAN-8	/EAN8	
EAN-13	/EAN13	
Codabar	/Codabar	
Postnet	/Postnet	
Maxicode	/Maxicode	
MSI Plessy	/MSI	
PDF-417	/PDF417	

Table 2 – PAL™ Bar Code List and Samples

PAL™ Print and Program Label Tutorial

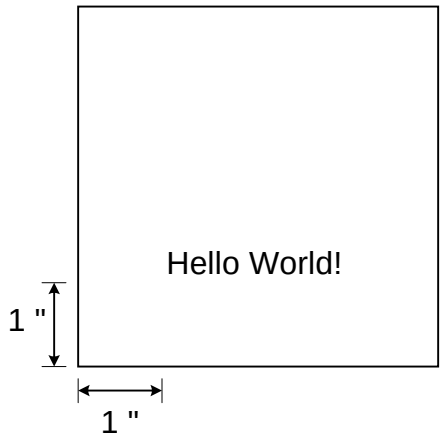
This Label Tutorial provides instructional steps showing the basic commands needed to create labels using PAL™ Print and Programming Language. This section covers some of the most common sequences used to print fonts, bar codes, lines etc. Each label introduces a basic concept and builds on the preceding label. Upon completion of the tutorial, a label consisting of text in two orientations, a line, a box and a bar code will be covered.

The examples may be created using a text editor and saved for subsequent transmission to the printer using the FlashWiz program found on the product CD, using the DOS copy command, or the send file command that is implemented in most terminal emulators.

For a deeper understanding of the concepts behind the sample label and the programming capabilities of PAL™, please refer to the PAL™ Pint and Program Reference Manual.

Note: *The PAL™ Print and Program command interpreter is case sensitive! All commands must be entered exactly as shown in the examples.*

Printing Text on a Label

Label Output	PAL™ Command Sequences
	/Sans12.00pt **findfont** 12 **scalefont** **setfont** 72 72 **moveto** (Hello World!) **show** **1 _showpages**

Purpose: Demonstrate how to print simple text on a label.

findfont - Establish the font to use

The fontname is preceded by a "/". In this example, a Sans Serif 12 point font was chosen. See Table 1 *for supported fonts.*

scalefont – Scale the selected font's size in points

It is typical to use the value indicated in the selected font. In this example, since Sans12.00pt was the selected font, the scaling was set to 12. Optionally, the command may be used to scale the font to a different size (e.g. 13 or 11)

setfont - Set the current font to the scaled font defined by the scalefont operator

This font will be used for all subsequent text unless another font is chosen.

moveto - Position the drawing cursor at the desired location

Moves the cursor position 1 inch to the right and 1 inch from the bottom (see box on next page for description of coordinate system).

show – Place the text on the label

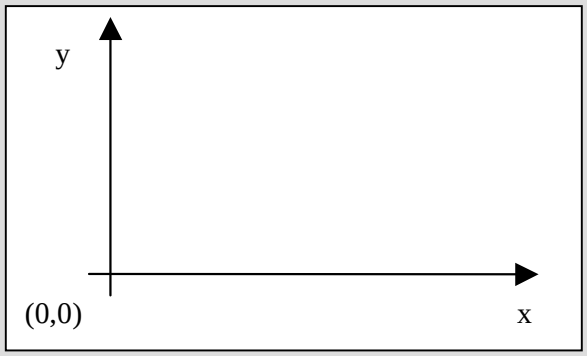
The text to be printed is enclosed by parentheses. The lower left-hand corner of the text is placed at the current cursor position. In this example the cursor position is established with the moveto command as described above.

_showpages - Print the created label

The "1" in the example indicates that one label is to be printed. If printing 10 labels, the command would be 10 _showpages.

PAL™ Print and Program Coordinate System

The default coordinate system used by PAL™ Print and Program Language is a traditional Cartesian coordinate system with the origin at the lower left-hand corner of the drawing surface:



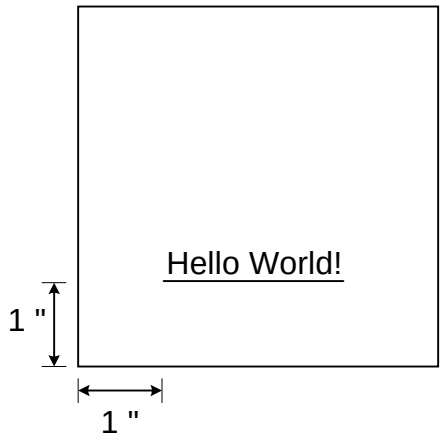
PAL Coordinate System

An internal "cursor" is maintained by PAL™ that keeps track of where to put the next print object, i.e. text or lines, etc. At power up this internal cursor is set to the origin or (0,0).

The default unit used for measuring distance in this coordinate system is the point. A point is a common typographical unit equivalent to 1/72". There are 72 points to an inch. The example sets the "cursor" to 72,72 to place text at a point 1 inch to right of the origin and 1 inch above.

Some printing commands such as *show* will change the location of the cursor. This happens for example after a text string is put on the label. After the text has been written to the label, the cursor is updated to point to the end of the text in preparation for the next string.

Printing a Line

Label Output	PAL™ Command Sequences
	/Sans12.00pt **findfont** 12 **scalefont** **setfont** 72 72 **moveto** (Hello World!) **show** 72 68 **moveto** 144 68 **lineto** **stroke** **1 _showpages**

Purpose: Demonstrate drawing lines on a label. This example underlines the "Hello World!" text from the previous example.

moveto - Position the drawing cursor at the desired location

The line will be positioned near the same location as the text, a bit lower in the y direction to allow for a small space between the bottom of the text and the line. This example uses the value 68, 4 points below the text (4/72 inches).

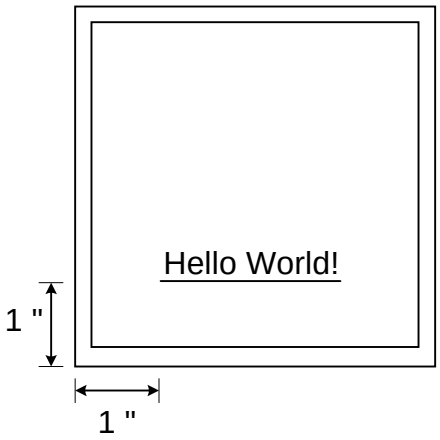
lineto – Set the dimensions for the line

The line will be drawn from the current position (72,68) to the position set by the lineto (144,68). The vertical position did not change resulting in a horizontal line stretching between the x locations of 72 and 144.

stroke – Draw the line

Actually draws the line specified by the lineto command.

Printing a Box

Label Output	PAL™ Command Sequences
	/Sans12.00pt **findfont** 12 **scalefont** **setfont** 72 72 **moveto** (Hello World!) **show** 72 68 **moveto** 144 68 **lineto** **30 30 moveto** **258 30 lineto** **258 258 lineto** **30 258 lineto** **closepath** **2 setlinewidth** **stroke** **1 _showpages**

Purpose: Demonstrate the drawing of a rectangular box. This example builds on the previous example by drawing a frame around the label. A 4" x 4" (288 points x 288 points) label is used in this example. The frame will be placed within 30 points of the edge of the label.

moveto - Position the drawing cursor at the desired location

This example assumes a 4" x 4" label (288 points x 288 points). A frame is drawn by moving to the starting point with the moveto operator.

lineto - Set the dimensions for the line

Forms three sides of the box with three separate lineto operators.

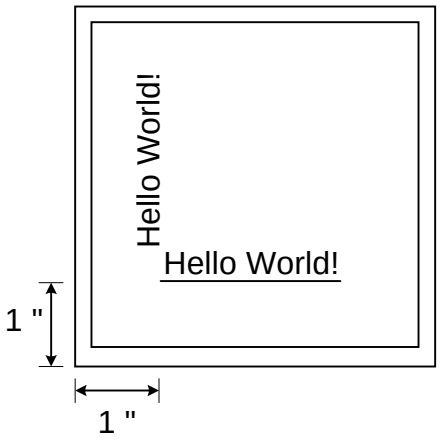
closepath - Close the shape

A box is drawn by drawing 3 sides of the box with the lineto operator followed by closepath, which closes the box by drawing the last line. It is important to use this operator to close a shape since the imaging algorithms may or may not actually close the shape due to rounding errors in the algorithm.

setlinewidth - Set the width of the lines

The width is set in points. In this example, the line width is set to 2 points. The line width value will remain the effective value for all lines until changed.

Rotate a Text Object

Label Output	PAL™ Command Sequences
	/Sans12.00pt **findfont** 12 **scalefont** **setfont** 72 72 **moveto** (Hello World!) **show** 72 68 **moveto** 144 68 **lineto** 30 30 **moveto** 258 30 **lineto** 258 258 **lineto** 30 258 **lineto** **closepath** **stroke** 72 90 **moveto** 90 **rotate** (Hello World!) **show** -90 **rotate** **1 _showpages**

Purpose: Demonstrate how to rotate text. This example builds on the previous example by placing another instance of "Hello World!" rotated 90 degrees.

moveto - Position the drawing cursor at the desired location

The text will be located at the same x position and slightly higher in the y direction relative to the previous text.

