PA/4000 OPERATIONS MANUAL TABLE OF CONTENTS

Section 1.0 Introduction to the PA/4000 Printer/Applicator Series  1-1
  1.1 Specifications  1-1
  1.2 Description of the Printer/Applicators in the Series  1-1

Section 2.0 Component Features and Specifications  2-1
  2.1 Floor Stand Assembly  2-1
  2.2 The Main Unit  2-5
  2.3 Air Cylinder/Tamp Head Assembly  2-6
  2.4 Air Filter  2-7
  2.5 Photosensor Assembly
  2.6 Hand-Held Terminal
  2.7 Optional Components
  2.8 Replaceable Components

Section 3.0 Packaging  3-1
  3.1 Containers  3-1

Section 4.0 Installation  4-1
  4.1 Overview  4-1
  4.2 Assembling the Stand  4-1
  4.3 Mounting the Main Unit to the Stand  4-4
  4.4 Mounting Attachments to the Main Unit
  4.5 Mounting the Hand-Held Terminal and Holster
  4.6 Mounting the Air Filter Assembly to the Stand
  4.8 Mounting the Optional Warning Tower to the Stand  4-6
  4.9 Mounting the Photosensor  4-6
  4.10 Mounting the Optional Secondary Wipe-Down  4-7
  4.11 Electrical Connections  4.8
  4.12 DIP Switch Settings
  4.15 Loading the Label Roll  4-14
  4.16 Loading the Ribbon Roll  4-15
  4.17 Testing the PA/4000  4-14
  4.18 Setting the Baud Rate and Word Length
  4.19 Minimum and Maximum Distances for the PA/4000
  4.20 Final Positioning  4-17
  4.21 Secondary Wipe-Down Assembly  4-20

Section 5.0 Configuration
  5.1 Hand-Held Terminal Configuration  5-1
  5.2 PA/4000 Remote IO Configuration  5-2
Section 6.0 Operations
   6.1 Start of the Day  6-1
   6.2 Adjustments during Operation  6-1
   6.3 Stopping Label Application  6-1
   6.4 End of Day  6-2

Section 7.0 Prodigy Plus™ Fonts and Bar Codes
   7.1 Available Fonts and Bar Codes
   7.2 Internal Font Examples
   7.3 Bar Code Examples

Section 8.0 Printing Labels
   8.1 Prodigy Plus™ Print Engine Description  8-1
   8.2 Media Supplies
   8.3 Sample Label Printout
   8.4 Start-up and Shut down Procedures  8-1
   8.5 Printing Labels with Performance Series  8-1

Section 9.0 Maintenance
   9.1 Daily Maintenance  8-1
   9.2 Weekly Maintenance  8-1
   9.3 Monthly Maintenance  8-1
   9.4 Six Month Maintenance  8-2
   9.5 Intermittent Maintenance  8-2
   9.6 Yearly Maintenance

Section 10.0 Troubleshooting
   10.1 Diagnostics  9-1
   10.2 Power Problems  9-2
   10.3 Printing Problems  9-3
   10.4 Tamping Problems  9-6
   10.5 Error & Warning Messages  9-16

Section 11.0 Service Parts and Kits

Appendix A
Appendix B Cable and Pin Connections

Glossary

Index
1.0 INTRODUCTION TO THE PA/4000 PRINTER/APPLICATOR SERIES

PA/4000 Series is comprised of three Printer/Applicators each designed with special features for different uses. PA/4000 Series are print and apply systems designed for high-speed, high-volume industrial applications. They are next-label-out systems that provide true on-demand, variable data labeling. High quality print ensures excellent legibility of critical information at every phase of the shipping process.

Each system in the series comes equipped with:

- An air cylinder tamp head assembly with auto-retract that apply labels with great accuracy at high conveyor speeds
- A Prodigy Plus™ print engine manufactured by DataMax
- A hand-held terminal device that allows for control of applicator functions
- An air filter assembly

The PA/4000 connects to almost any computer through either the RS-232C or the RS-422 serial interface. If your PC uses an interface other than ASCII character based RS-232 or RS-422 you will need an interface converter. The manufacturer of your computer will be able to recommend the proper protocol and interface converter between the system and the Prodigy Plus’s asynchronous RS-232C interface.

An optional software package recommended by Diagraph, called Performance Series for Windows™, is available for creating, storing, and printing label formats from IBM® or compatible - personal computers.

The PA/4000 has a full-range of options available. It is flexible and can address a variety of design and custom application requirements:

1. Product labeling using labels as large as 4.5 inches x 13 inches
2. Colored ribbons are available
3. Pharmaceutical and electronics packaging
4. Popular UPC bar codes
5. High-quality fonts and graphics

1.1 Specifications

<table>
<thead>
<tr>
<th>Input Devices</th>
<th>Hand-Held Terminal and PC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communications</td>
<td>Serial, RS-232 or RS-422 (300 to 19,200 Baud)</td>
</tr>
<tr>
<td>Software (recommended)</td>
<td>Diagraph’s Performance Series for Windows™</td>
</tr>
<tr>
<td>Applicator</td>
<td>Tamp with auto-retract available in 6” 12” and 18” cylinder lengths</td>
</tr>
<tr>
<td>Air</td>
<td>20-60 PSI minimum, 3 cfm</td>
</tr>
<tr>
<td>Electrical</td>
<td>100-140 VAC, 60 Hz, 5 A; 200-240 VAC, 50 Hz, 5 A.</td>
</tr>
<tr>
<td>Dimensions</td>
<td>38” W X 25” H x 25” D without stand</td>
</tr>
<tr>
<td>Weight</td>
<td>150 lbs. (includes print engine) without applicator assembly or stand</td>
</tr>
<tr>
<td>Environmental Requirements</td>
<td>41° F-100°F; 20-85% RH non-condensing</td>
</tr>
</tbody>
</table>
1.2 Description of the Printer/Applicators in the Series

The Diagraph PA/4000 Printer/Applicator Series is comprised of three printer applicators with features that match various labeling application needs:

- PA/4010
- PA/4015
- PA/4020

A description of the three PA/4000 systems and their features follows.

**PA/4010 Printer/Applicator**

The PA/4010 Printer/Applicator is ideal for high-speed lines running many products per minute (actual number of products per minute depends on several factors including label size).
The PA/4015 Pallet Printer/Applicator is ideal for pallet applications where distance from the applicator to the pallet varies. This pallet labeling system accommodates long distances between the applicator and the pallet with the extended-length cylinder option. The applicator can be configured in either horizontal or vertical orientations.

This unit handles label sizes from 4 x 4 inches to 4.5 x 12 inches.
PA/4020 Dual-Panel Printer/Applicator

The PA/4020 Dual-Panel Printer/Applicator combines a tamp applicator with a secondary wipe-down mechanism. This mechanism applies a wrap-around label up to 13 inches long to two adjacent sides of the carton for side/front or side/back labeling. This unit is functional from either side of the conveyor.

The unique dual-vacuum and slotted-vacuum design delivers a high degree of label control.

The reliable twin-rod air cylinder [A] tamps the first half of the label onto the carton as the secondary wipe-down roller [B] wraps the label around the corner and onto the adjacent side of the carton.
2.0 COMPONENT FEATURES AND SPECIFICATIONS

2.1 Floor Stand Assembly

This assembly includes a tee base with casters [D]; an upright post with a height-adjustable mounting plate [B]; a yoke [C]; and a crank handle for adjusting the height [A]. The stand can be bolted to the floor for stability. The bolting holes are located on the t-base [E].

2.2 The Main Unit

The PA/4000 main unit is a robust, yoke-mounted design of aluminum and steel. It swivels to conform to common application orientations - top down, side panel and bottom up - and then locks in place. It accommodates different sizes of tamp cylinders for variable distance and variable label size applications. It provides easy access to configuration controls - switches, air control, print engine and sensor adjustments. This unit connects to almost any computer through either the RS-232C or the RS-422 serial interface. It has three main components:

- The air control unit [A]
- label supply and rewind hubs [B]
- Prodigy Plus™ print engine [C].
The Air Control Unit [A]
The air control unit regulates the vacuum, air assist and tamp pressure. The vacuum holds the label against the tamp pad prior to application. The air assist guides the label (as it comes off the peel blade) on to the tamp pad. The tamp pressure controls how much air goes into the cylinder (between 20-40 psi is the usual range).