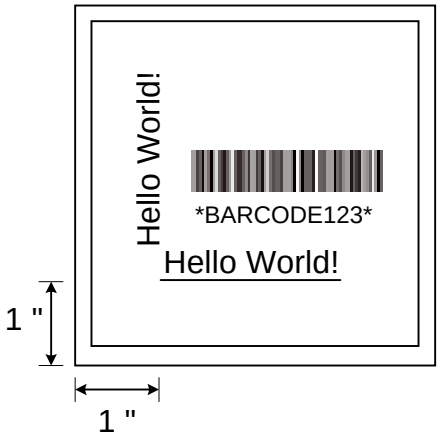
rotate - Rotate the coordinate system

In this example the coordinate system is rotated 90 degrees. Since the entire drawing surface is being rotated, it is important to reset the rotation by the same amount in the opposite direction (-90 degrees) after text has been placed.

show - Place the text on the label

The text to be printed is enclosed by parentheses. The lower left-hand corner of the text is placed at the current cursor position.

Printing a Bar Code

Label Output	PAL™ Command Sequence
	/Sans12.00pt **findfont** 12 **scalefont** **setfont** 72 72 **moveto** (Hello World!) **show** 72 68 **moveto** 144 68 **lineto** 30 30 **moveto** 258 30 **lineto** 258 258 **lineto** 30 258 **lineto** **closepath** **stroke** 72 90 **moveto** 90 **rotate** (Hello World!) **show** -90 **rotate** **100 100 moveto** **(BARCODE123)** /Code39 **_barcode** **1 _showpages**

Purpose: Demonstrate how to print a bar code. This example builds on the previous example by placing a bar code near the center of the label.

Moveto - Position the drawing cursor at the desired location

Position cursor at desired location for bar code.

(BARCODE123) – String object defining the barcode content.

The parentheses delimit the text string and are not part of the barcode. The actual bar code value in this case is BARCODE123, i.e. parentheses not included.

_barcode – Place the specified bar code on the label

The type of bar code is referenced by a '/' followed by the name of the bar code type. For a list of supported bar codes, see Table 2.

INTRODUCTION TO PAL™ ADVANCED TOPICS

Advanced Overview

As previously mentioned the PAL™ Print and Program Language is both a powerful printing and programming language. For example the included Windows driver takes advantage of the powerful printing portion of the language. Your VAR or internal programming staff may take advantage of some of the programming abilities. The fact that a single printer language supports both capabilities is unique. PAL™ Print and Program enabled printers can be used in many ways not supported by traditional printers.

A full technical description of the PAL™ Print and Program Language is beyond the scope of this manual. Please refer to the PAL™ Print and Program Language Reference manual for details.

For assistance developing PAL™ applications or solutions for your unique labeling requirements, please contact your sales representative.

PAL™ Print and Program Language Features

- Page Description Language
- No control Codes (easy to pass through networks, filters, etc.)
- Compatible with midrange and mainframe computers and any host or PC programming language.
- Is an executable language
  - Procedures can be defined
  - Functions
  - Conditional statements
  - Loops
- Can create and use simple and/or complex data formats
- Can gain full access to resident printer features
  - LCD
  - Interfaces
  - Keys
  - Keyboards
  - Internal Memory drives
- Language is Reverse Polish Notation (RPN)
  - Like HP Calculator
  - Arguments first then operators i.e. 4 6 + versus 4 + 6 =
  - Data passed on stack
- PAL™ Coding Structure is Free Form
  - All operators, objects, and data are separated by whitespace: CR, CR+LF, LF, LF+CR, Tab, or Space.
  - Extra lines in data are OK
  - Comments may be added proceeded by % character.
- Powerful Object handling
  - Basic Objects: Integers, Fixed-Point, Boolean
  - Composite Objects: String, Name, Arrays, Dictionaries, Procedures

Sample Demo Files

Several text files containing PAL™ examples are included on the product CD. These files show programming techniques and examples, which may be incorporated into host or PC programming or just used as reference. Each text file includes descriptive comments within the file. Below is a description of each file:

File Name	Description
Pal_Procs_and_Formats.txt	This file contains a number of print utilities written as PAL™ procedures. These were designed to illustrate common printing commands and the use of common PAL™ operators. These utilities once defined may simplify common printing functions. Also within this file is a number of sample label Formats. These label formats make extensive use of the print utilities defined in this file. These formats show how once a label format is defined it may be used by simply listing the variable data and calling the format name.
Format_Demo.txt	This file shows how to call up and use the label formats defined in the file Pal_Procs_and_Formats.txt
Proc_Demo.txt	This file shows how to call up and use the print utility procedures defined in Pal_Procs_and_Formats.txt.
Proc_Template.txt	This file shows the format of the calls to the print utility procedures defined in Pal_Procs_and_Formats.txt
Format_Template.txt	This file can be used to define new label formats. It includes all the print utilities defined in Pal_Procs_and_Format.txt. Once new label formats are defined, this file may be copied to the printer and the new formats may be called up and used as demonstrated by the other files.

Note: *Before using any of the print utility procedures or label format procedures defined in the text file Pal_Procs_and_Formats.txt, this file must be copied to the printer so that the PAL™ interpreter can parse these new procedures. The FlashWiz utility included on the product CD may be used to copy this file to the printer prior to use.*

Example of a Procedure defined in PAL™

The following procedure is defined in Pal_Procs_and_Formats.txt and illustrates how PAL™ commands may be combined in a procedure to create a completely new function or capability. The file Pal_Procs_and_Formats.txt must be copied to the printer prior to using any of these utilities. The following utility shows how PAL™ operators are used to create a simple Box draw procedure. This Box procedure makes use of another procedure defined called inchtopts. This procedure takes measurements in inches and converts to points which is the native unit used by PAL™. The advantage of using a procedure like this to draw boxes is to simplify the use of the PAL™ language. Instead of issuing 7 PAL™ commands to draw a box, this single procedure may be called with 5 parameters (lower left corner x,y, upper right corner x,y, and line width).

```
%========================================================================
% Box draw procedure
% Usage:   botX(in.)  botY(in.)   topX(in.)   topY(in.)   lwidth(in.)  Box
% Example: 0.1        0.1         3.9         1.9         0.01         Box
%
%                  (topX, topY)
%              +--------*
%              |        |
%              |        |
%              *--------+
%         (botX, botY)
%
%========================================================================
/Box
{

  /lwidth exch def
  /topY exch def
  /topX exch def
  /botY exch def
  /botX exch def

  botX inchtopts botY inchtopts moveto
  botX inchtopts topY inchtopts lineto
  topX inchtopts topY inchtopts lineto
  topX inchtopts botY inchtopts lineto
  closepath
  lwidth inchtopts setlinewidth
  stroke

} bind def
```

Example of calling a Procedure from a host application

The two lines preceded by % are comment lines ignored by the PAL™ interpreter and don't actually need to be transmitted to the printer. The last line shows the actual call to the procedure named Box defined in Pal_Procs_and_Formats.txt. Note that floating point numbers must have a leading 0 for example 0.1 instead of .1. Also note while the example below uses many spaces between parameters, this is only for clarity and only a single whitespace character is actually needed i.e. 0.1 0.1 3.9 1.9 0.01 Box would also work.

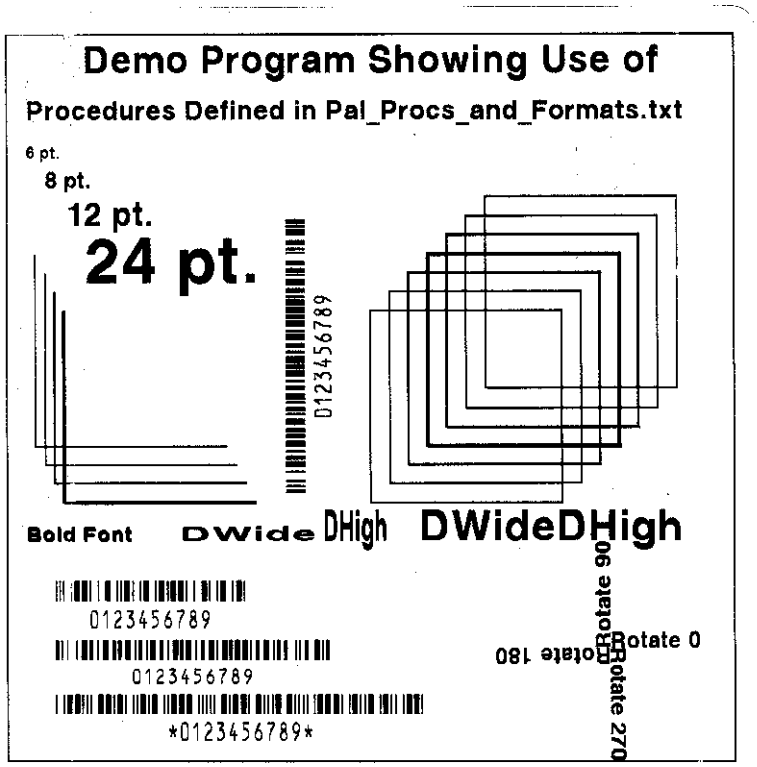
```
% Box draw

% botX(in.) botY(in.)  topX(in.) topY(in.) lwidth(in.) Box

  0.1       0.1        3.9       1.9       0.01        Box
```

Demo Label showing use of Print Utility Procedures

After the file Pal_Procs_and_Formats.txt has been copied to the printer, a number of new procedures are now defined in the printer (until powered off). These procedures have been written specifically to demonstrate how to use the PAL™ Print and Program operators to produce printed output. These procedures also provide easy ways to print various objects without actually needing to know the PAL™ language. The print utility procedures may be incorporated into custom programming or just used as reference to better understand the PAL™ Print and Program operators. After downloading Pal_Procs_and_Formats.txt to the printer, copy the file Proc_Demo.txt to the printer. This file uses the various print utility procedures defined to produce a demo label. Using a text editor, open the file Proc_Demo.txt file to see how these various utilities may be used as shown in the demo label print sample below.