Label Supply and Rewind Hubs [B]
The Label Supply Hub holds the roll of labels in place while the Label Rewind Hub collects the label backing material once the label is peeled off.

The Prodigy plus™ print engine [C]
The Prodigy Plus™ print engine is a high-performance direct thermal and thermal transfer label printer.

Some Prodigy Plus™ print engine features:
- Clear side door that allows for viewing of the label and ribbon functions.
- Internal time and date clock
- Label feed counter
- Choice of English or metric label data input.
- Equipped with die cut, or blackstripe sensing media.
- Easy-to-load mechanism for label stock and transfer ribbon.
• All popular bar codes and nine different alphanumeric fonts resident in memory.

• The 0.0049 inch print element prints high-density bar codes and easy-to-read characters at 203 dot-per-inch resolution. In addition, the pixel size can be multiplied by 2 in the horizontal, and 3 in the vertical direction producing even larger label formats.

• Optional memory and font modules programmable using HP LaserJet II (PCL-4) compatibility

• Dot-addressable graphics function; compatible with PCX, IMG file formats

• User selectable and software-selectable print speeds and form dimensions. Prints at speeds of up to 6 inches per second (152.4 mm/sec.) with maximum print quality. In After Burner™ mode, print speeds of 8 inches per second (203.2 mm/sec.) can be attained for some formats with only a minor reduction in print quality. Print area is 4.1 inches W x 10.0 inches L (104 mm x 254 mm). It has an innovative dot-history control circuit, called SEAQ™ (Sequential Energy Adjustment for Quality) which provides exceptional quality while printing at high speeds. This circuit monitors the printed data and automatically adjusts to provide maximum printhead performance.

• Allows for adjusting printhead temperatures (darkness), print speeds and slew rates.

Resident Bar Codes
The Prodigy Plus print engine has all popular bar codes resident in memory and can print adjacent human readable characters. It has user-selectable bar code ratios and heights.

Resident Fonts
There are nine different size built-in alphanumeric fonts. Font multiplication allows you to print 0.035 inch H (0.9 mm) to 16.0 inches H (406.4 mm). These fonts include OCR-A, OCR-B (size and character set III), and the ninth one, a CG Triumvirate™ smooth font, contains 10 different font sizes. All the fonts can be printed in four different directions.

Optional Memory Modules
There is three optional Memory modules that provide storage for fonts, label formats, and graphic images. These modules are available in RAM, Flash and ROM FONT versions (512K available in RAM only).

256K RAM Memory Module: This module should be used in any application that requires fonts not resident in the printer (i.e. True Type fonts) or for the
direct connect download of a label format (label formats can also be stored and recalled from RAM modules) or graphics (logos). Graphics can be loaded using programs with an image download function. The loading of images can also be done with minimal programming on most host computers. Single font bitmaps, images, or formats cannot be deleted individually. The entire module must be cleared and data reloaded. This module can be installed in either slot A or B. This is a volatile memory (temporary storage) and will be lost at power down.

256K Flash ROM Module: This module provides the same features as the RAM modules with the added benefit of permanent storage. Typical applications for a Flash module include downloadable soft fonts, graphics, and label format storage for use with host computers. This module must be installed in slot A when being loaded with data. Once it is programmed they can be installed in either slot A or B. There is a copy command available for duplicating ROM modules. When using this feature, the source module should be installed in the B slot, and the blank module in the A slot. A WRITE PROTECT switch on the Flash module can protect data stored on the module from being overwritten or erased. This module is a non-volatile memory, data is stored permanently.

512K RAM Module: This module is used primarily when label formats exceed 10 inches in length. When this module is in the A slot, the dot memory is double (from 10” to 20” at 203 dpi). The upper half of memory is reserved for long label length formatting and the bottom half functions the same as the 256K RAM module. This is a volatile memory (temporary storage) and will be lost at power down.

**Optional Font Modules**

There are six optional 512K byte ROM FONT modules available. They are:

1. CG Triumvirate Bold
2. CG Triumvirate Italic
3. CG Times
4. CG Times Bold
5. Futura Extra Bold Condensed
6. Plantin

Each ROM Font module comes with documentation detailing the type and sizes available on the module and the font number of each size used in the label formatting. ROM Font modules are programmed at the factory and cannot be modified for any other purpose. ROM Font modules will operate in either the A or the B slot.
Module Slot locations

The PA/4000 Printer/Applicator has two module slots in the rear of the print engine for use with optional memory modules and font modules. The upper slot is referenced, as “A” [A] and the lower slot is “B” [B].

Print Engine Specifications:

<table>
<thead>
<tr>
<th>Print Engine</th>
<th>Prodigy Plus™</th>
</tr>
</thead>
<tbody>
<tr>
<td>Print Method</td>
<td>Direct thermal or thermal transfer</td>
</tr>
<tr>
<td>Maximum Print Speed</td>
<td>6 inches/second with afterburner speeds up to 8 inches/second</td>
</tr>
<tr>
<td>Print Resolution</td>
<td>203 dots per inch</td>
</tr>
<tr>
<td>Media Dimensions, Min.</td>
<td>1” x .25” (25.4 mm x 6 mm)</td>
</tr>
<tr>
<td>Media Dimensions, Max.</td>
<td>4” x 13” (101.6 mm x 330 mm)</td>
</tr>
<tr>
<td>Roll Capacity</td>
<td>13” (330 mm) outer diameter</td>
</tr>
<tr>
<td>Fonts</td>
<td>Nine internal fonts. American and European, uppercase and lowercase with descenders. Six optional font modules available.</td>
</tr>
<tr>
<td>Flexibility</td>
<td>Rotation of bar codes and text in four 90 degree steps; character expansion horizontally and vertically to 12X; RAM storage for special characters, dot-addressable graphics; sequential numbering.</td>
</tr>
<tr>
<td>Memory Module Option</td>
<td>Three optional memory modules available: 256K RAM, 256 Flash ROM, and 512K RAM.</td>
</tr>
<tr>
<td>Communications</td>
<td>RS-232 (300 → 19,200 bps, Ready/Busy and X-ON/X-Off)</td>
</tr>
<tr>
<td>Data Transmission</td>
<td>ASCII</td>
</tr>
</tbody>
</table>
Print Engine Programming and Support

Programming and support for the print engine is available from Datamax.

Software Performance Series™. Diagraph supports Performance Series™ (Premier, Express or Flash) as the software solution for label creation and printing on the PA/4000.

Windows Drivers. Datamax provides print drivers through its web site for users who want to print labels from word processors such as Microsoft Word or Word Perfect. These drivers provide compatibility for Windows-based applications but do not take the place of a dedicated label creation and printing program.

Manuals Datamax Programmers Manual. Datamax provides a free programmer’s manual in pdf format through its web site. This manual explains how to use Datamax Programming Language (DPL) to write programs for Datamax printers that create label formats and control the operation of the printer.

Address Datamax World Headquarters
4501 Parkway Commerce Boulevard
Orlando, Florida USA 32808
(407) 578-8007

Datamax Tech Support Hotline – (407) 523-5540

Internet http://www.datamaxcorp.com
2.3 Air Cylinder/Tamp Head Assembly (6” 6105-180 Shown)

There are three sizes of tamp cylinders available: 6, 12 and 18 inch. The Air Cylinder/Tamp pad Assembly attaches to the extended horizontal support bar on the PA/4000 main unit. It comes with a spare tamp pad kit. There are two sensors [A] located on the tamp pad:

1. The Label Present Sensor detects when a label is on the tamp pad. The printer will not print another label until the current label has been removed.
2. The Auto-Retract Sensor detects the product. Once the product is detected, the air cylinder will retract.

**Tamp Pads**

Tamp pads are available in a wide range of sizes. The available range runs from 4”x 2” up to 7”x 13” with ¼” increments along the way. As shown below, the part numbering system for these pads includes the size of the pad in the number: For example, the part number for a tamp pad using a four-inch wide by two-inch long label is 6150-223-4000200. Call Diagraph for pricing and availability.
2.4 Air Filter 7505-103

The PA/4000 Air Filter takes the incoming factory air supply and filters out impurities and moisture to give a clean, air supply. The PA/4000 must be supplied with 95-120 psi of clean, dry, and unlubricated air. The air filter comes with the system and is equipped with an OSHA approved air shut-off valve.