The interesting thing to note in the Proc_Demo.txt file is that the only actual PAL™ operator used is the showpage operator. The other procedure names used such as Printfont and Printbarcode are not native PAL™ operators but new procedures defined. A careful study of the definition of these procedures will reveal the actual PAL™ operators used.

The basics of creating procedures and using them in the PAL™ language should start to make sense after reviewing how the procedures are defined (in Pal_Procs_and_Formats.txt) and how they can be used (in Proc_Demo.txt). New procedures performing virtually any task can now be written using the PAL™ Print and Program Reference manual for detailed information on additional PAL™ operators. The existing procedures may be modified as needed to meet requirements or completely new procedures may be written.



Example of How to Define Label Formats

The example below shows how a label format can be defined as a PAL™ procedure. This label format called Mailing_Label uses 5 variables. Notice how the variables are defined in reverse order compared to how this format is called. This format is defined in Pal_Procs_and_Formats.txt. Looking at this file will also reveal that this procedure makes use of the print utility procedures also defined in this file. Instead of using these print utilities, these formats could also use direct PAL™ operators. This approach however allows label formats to be defined with very little knowledge of the PAL™ Print and Program Language. In this label format the procedures Printfont, PrintBoldfont, and Printbarcode are used. These are not native PAL™ operators but new procedures also defined in this file. Using print utility procedures like this in the label format makes it easy to define formats using inches as the measurement system with very little knowledge of PAL™ operators.

The procedure below defines a label format called Mailing_Label. This name is case sensitive. The first 5 lines after the { character assign the passed parameters to names. These names are in turn used when needed to pass information to PAL™ operators or in this case other PAL™ procedures. When the label format is called, the very first parameter specified will be the name. Notice in the definition below that the Name variable is actually the last defined. This is due to the stack based nature of PAL™. The first defined parameter on the stack is the last off the stack (just like a stack of plates for example, last one stacked is first one off). The line below shows that at an X,Y position of 0.25", 0.75", the name variable will be printed in bold at a size of 12 points with no rotation. This PrintBoldfont procedure makes it easy to place text of any size and rotation at any position just by specifying the parameters in correct order then calling the PrintBoldfont.

```
0.25 0.75 0 12 Name PrintBoldfont
```

If should also be noted that the label format defined below is actually just another PAL™ procedure definition just like the PrintBoldfont. Parameters are passed to these procedures in the same way. The big difference is that the PAL™ operator ***showpage*** is included in the label format procedure which will actually cause a label to be printed each time this format is called.

```
%================================================================================
% Mailing_Label procedure definition
% Usage:   Name       Street          CityState     Zip5    Zip4   Mailing_Label
% Example: (John Doe) (1234 Main St.) (Anytown, NC) (12345) (1234) Mailing_Label
%================================================================================
/Mailing_Label
{
  /Zip4 exch def
  /Zip5 exch def
  /CityState exch def
  /Street exch def
  /Name exch def

  0.25 0.75 0 12 Name PrintBoldfont
  0.25 0.55 0 12 Street Printfont
  0.25 0.35 0 12 CityState (  ) concat Zip5 concat (-) concat Zip4 concat Printfont

  0.1 0.1 0 0.1  Zip4 Zip5 concat /Postnet Printbarcode

  showpage

} bind def
```

Example of calling Label Format from Host Application

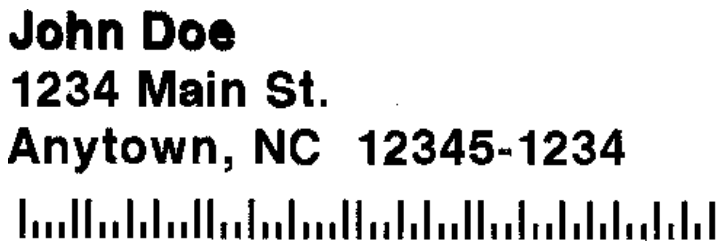
The example below shows how a form named Mailing_Label that was defined in the file Pal_Procs_and_Formats.txt may be called from a host or PC application. The file Pal_Procs_and_Formats.txt must be copied to the printer first before the label format is defined. Also it is possible to store the formats in Flash memory which is an advanced topic not covered here. Other examples of calling these formats may be found in Format_Demo.txt

Notice how strings are enclosed in ( ). Also notice how variables are separated by whitespace which may be a single space character or a CR+LF. Two possible call formats are shown below each producing the same output as the label sample below shows.

The actual label format name is shown in bold for clarity.

```
(John Doe)
(1234 Main St.)
(Anytown, NC)
(12345) (1234)
Mailing_Label

Or an equivalent format:

(John Doe) (1234 Main St.) (Anytown, NC) (12345) (1234) Mailing_Label
```

Print sample produced by label format Mailing_Label.



WINDOWS PRINTER DRIVER
Windows 2000 Driver Installation

1. From the task bar select Start->Settings->Printers. The printers folder should be displayed.
2. Double click the Add Printer icon.
   - The Add Printer Wizard dialog should be displayed.
   - Click the Next button.
3. Select the Local printer option and click the Next button.
4. Select the desired printer port and click the Next button.
5. From the Manufacturers list dialog click the Have Disk button.
6. From the Install From Disk dialog browse to the location of the driver files and click OK.
7. From the Install from Disk dialog, select the displayed .inf file and click OK.
8. Click OK from the Install From Disk dialog.
9. The Add Printer Wizard should now display the available models for this driver. Select the model you wish to install and click Next.
10. Select Replace existing driver and click Next.
11. From the Name your printer dialog, enter the name you wish to call the printer. This name will be displayed in the Printers Dialog. Also, if you want this printer to be the default system printer, click this check box now. Click the Next button.
12. Select the desired option from the Printer Sharing dialog and click Next.
13. Select No to the print test page question since the test page does not fit within the printers page size and click Next.
14. Click the Finish button on the Completing the Add Printer Wizard. If a Hardware Installation message is displayed, click Continue Anyway. A printer icon should be added to the list of printers. If a message is displayed indicating the installation could not be completed, you may need to change the security level for installing drivers and repeat the installation process.

If you have set the printer as the default printer, the driver is now ready for use.

If you did not set the printer as the default printer, you can change the setting by right clicking on the printers' icon and select 'Set as Default' from the dialog.

If you are replacing an existing driver, you may have to reboot your system in order to reload the new driver.

Selecting Printer Fonts

When the driver is installed, a custom True Type font is also installed called AMT Sans Serif which closely matches the resident scalable font in the printer. This font may be printed in a variety of point sizes. Using this font increases print speed and minimizes the data transmitted to the printer. Use of other True Type fonts are supported but are printed as graphics. To use the printer resident font:

1) For each size font highlight the font using the mouse.
2) From your applications font selection list, select AMT Sans Serif font.
3) Using your applications font size ability, select the point size as needed to produce the size font desired.

Repeat for all text area's for which you will use the printer resident font.

Printing Bar Codes From Windows 2000 Applications

Using the Fastmark PAL™ Windows driver, printing bar codes from any Windows application is possible. These bar codes are printed using the internal bar code ability of the printer resulting in superior bar code quality. The following steps indicate how to do this:

1) Ensure the Fastmark PAL™ Driver is selected within this application.

2) Select the media size to be used for this label.