**NOTE:** The air filter will drain out any moisture that has collected while the air was disconnected. It is recommended that the air be shut off when the unit is turned off. If excessive moisture builds up, the supply for incoming air should be checked. An air dryer should be installed in the compressed air supply system if too much water condensation is present.

2.5 Photosensor Assembly 5700-216

This assembly includes a diffuse-type self-contained photosensor with a ten foot cable and multi-position bracket mounts. It functions as a switch to start the application cycle when it detects the presence of a product on the conveyor. It senses the presence of a product by receiving LED radiation reflected from a product surface. Adjust the sensing distance of the photosensor with the potentiometer at the rear of the photosensor.
2.6 **Hand-Held Terminal  6105-260**

The PA/4000 terminal is a hand-held device, designed for industrial environments that allows you to control all of the applicator functions needed to print and apply labels.

It has a LCD (Liquid Crystal Display) with a one line by sixteen character text display. The four LEDs show power on and warn of error conditions. The seven control keys are described in Section 5.2.

The hand-held terminal communicates with the PA/4000 main unit through an RJ-11 cable that connects to J1 on the electrical panel on the back of the print engine (see Section 4.12). It sits in its holster attached to the yoke when not in use. See Section 5.2 for more information on configuring print applications with the Hand-Held Terminal.
2.7 Optional Components

2.7.1 Secondary Wipe-Down Assembly  6105-103

A secondary wipe-down unit is used when applying labels onto two adjacent panels of a carton. The primary applicator applies part of the label onto one surface and the secondary wipe-down roller pushes the unattached portion onto the second surface.

The PA/4000 supplies both electric (24 VDC) and air (0-100 PSI) power. The assembly includes bracketry [A]; a tee fitting [B]; an interconnect cable [C] and a photosensor [D] that acts as the signal source to initiate the cylinder stroke. This assembly also includes the Secondary Wipe-Down Assembly User’s Manual [E] (5802-930) which contains complete installation and operation instructions.

This unit comes bundled with the PA/4020 or can be purchased separately.
2.7.2 Warning Tower 6150-320

The warning tower assembly provides visual feedback when error conditions occur. This assembly includes the tower, the mounting hardware and a signal cable.

<table>
<thead>
<tr>
<th>CONDITION</th>
<th>GREEN</th>
<th>YELLOW</th>
<th>RED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Label Low</td>
<td>Solid</td>
<td>Flashing</td>
<td>OFF</td>
</tr>
<tr>
<td>Ribbon Low</td>
<td>Solid</td>
<td>Flashing</td>
<td>OFF</td>
</tr>
<tr>
<td>Label Out</td>
<td>OFF</td>
<td>OFF</td>
<td>Flashing</td>
</tr>
<tr>
<td>Ribbon Out</td>
<td>OFF</td>
<td>OFF</td>
<td>Flashing</td>
</tr>
<tr>
<td>Printer Paused</td>
<td>Flashing</td>
<td>Solid</td>
<td>OFF</td>
</tr>
<tr>
<td>Cylinder Error</td>
<td>OFF</td>
<td>OFF</td>
<td>Flashing</td>
</tr>
<tr>
<td>Printer Error</td>
<td>OFF</td>
<td>OFF</td>
<td>Flashing</td>
</tr>
</tbody>
</table>
3.0 **PACKAGING**

3.1 **Containers**

The basic PA/4000 without options ships in three containers. Unpacking requires two people.

| CONTAINER #1 | 1 Tee base  
|              | 2 ¾ inch x 5 inch bolt with flat washer  
|              | 1 Stand upright piece  
|              | 1 ¾ inch bolt with washer and nut for chassis mount  
|              | 1 Crank handle for height adjustments  
|              | 1 Yoke  
|              | 1 Air filter assembly with mounting hardware  
| CONTAINER #2 | 1 Chassis Assembly with Prodigy Plus™ Print Engine  
|              | 1 PA/4000 User’s Manual  
|              | 1 Power Cord  
|              | 1 Hand-Held Terminal  
|              | 1 Holster with mounting hardware  
|              | 1 Cable  
|              | 1 Label Inner Supply Disk  
|              | 1 Label Outer Supply Disk  
|              | 1 Photosensor with mounting hardware  
| CONTAINER #3 | 1 Air Cylinder/Tamp Head Assembly with spare tamp pad kit and mounting hardware  