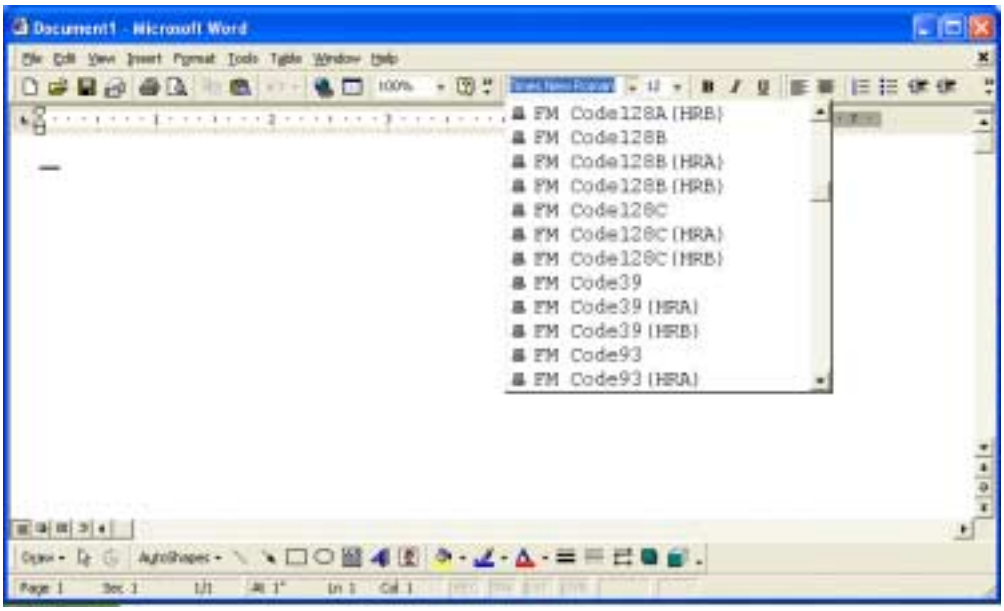
3) Position the text or numeric data at the approximate position it is to be printed at using whatever methods are possible within the particular program you are using. You can use a text box if supported by your application.

4) If your application supports text rotation, you can do this now. Some applications may require you to use a "text box" to generate rotated text.

5) Highlight this text or numeric data as you normally would before changing the font.

6) Using the normal method of selecting fonts such as a pull down menu, select one of the bar code fonts displayed such as FM Code 128A.

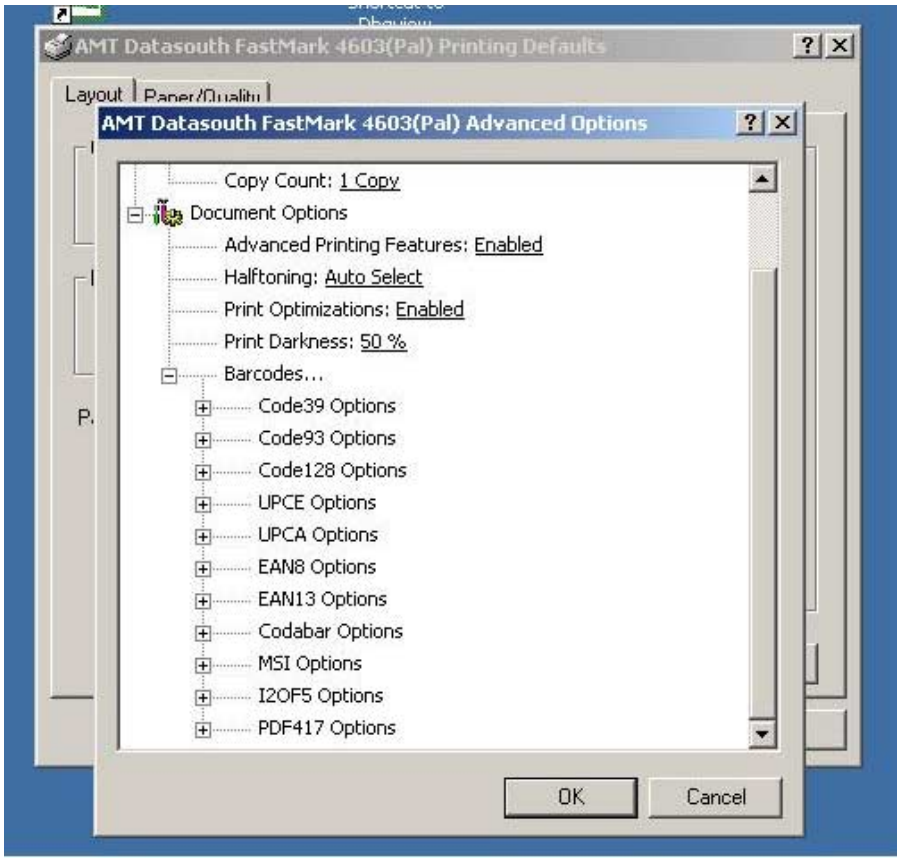
Note: *The font will still be displayed as text or numeric data however when printed will appear as a barcode.*



Adjusting the Windows 2000 Driver Bar Codes

Using the method just described, any Windows application can produce bar codes using the Fastmark drivers. Simply selecting the font as a bar code font does this. The driver also provides ways to finely adjust the bar code printed. For example, human readable text may be enabled or disabled. The X dimension may be adjusted. Depending on the bar code type other parameters may be adjusted for example enabling or disabling a check digit.

Each bar code property may be accessed by selecting the driver then Advanced Options dialog box. Each bar code type is listed. Click on the + symbol to expand the possible selections for a particular bar code. Then the settings for that bar code may be adjusted and will be saved with the current document.



Windows XP Driver Installation

1. Go to the Printers and Faxes folder.
2. In the Printer Tasks window double click the Add a Printer icon. The Add Printer Wizard dialog should be displayed. Click the Next button.
3. Select the Local printer option and click the Next button.
4. If the New Printer Detection dialog is displayed, click the Next button to install manually.
5. Select the desired printer port and click the Next button.
6. From the Manufacturers list dialog click the Have Disk button.
7. From the Install From Disk dialog browse to the location of the driver files. An installation file should be displayed. The file has an .inf and the filename depends on the model being installed. Select this file and click Open.
8. Click OK from the Install From Disk dialog.
9. The Add Printer Wizard should now display the available models for this driver. Select the model you wish to install and click Next.
10. Select Replace existing driver. Click Next.
11. Choose whether to install the printer as the default printer. Click Next.
12. Select No to the print test page question since the test page does not fit within the printers page size and click Next.
13. Click the Finish button on the Completing the Add Printer Wizard. If a Hardware Installation message is displayed, click Continue Anyway. A printer icon should be added to the list of printers. If a message is displayed indicating the installation could not be completed, you may need to change the security level for installing drivers and repeat the installation process.

If you have set the printer as the default printer, the driver is now ready for use.

If you did not set the printer as the default printer, you can change the setting by right clicking on the printers' icon and select 'Set as Default' from the dialog.

If you are replacing an existing driver, you may have to reboot your system in order to reload the new driver.

Selecting Printer Fonts

When the driver is installed, a custom True Type font is also installed called AMT Sans Serif which closely matches the resident scalable font in the printer. This font may be printed in a variety of point sizes. Using this font increases print speed and minimizes the data transmitted to the printer. Use of other True Type fonts are supported but are printed as graphics. To use the printer resident font:

1) For each size font highlight the font using the mouse.
2) From your applications font selection list, select AMT Sans Serif font.
3) Using your applications font size ability, select the point size as needed to produce the size font desired.

Repeat for all text area's for which you will use the printer resident font.

Printing Bar Codes From Windows XP Applications

Using the Fastmark PAL™ Windows driver, printing bar codes from any Windows application is possible. These bar codes are printed using the internal bar code ability of the printer resulting in superior bar code quality. The following steps indicate how to do this:

1) Ensure the Fastmark PAL™ Driver is selected within this application.

2) Select the media size to be used for this label.

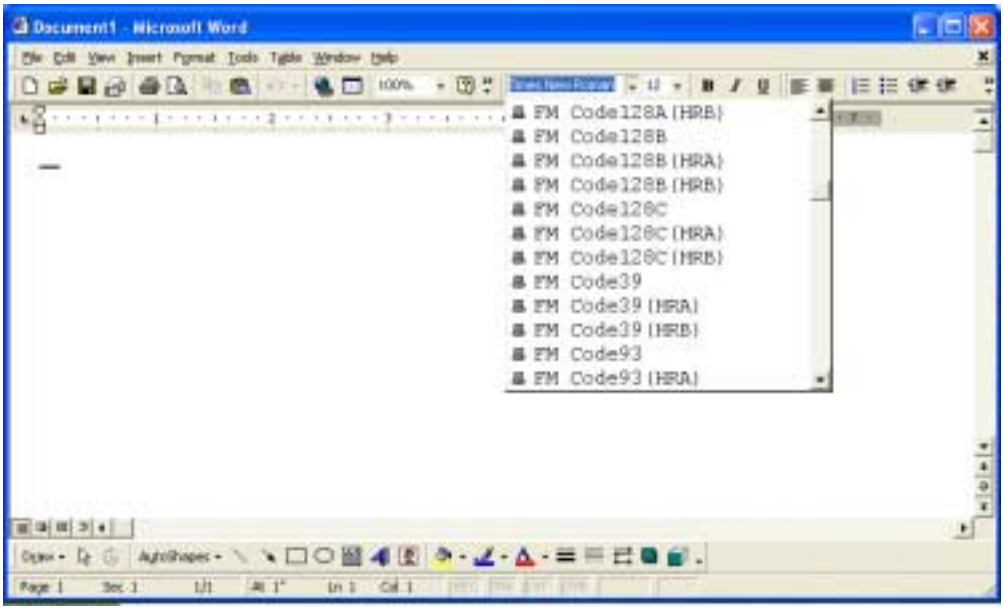
3) Position the text or numeric data at the approximate position it is to be printed at using whatever methods are possible within the particular program you are using. You can use a text box if supported by your application.

4) If your application supports text rotation, you can do this now. Some applications may require you to use a "text box" to generate rotated text.

5) Highlight this text or numeric data as you normally would before changing the font.

6) Using the normal method of selecting fonts such as a pull down menu, select one of the bar code fonts displayed such as FM Code 128A.

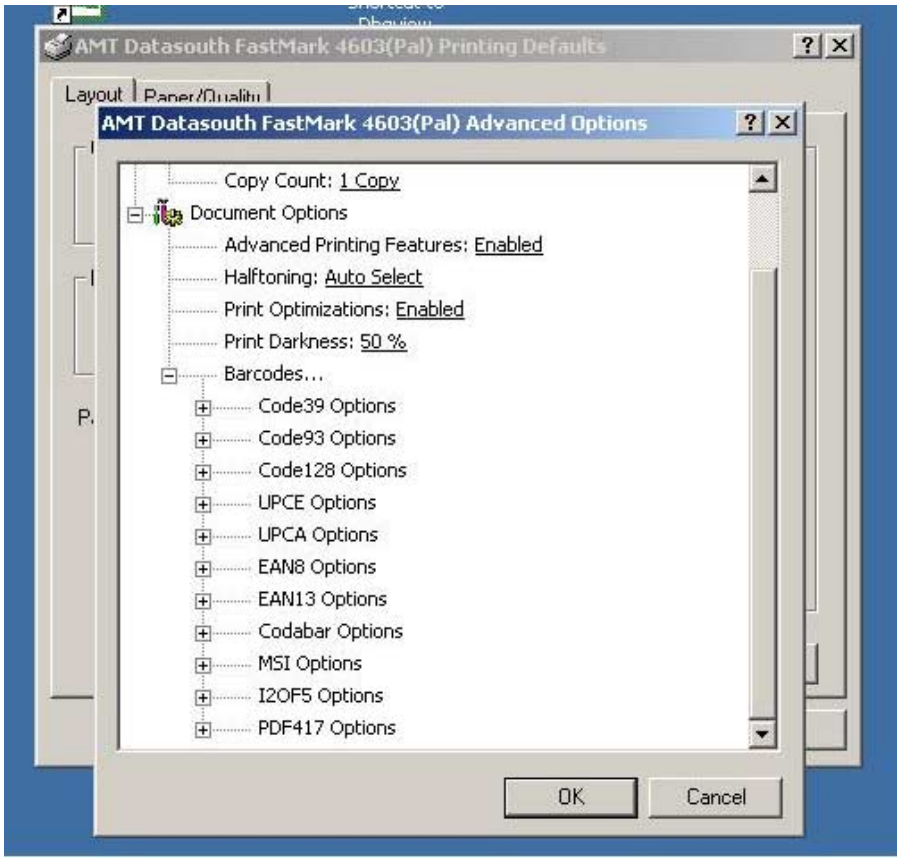
Note: *The font will still be displayed as text or numeric data however when printed will appear as a barcode.*



Adjusting the Windows XP Driver Bar Codes

Using the method just described, any Windows application can produce bar codes using the Fastmark drivers. Simply selecting the font as a bar code font does this. The driver also provides ways to finely adjust the bar code printed. For example, human readable text may be enabled or disabled. The X dimension may be adjusted. Depending on the bar code type other parameters may be adjusted for example enabling or disabling a check digit.

Each bar code property may be accessed by selecting the driver then Advanced Options dialog box. Each bar code type is listed. Click on the + symbol to expand the possible selections for a particular bar code. Then the settings for that bar code may be adjusted and will be saved with the current document.



Windows NT/9x Driver Installation

1. Go to the Printers and Faxes folder.
2. Double click the Add Printer icon. The Add Printer Wizard dialog should be displayed. Click the Next button.
3. Select the Local printer option and click the Next button.
4. Select the desired printer port and click the Next button.
5. From the Manufacturers list dialog click the Have Disk button.
6. From the Install From Disk dialog browse to the location of the driver files and click OK.
7. From the Install from Disk dialog, select the displayed .inf file and click OK.
7. Click OK from the Install From Disk dialog.
8. The Add Printer Wizard should now display the available models for this driver. Select the model you wish to install and click Next.
9. Select No to the print test page question since the test page does not fit within the printers page size and click Next.
10. Click the Finish button on the Completing the Add Printer Wizard. A printer icon should be added to the list of printers.

If you have set the printer as the default printer, the driver is now ready for use.

If you did not set the printer as the default printer, you can change the setting by right clicking on the printers' icon and select 'Set as Default' from the dialog.

If you are replacing an existing driver, you may have to reboot your system in order to reload the new driver.

Selecting Printer Fonts

The driver has a resident font called AMT Sans Serif which is displayed in the application's font list. This font may be printed in a variety of point sizes. Using this font increases print speed and minimizes the data transmitted to the printer. Use of True Type fonts are supported but are printed as graphics. To use the printer resident font:

1) For each size font highlight the font using the mouse.
2) From your applications font selection list, select AMT Sans Serif font.
3) Using your applications font size ability, select the point size as needed to produce the size font desired.

Repeat for all text area's for which you will use the printer resident font.

Printing Bar Codes From Windows NT/9x Applications

Using the Fastmark PAL™ Windows driver, printing bar codes from any Windows application is possible. These bar codes are printed using the internal bar code ability of the printer resulting in superior bar code quality. The following steps indicate how to do this:

1) Ensure the Fastmark PAL™ Driver is selected within this application.

2) Select the media size to be used for this label.

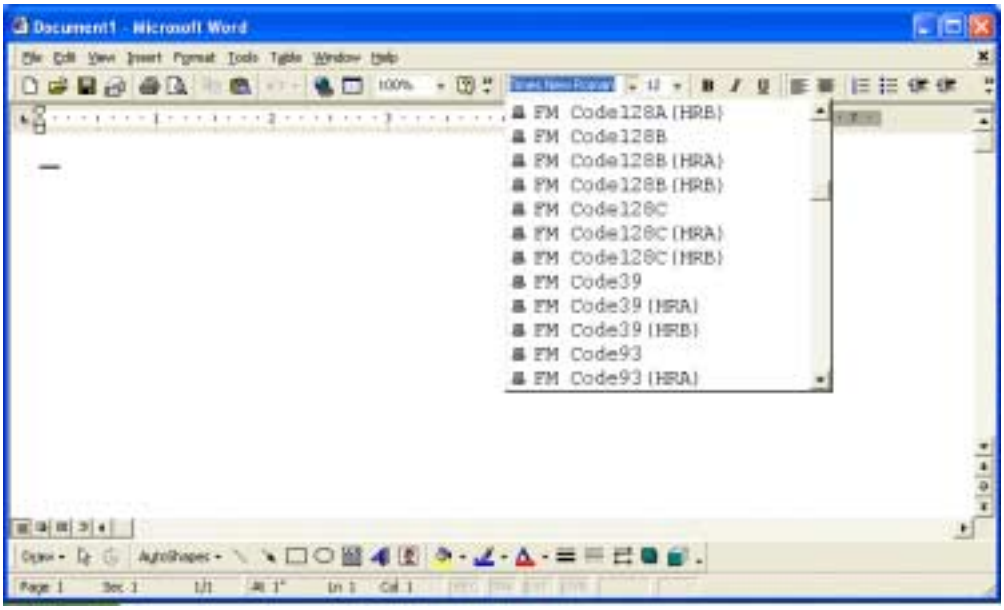
3) Position the text or numeric data at the approximate position it is to be printed at using whatever methods are possible within the particular program you are using. You can use a text box if supported by your application.

4) If your application supports text rotation, you can do this now. Some applications may require you to use a "text box" to generate rotated text.

5) Highlight this text or numeric data as you normally would before changing the font.

6) Using the normal method of selecting fonts such as a pull down menu, select one of the bar code fonts displayed such as FM Code 128A.