**Optional Container**

| Warning Tower | 1 Warning tower assembly with cable and mounting bracket and hardware  
| Wipe-Down Assembly | 1 Wipe-down assembly, air hose, spare roller, user’s manual, magnetic switch assembly, power supply, photosensor/cable assembly, T-fitting and opposite torsion spring and mounting hardware  

4.0 INSTALLATION

4.1 Overview

Instructions in this section show the PA/4000 in a top down configuration, that is with the print engine upright and labels applied on top of the product. The size of the PA/4000 necessitates two people for installation.

Review Section 1.1 for power and air requirements.

**Tools:** Installation and configuration of the PA/4000 requires the tools listed below:

- Set of socket wrenches with a socket as big as 1 1/8 inch
- Utility knife
- Sets of Allen wrenches, U.S. and metric
- Phillips #1 screwdriver
- Phillips #2 screwdriver
- Small slotted tip screwdriver
- Medium slotted tip screwdriver
- Diagonal cutters
- 9/16 inch box wrench
- 15/16 inch open-end wrench (optional)

4.2 Assembling the Stand

**Parts:**

- 1 Tee base
- 1 Upright post
- 1 Nut for upright to base connection
- 1 Crank handle
- 1 Yoke

**Assembly:**

1. Position the upright post on the tee base and tighten in place with the nut, flat washer and lock washer provided.
2. Lock casters to prevent the stand from rolling during assembly.
3. Place the crank handle on top of the post for height adjustment of the yoke mounting plate.
4. Attach the yoke to the mounting plate with the washer and nut provided.
5. Once the unit is positioned on the line for print and apply operation, bolt the unit to the floor through the 3 holes provided on the t-base of the stand.
4.3 Mounting the Main Unit to the Stand

NOTE: The Main Unit assembly [B] weighs over 150 pounds. It is best to have help to connect it to the yoke. Exercise care when attaching the main unit to the yoke to avoid bending the air assist tube [C] at the bottom of the print engine.

Tips for attaching the main unit to the yoke by yourself:

1. Place the main unit on a work surface. The surface should allow for the base of the stand to roll under it so that the post can touch it.
2. Roll the stand to the surface so that the base rolls under the surface and the post touches it.
3. Lower the stand with the crank handle so that the yoke mounting bolts [A] line up with the mounting holes on the main unit. Attach and tighten the bolts.
4. Raise the main unit up and off the surface with the crank handle on the top of the stand and roll the unit away from the surface for further assembly.

Parts: 1 PA/4000 main unit [B]
Assembly: 1. Attach the main unit to the yoke with bolts provided [A].
2. Make sure the yoke/main unit assembly is level and secure before proceeding.
4.4 Mounting Attachments to the Main Unit

4.4.1 Attaching the Label Supply Disc

Parts:  1. Aluminum Rear Label Supply Disc [A]
        1. Smokey Plexiglass front Label Supply Disc [F]

Assembly:  1. With an Allen wrench, loosen the set screw [D] on the plastic collar that is attached to the aluminum rear label supply disc.
          2. Slide the aluminum rear label supply disc [A] (with the collar facing toward you) onto the label supply hub. The label sensor slot [C] on the disc allows the label low sensor [B] to sense when the label roll gets low. After the disc is in position tighten the set screw [D] with an Allen wrench,
          3. Load the label roll onto the hub [E] (see label loading instructions in Section 4.13).
          4. Slide the plexiglass smoke-colored front label supply disc onto the label supply hub [E]. It will be a tight fit so you will need to tap it in gently. Be sure that the flanged collar fits into the label roll core.
4.4.2 Attaching the Air Cylinder/Tamp Pad