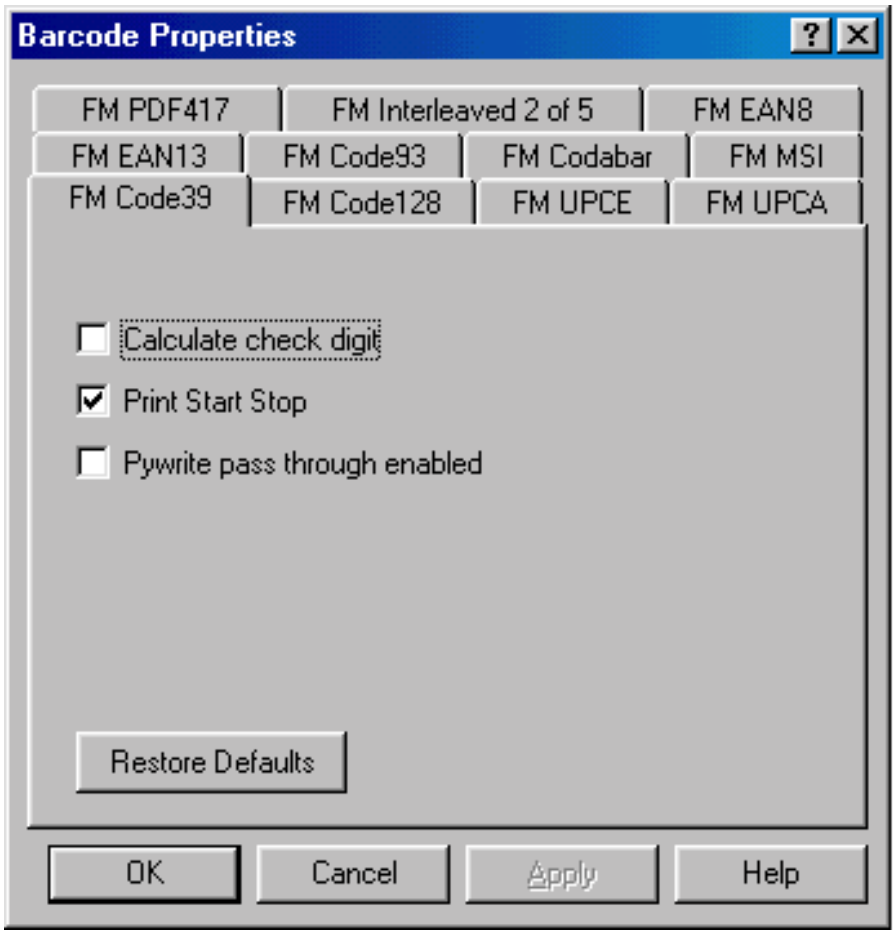
Note: *The font will still be displayed as text or numeric data however when printed will appear as a barcode.*



Adjusting the Windows NT/9x Driver Bar Codes

Using the method just described, any Windows application can produce bar codes using the Fastmark drivers. Simply selecting the font as a bar code font does this. The driver also provides ways to finely adjust the bar code printed. For example, human readable text may be enabled or disabled. The X dimension may be adjusted. Depending on the bar code type other parameters may be adjusted for example enabling or disabling a check digit.

Each bar code property may be accessed by selecting the driver then Advanced Options dialog box. Each bar code type is listed. Click on the + symbol to expand the possible selections for a particular bar code. Then the settings for that bar code may be adjusted and will be saved with the current document.



Using the Windows Driver To Produce PAL™ Print Command Examples

To use the Windows driver to produce a PAL™ sample for use in host programming do the following:

1) Design the label as needed using suitable Windows application.
2) Where possible always use the printer resident font such as AMT Sans Serif.
3) Use bar code fonts for data fields to be printed as bar codes. Use the driver Advanced Properties dialog box to select various options for the bar codes to be printed.
4) While working on the label format, print to the attached Fastmark printer as needed to finally adjust the position of text, lines, boxes, graphics, and bar codes.
5) When the printed output closely matches the desired output, use the Print to File option of the driver and give the output a descriptive name with a .txt extension. For example shipping.txt.
6) Edit this text file using any text editor for a sample PAL™ Print and Program commands. This file may be further adjusted referring to the PAL™ Print and Program Reference Manual, or used as is. It may be incorporated into a host program or just used as a reference.

TROUBLESHOOTING AND MAINTENANCE

The printer can detect the following errors. In each case the **READY LED** will blink at a steady rate to indicate there is an error. If the error is not obvious (Media or Ribbon Out) use the **Feature Management Mode** (and **FeatureMan** program) to determine the error. When the **Feature Management Mode** is enabled the **FeatureMan** program will display the corresponding error message.

Printer Detected Errors

LCD ERROR MESSAGE	DESCRIPTION	RECOVERY
Error: Power Fail	The printer has detected +24VDC has dropped below a minimum acceptable level causing the printer to back up all settings to EEPROM.	Turn printer off, wait 5 seconds and turn back on.
Error: Media Out	The printer has detected a media out condition while printing or feeding media.	Open print head and replace media. Close print head and press the **FEED** key. If media appears to be loaded, check for proper routing, check Media Sensing feature to make sure it matches media type used either gap or black bar. Run the Media Calibration test.
Error: Media Feed	A media feed error is displayed when the printer is unable to find the top of form indication as configured either gap, or black bar.	Open print head and verify media is loaded correctly. Check the feature Media Sensing and verify it is set to the type of media used either gap, or black bar. Close print head and press the **FEED** key. Run the Media Calibration test.
Error: Ribbon Out	Reported when the printer detects the end of ribbon while printing or feeding media after the current label is complete.	Open the print head, remove old ribbon cores, replace with new ribbon ensuring the routing is correct. Close print head and press the **FEED** key. If this is direct thermal application, change Media Type feature to Direct Thermal.

Printer Detected Errors (Continued)

Error: Image System	Error reported by the imaging sub-system indicating a memory shortage or other graphics problem.	Press the **FEED** key to remove current print job. Cycle power on the printer. Verify communications settings are correct. Re-send print job.
Error: Data Format	The printer has detected a data format or parity error on the serial port. This could be caused by improper settings between host and printer or a glitch in data transmission such as a PC being powered up.	Press the **FEED** key to clear the error and print buffer. Resend the print job. If the error occurs again verify baud rate, data bits, and parity settings match host and cable pin out are correct.
Error: Data Overrun	This error is unlikely to occur and would indicate data is being transmitted to the printer faster than it can be processed. If this error does occur it might indicate a faulty parallel cable or other communication problem.	Press the **FEED** key then cycle power on the printer. If the error occurs again verify all communication features are set to match host and quality interface cables correctly pinned out are used.
Error: Buffer Overflow	This error indicates the printers incoming print buffer (FIFO) has overflowed. The most common cause of this error is improper handshaking between the printer and host due to improper settings or improper cable.	Press the **FEED** key and re-send the print job. If the error occurs again verify all communication features are set to match host and quality interface cables correctly pinned out are used.
Software Locked	This error is reported when PAL™ Print and Program firmware is loaded into a printer after another type of firmware was previously installed. Since PAL™ Print and Program firmware is Copyrighted, a special code is needed to enable it.	Call your sales representative for information on how to correct this error.

User Detected Errors

The following issues may be detected by the user but are not reported by the printer.

Vertical streaks in the print

This could indicate a dirty or faulty print head. Clean the print head first. Verify the media does not have excessive paper fibers or dust. Verify there are no nicks or burrs anywhere in the paper path such as a scratched rail. If no other source of streaks can be found replace the print head.

Vertical gaps in the print

This could indicate a dirty or faulty print head. First clean the print head. Verify the ribbon is not wrinkling. Verify darkness feature is set high enough. Manually add force to the print head bracket in the area of the streaks. If the streaks go away the print head itself is not the cause.

Poor print out quality

- Verify type of media and ribbon (if used) are compatible.
- Verify ribbon is not being used with direct thermal media.
- Lower print speed and adjust print darkness.
- Verify print head is clean.
- Verify platen roller is clean.
- Verify media and ribbon are both loaded exactly as described in media and ribbon loading sections.
- Replace print head if print out is streaked or missing and all of above does not resolve.

Preventive Maintenance

Before performing any Preventive Maintenance be sure to turn off the printer's power and unplug the power cable.

Cleaning the Thermal Print Head (TPH)

It is recommended at a minimum that the Print Head should be cleaned:

- Each time a Ribbon is changed.
- Each time a new roll of media is installed.

1. Turn off the printer, open the top cover, and if installed remove the ribbon.
2. Lift the print head module to the vertical position.
3. Rub the print head with a piece of cotton, which has been moistened with Isopropyl Alcohol, or use a thermal head-cleaning pen.
4. Check for any traces of discoloration or adhesive on the cotton after cleaning.
5. Repeat if necessary until the cotton is clean, after it is passed over the print head.

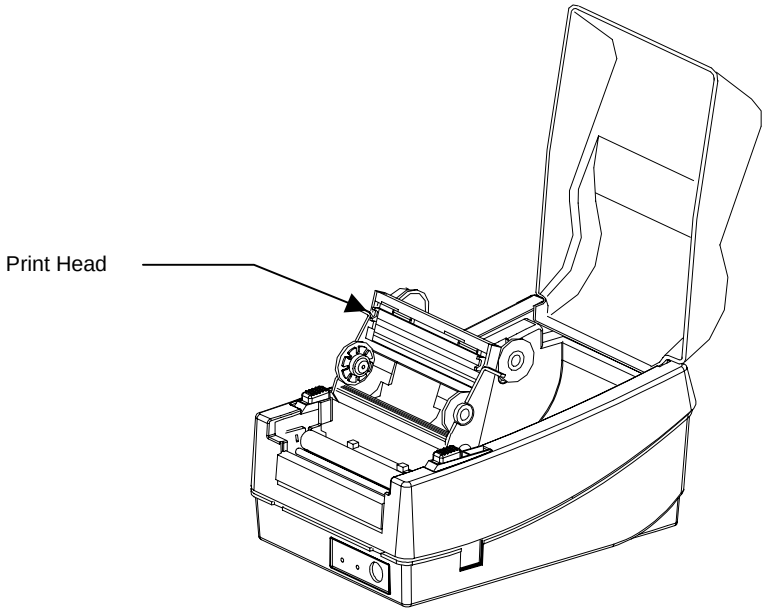


Figure 20 – Print Head Location

Note: *The print head should be cleaned at least every time the ribbon is replaced and more often depending on actual usage and conditions.*

Cleaning the Platen Roller

It is recommended that the platen roller should be cleaned when:

- Excessive dusty condition exists.
- Following a media jam where the adhesive comes in contact with it.