**Parts:**
1. Air Cylinder/Tamp Pad
2. Support bar and hardware

**Assembly:**

1. Slide the air cylinder/tamp pad assembly onto the extended horizontal support bar [A] on the PA/4000 main unit.
2. Position the assembly so the tamp pad [C] rests 3/16 inch [D] from the peel blade [E] on the print engine. Before you tighten the assembly into position, manually extend the tamp pad [C] to make sure that it will not hit the air assist tube [F]. Tighten the two 10-32 socket head screws [B] using a 3/32 inch Allen wrench.
3. Fully retract the tamp pad. The bottom of the tamp pad [C] should be 1/16 inch [G] lower than the peel blade [E] position. To attain this, adjust the stop bolt [H].
4. Plug the cable into J5 of the electrical panel on the rear of the main unit, see Section 4.12. Plug in and power ON the system.
5. The cylinder home switch [I] (located near the top of the cylinder) must be positioned so that the red LED is ON when the cylinder is fully retracted and the stop bolt [H] is against the tamp pad. Loosen the set screws [J] with an Allen wrench and move the cylinder home switch up or down until the LED lights. Tighten the set screws [J].
4.5 Air Tube Connections

Parts:
1 1/4 inch clear air tube marked “VAC”
1 1/8 inch clear air tube marked “AIR ASSIST”
1 1/4 inch clear air tube marked “TOP”
1 1/4 inch clear air tube marked “BOTTOM”

Assembly:

Vacuum Tube Connection
Connect the 1/4 inch clear air tube marked "VAC" [C] to the brass vacuum input located on the tamp pad.

Air Assist Tube Connection
Connect the 1/8 inch clear air tube marked "AIR ASSIST" [B] to the input located on the blow tube of the print engine.

Air Cylinder Top
Connect the 1/4 inch clear air tube marked "TOP" [A] to the input located on the top of the air cylinder.

Air Cylinder Bottom
Connect the 1/4 inch clear air tube marked "BOTTOM" [D] to the input located on the bottom of the air cylinder.

NOTE: See Section 5.4 for configuration of the air cylinder/tamp pad.
4.6 Mounting the Hand-Held Terminal with Holster

**Parts:**
1 Holster
1 Hand-Held Terminal

**Assembly:** Mount the Holster to the Yoke
The holster can be hung over the side of the yoke.

Place the Hand-Held Terminal into the holster and plug into J1 of the electrical panel on the rear of the main unit.
4.7 Mounting the E-stop to the Stand

The E-stop attaches to the middle of the upright part of the stand assembly [A]. Remove the E-stop cover and use the opened box for a template for drilling the two holes needed to bolt it to the stand. Secure it to the stand with the two Allen bolts provided [B]. Replace the E-stop cover after mounting. Plug the E-stop into ______________
4.8 Mounting the Air Filter Assembly to the Stand

The filter assembly comes equipped with an OSHA approved air shut-off valve [F]. To turn on the air, push the OSHA approved shut-off valve up (Open) [D].

**Parts:**
1 Air filter assembly with screws

**Assembly:**
Attach the air filter assembly to the stand with the provided Allen bolts [A] using a 3/16 inch Allen wrench. Attach the ground cable from the main unit to the screw indicated at [B]. This ground cable provides ground bonding between the stand upright and the PA/4000 Main Unit. Attach the air output hose from the main unit to [C]. Attach the factory input air hose to [G]. Use clean unlubricated air supply (95-120 psi – 3 cfm).

**NOTE:** To warn others not to turn on the air until the PA/4000 can be serviced, “Tag” the air shut-off valve [E] when it is in the closed position. Tag the unit in accordance with OSHA policies.
4.9 Mounting the Optional Warning Tower to the Stand

If your system does not have a warning tower, move to the next section.

**Parts:**

1. Warning Tower [A] with cable [D], mounting plate and hardware [B] (P/N 6150-320)

**Assembly:**

1. Screw the mounting plate [B] onto the stand [E] with the 1/4 inch Allen bolts provided using a 3/16 inch Allen wrench.
2. Loosen the cable grommet and the adjacent nut on the end of the warning tower. Let the grommet and nut slide down the cable.
3. Holding the tower upright, pass the tower through the slot in the mounting plate [B]. Tighten the nut under the mounting plate and re-attach the cable grommet.
4. Plug the DB9 plug into connection J4 on the electrical panel on the back of the print engine [C] (see Section 4.12) and hand tighten the jackscrews.
4.10 Mounting the Photosensor

The distance between the photosensor and the PA/4000 is not crucial. A good guideline is to place the photosensor as close as possible to the applicator.