1. Turn off the printer and open the top cover.
2. Lift the print head module to the vertical position.
3. Rub the full length of the platen available with a piece of cotton, which has been moistened with Isopropyl Alcohol.
4. Manually rotate the platen and repeat step 3 until the entire platen has been cleaned.

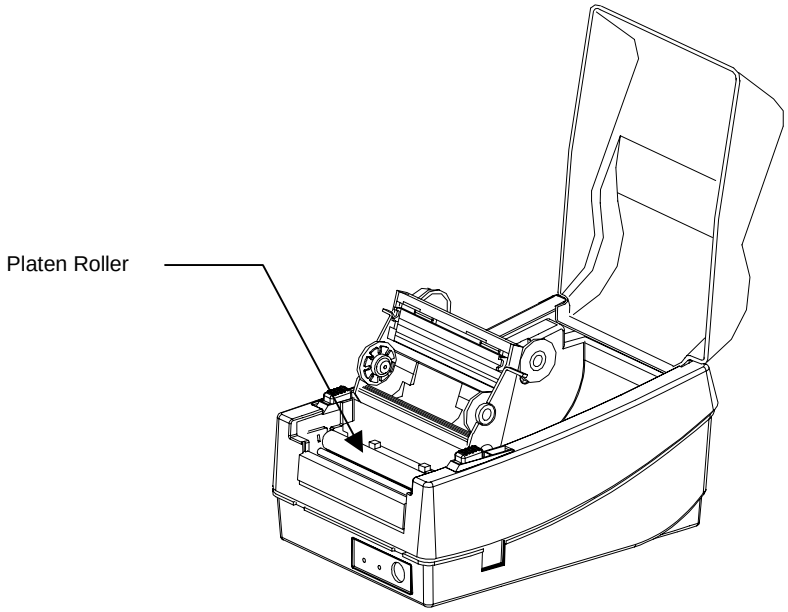


Figure 21 – Platen Roller

Note: *The roller should be cleaned whenever it has been in contact with foreign materials such as dust or adhesives.*

Cleaning the Paper Compartment

It is recommended that the Paper Compartment be cleaned regularly if exposed to a dust environment. This will keep dirt and dust from contaminating or damaging your printer (Print Head and Platen).

1. Turn off the printer and open the top cover.
2. Remove paper dust by blowing using compressed air or vacuuming.
3. Clean the paper compartment with cotton, which has been moistened with mild detergent.

Cleaning the paper sensor

It is recommended that the Paper Sensor be cleaned regularly if exposed to a dusty environment. This will prevent false paper OUT or paper IN conditions.

1. Turn off the printer and open the top cover.
2. Remove paper dust by blowing using compressed air or vacuuming.
3. Clean the two Paper Sensor LED's with cotton stick, which has been moistened with Isopropyl Alcohol.

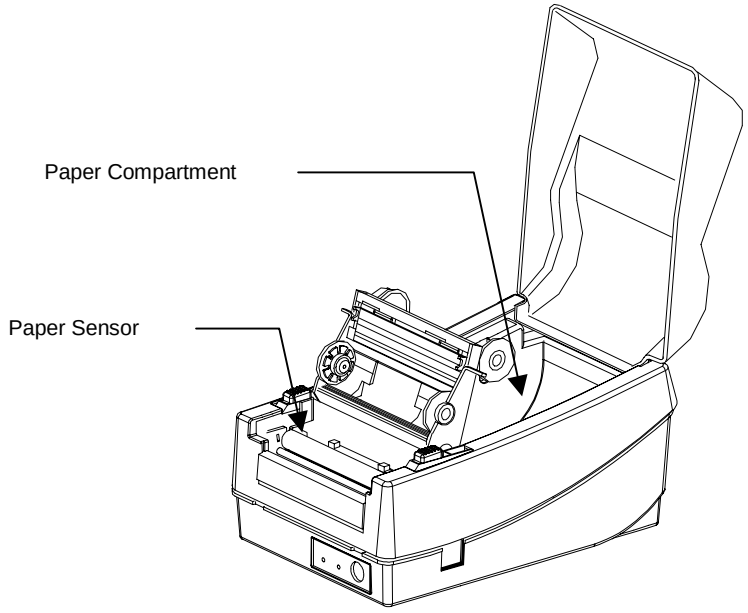


Figure 22 – Paper Compartment and Paper Sensor

Appendix A: GENERAL SPECIFICATIONS

Note: *The FM402TT does not support the PAL™ Print and Program Language but is included here for reference only.*

Specification	**FM402TT**	**FM412TT**	**FM403TT**
Print method	Direct thermal and thermal transfer		
Resolution	203 DPI (8 dots/mm)	203 DPI (8 dots/mm)	300 DPI (12 dots/mm)
Maximum print width	4.2 in. (107 mm)		4.10 in. (104 mm)
Maximum print length	43 in. (1090 mm)**	80 in. (2032 mm)	54 in. (1371 mm)**
Maximum print speed	3 inches (76.2 mm) per second		2 inches (50.8 mm) per second
Onboard RAM	512 K bytes	2 M bytes	2 M bytes
Media type	Direct thermal: Paper, vinyl, visible light and infrared scannable label, tag stock, butt cut or die cut, with various adhesives.II. Thermal transfer: Paper or vinyl labels and tags, butt cut or die cut, with various adhesives.		
Maximum label roll diameter	4 in.(102mm) outside diameter, 1 in.(25.4mm) inside diameter		
Label indexing	Black stripe and gap		
Ribbon types	Wax, Wax/resin and Resin		
Ribbon size	OD 1.45 in. (37 mm); ID 0.5 in. (12.7mm)		
Interface	RS-232 serial and Centronics parallel ports, with auto polling		
Dimension	W7.3 in. x D10.9 in. x H6.0 in. (W186 mm x D278 mm x H153mm)		
Weight	1.9 kg (4.1 lbs.)		
Electrical	FCC class B	FCC class A	
	CE, UL and CUL approved. Input 19 VAC or 24 VDC (min. 2.5 A), 50/60 Hz		
Operating temperature	40° to 140°F (5° to 38°C)		
Storage temperature	-40° to 140°F (-40° to 60°C)		
Humidity	15 to 85% RH		
Windows driver	Win, 95, 98, 2000, XP and NT		
Printer emulation	PPLA, PPLB	PAL, Text, Display, Hex	
Rotation	0°, 90°, 180° and 270°, 4 direction rotations		

Appendix B: INTERFACE SPECIFICATIONS

This appendix presents the serial and parallel interface specifications. These specifications include pin assignments, protocols and detailed information about how to properly interface your printer with your host or terminal.

Serial Interface

Pin Configuration

The RS-232 serial interface uses a female, DB-9 conncetor.

Pin	Direction	Definition
1	Tied to in 6	Not used
2	In	Receive Data (RxData)
3	Out	Transmit Data (TxData)
4	-	No connection
5	-	Logic Ground
6	Tied to pin 1	Not used
7	Out	Request to Send (RTS)
8	In	Clear to Send (CTS)
9	Out	+5V

Note: *Pin 9 is reserved for Keyboard Device Unit (KDU) only,* ***do not connect*** *this pin if you are using a general host like a PC.*

Connection With Host

Host 25S		Printer 9P	Host 9S		Printer 9P
(PC or compatible)			(PC or compatible)		
DTR 20	.....	1 DSR	DTR 4	.....	1 DSR
DSR 6	.....	6 DTR	DSR 6	.....	6 DTR
TX 2	.....	2 RX	TX 3	.....	2 RX
RX 3	.....	3 TX	RX 2	.....	3 TX
CTS 5	.....	7 RTS	CTS 8	.....	7 RTS
RTS 4	.....	8 CTR	RTS 7	.....	8 CTS
GND 7	.....	5 GND	GND 5	.....	5 GND

Three Wire Connection

This method is the simplest method of connecting the printer to a host or terminal. This method requires Software Protocol Handshaking (XON/XOFF flow control).

Host 25S		Printer 9P	Host 9S		Printer 9P
(PC or compatible)			(PC or compatible)		
TX 2	.....	2 RX	TX 3	.....	2 RX
RX 3	.....	3 TX	RX 2	.....	3 TX
GND 7	.....	5 GND	GND 5	.....	5 GND
pin 4			pin 4		
pin 5			Pin 6		
pin 6			Pin 7		
pin 20			Pin 8		

Serial port settings

Baud Rate, Parity, Data Bits, and Handshaking may be configured using the **Feature Management mode**.

Parallel (Centronics) Interface

The parallel port uses a standard 36-pin Centronics connector.

Pin	Direction	Definition	Pin	Direction	Definition
1	In	/STROBE	13	Out	SELECT
2	In	Data 1	14,15		NC
3	In	Data 2	16	-	Ground
4	In	Data 3	17	-	Ground
5	In	Data 4	18		NC
6	In	Data 5	19 to 30	-	Ground
7	In	Data 6	31		NC
8	In	Data 7	32	Out	/Fault
9	In	Data 8	33 to 36	-	NC
10	Out	/ACK			
11	Out	BUSY			
12	Out	PE			

Auto Interface Select

The setup feature Interface Select controls the operation of interface arbitration. One of 3 settings is possible:

Parallel Only: With this setting the serial interface is ignored.

Serial Only: With this setting the parallel interface is ignored.

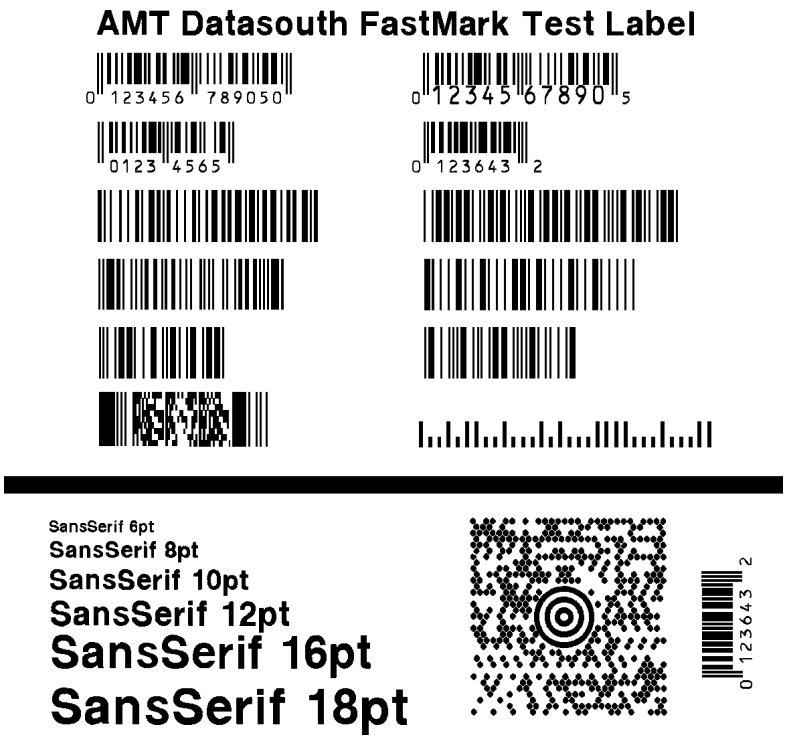
Auto Select: With this setting, the printer automatically arbitrates between the parallel and serial interfaces. The first interface to go active maintains active status while the other interface is held busy. After a time out period, the other interface is placed in a ready state.

Appendix C: ASCII TABLE

The following table may be used to determine HEX values of ASCII characters. For example the character A is hex 41 commonly shown as 0x41H.

	0	1	2	3	4	5	6	7
0	NUL			0	@	P	`	P
1	SOH	XON	!	1	A	Q	a	Q
2	STX		“	2	B	R	b	R
3		XOFF	#	3	C	S	c	S
4			$	4	D	T	d	T
5		NAK	%	5	E	U	e	U
6	ACK		&	6	F	V	f	V
7	BEL		‘	7	G	W	g	W
8	BS		(	8	H	X	h	X
9			)	9	I	Y	i	Y
A	LF		*	:	J	Z	j	Z
B		ESC	+	;	K	[	k	{
C	FF		,	<	L	\	l	|
D	CR		-	=	M	]	m	}
E	SO	RS	.	>	N	^	n	~
F	SI	US	/	?	O	_	o	DEL

Appendix D: SELF TEST PRINT SAMPLE



Appendix E: HIDDEN SETUP FEATURES

To access the hidden list of features, select the Firmware Rev. feature then click the **Enter** button twice. The hidden feature list is now enabled and may be selected by clicking the **Display Down** button.

Hidden Setup Feature and Value List

FEATURE NAME	VALUE RANGE	DESCRIPTION
Ripple Pattern	N/A	Click the **Enter** button to initiate a rolling ASCII ripple pattern.
Factory Defaults	N/A	Clicking the **Enter** button resets all keypad features to factory defaults. If the RTC clock is installed, these features are not reset. The Label Count Feature can not be reset. Caution: This feature could cause a loss of communication with host if interface features have been modified.
PAL Boot Drive	[A:,B:,C:, Auto Detect]	This feature selects the boot drive. During power up the system will scan the boot drive for a PAL program to run. If Auto Detect is selected the system will scan all drives in succession, starting with A:, searching for the first PAL program to run.
F/W Update Mode	N/A	Clicking the **Enter** button causes main firmware control to be halted and boot load firmware to be loaded. This mode has a distinct setup mode feature list allowing serial port parameters to be adjusted for the firmware download. See Appendix F on firmware updates for more information.

Hidden Setup Feature and Value List (Continued)

Max Media Length	[12-80] inches	This feature sets the maximum length media that the printer will recognize. In normal setup mode, this value sets the upper limit on the Media Length feature to avoid excessive menu scrolling. This also controls how long of a label the printer will look for when performing a label calibration. Increase this value if media over 12 inches long is used.
Keypad Lockout	[Enabled, Disabled]	When Keypad Lockout is Enabled, the value of features may be viewed but not changed. Also, any feature value which may be changed from downline using a PAL™ operator is also locked out from change. This feature may be used to keep users from modifying features or to override host changes if needed.
Label Count	N/A	This feature displays the number of labels printed since the printer was manufactured. The total label length issued by the printer will be dependant on the label length used. For example if 4 inch label stock is used and the Label Count feature indicates 100, then 400 inches of media have been printed.

Appendix F: UPDATING PRINTER FIRMWARE

Occasionally there may be a need to update printer firmware either to enhance capabilities or correct issues. Updating firmware via the parallel interface is possible only after activating the printers boot mode firmware. Use the following procedure to activate the boot mode firmware:

1) Enable the Feature Management mode. (Refer to the section **Feature Management Mode** section for instructions.)

2) Enable the Hidden Setup Features. (Refer to Appendix E for instructions.)

3) Scroll to the hidden **F/W Update Mode** feature.

4) Click the **Enter** button to activate boot mode firmware

   After the boot mode firmware is activated, the FeatureMan program will display the following.

Off line:
F/W Update Mode

   The only possible actions at this point are to enter boot setup mode or cycle power to exit this mode. This setup mode works like the normal printer setup mode except the feature list is limited to specific features used during firmware updates. Click the **Display Up/Down** buttons to enter the boot setup mode. (Refer to the **Boot Mode Feature and Value List** for a description of the features.)

5) Scroll to the **Download New F/W** feature.

   When the **Download New F/W** feature is selected the **FeatureMan** program will open up a new 'file download' section called **FlashWiz Lite**.

6) Click the **Enter** (or CANCEL) button to activate the **Download New F/W** mode.

   After the **Download New F/W** mode is activated, the **FeatureMan** program will display the following.

Download New F/W
Waiting For Data CANCEL to Stop

7) In the **FlashWiz Lite** section, select the appropriate LPT port to be used for the download.

8) Click the **File** button to select the appropriate download file.

9) Click the **Send** button to start the download.

10) After the download is complete follow the instructions on the display of the **FeatureMan** program to reset all printer features.

    At this point you can either continue operating the printer in the **Feature Management Mode** or you can exit. To exit the **Feature Management Mode** power the print off, wait 5 seconds, then power the printer on. Refer to the section Calibrating Media Sensors to recalibrate the printer.

Boot Mode Feature and Value List

The Boot Mode has several programmable features that are used during firmware updates. Click the **Display Up/Down** buttons to access the Boot mode features.

FEATURE NAME	VALUE RANGE	DESCRIPTION
Download New F/W	N/A	Click the **Enter** button to start download mode. The display will change to: Download New F/W Waiting For Data / <CANCEL to Stop> The printer will wait on a firmware update file on the Parallel ports. The FlashWiz Lite section of the Feature-Man program is used to download firmware files.
Reboot System	N/A	To exit boot mode and return to normal PAL™ firmware mode, click the **Enter** button. After a firmware update is complete, this feature is automatically selected and allows the printer to be rebooted with the newly loaded firmware.
Interface Select		Identical to feature in standard setup mode.
COM1: Baud Rate		Defaults to 57K baud when in boot mode. Change to match host if needed.
COM1: Parity		Change to match host if needed.
COM1: Data Bits		Change to match host if needed.
COM1: Handshake		Change to match host if needed.
Firmware Rev.		Displays revision of boot code currently loaded. The boot code can only be updated by changing Flash chips located on main board.