**Parts:**
1. Diagraph photosensor kit P/N 5700-216

**Assembly:**
1. Mount the photosensor to the conveyor using the bracket and hardware provided. Position the photosensor where it will not be tripped by the next product prior to completion of the product delay on the first product. Improper positioning will result in missed products. Adjust the sensing distance of the photosensor with the potentiometer at the rear of the photosensor.
2. Tighten screws with a Phillips screwdriver and a 5/16-inch wrench.
3. Measure the distance from the photosensor to the peel blade on the print engine and record this measurement on the PA/4000 Configuration sheet, see Section 6. You will need this information later during the configuration of this system.
4. Make sure the power is OFF and connect the photosensor to J2 on the electrical panel on the back of the print engine, see Section 4.12.
4.11 Mounting the Optional Secondary Wipe-Down Applicator

If your system has a secondary wipe-down applicator, follow the installation and operation instructions in the Secondary Wipe-down User’s Manual (5802-930).
4.12 Electrical Connections

The following installation notes cover ALL cable connections. Skip any directions for connecting devices that are not included in your system.

**Rear Panel Inputs**

**Hand-Held Terminal**
Connect the RJ-11 cord to input J1 [C]. Place the terminal in its holster when not in use.

**Photosensor 1**
Connect the photosensor 1 cable to input J2 [D]. When using a single photosensor, position it so that the secondary wipe-down cylinder has actuated prior to the next photosensor trip.

**Photosensor 2 (Optional)**
For the PA/4020 Dual Panel Applicator with the secondary wipe-down applicator using a second photosensor. Connect the photosensor cable to input J3 [E].

**Photosensor Out (Optional)**
For the PA/4020 Dual Panel Applicator with a secondary wipe-down applicator. Connect the photosensor output cable from the photosensor out slot on the secondary wipe-down unit to input J6 [F].

**Warning Tower (Optional)**
Connect warning tower cable to input J4 [G].

**Sensor for Air Cylinder/Tamp Head Assembly**
Connect the sensor cable from the Tamp Head to input J5 [H].

**Top Panel Inputs**

**Power Cord**
Connect the power cord [A].

**Rs-232 Computer Cable**
Connect the computer cable from your PC’s serial port to RS-232 [B].
4.13 Loading the Label Roll

Follow the label web path shown on the label inside the print engine.

1. Remove the outer supply disk from the label supply hub [F] and set aside.
2. Remove the wire clip from the take-up spool [H].
3. Open the clear printer engine cover.
4. On the printer engine, release the printhead lift lever [E] and the pinch roller release lever [I].
5. Unpack a roll of labels and remove enough labels to leave approximately two feet of exposed label liner.
6. Load the label roll onto the supply hub [F] so that the labels spool off to the left. Push the label roll flush against the inner supply disk [G] making sure that the label core seats firmly on the guide collar.
7. Support the label roll with one hand while replacing the outer supply disk with the other hand. Make sure the guide collar seats inside the label core.
8. Spool off the labels over the guide roller [A].
9. Feed the labels under the guide roller [B].
10. Route the liner between guide roller [C] and the pinch roller [J].
11. Pull the labels to the left and through the label edge sensor [K]. This sensor locates the leading edge of a label, by measuring the level of opaqueness. You can move it left and right to accommodate different activators (label edge or backprinted, black stripe). The black stripe sensor locates the leading edge of a label by measuring the level of reflectivity instead of a change in opaqueness.
12. Loop the labels over the label peel blade [M] and make a u-turn with the liner to the right. Route the liner between the air assist tube [L] and the pinch roller [J]. Take care not to route the labels under the air assist tube.
13. Feed the liner under guide roller [D]. Be sure all label guide roller collars on [A], [B], [C] and [D] are flush with the label edge.
14. Route the liner counter-clockwise onto the take-up spool [H]. Anchor in place with the wire clip.
15. Check that the leading edge of the label at the printhead is square with the printhead and that the stock is positioned all the way into the assembly.
16. Lock down the printhead lift lever [E].
17. Turn the label take-up spool [H] counter-clockwise very gently (liner tears easily) until there is no slack in the liner between the peel blade [M] and the pinch roller [J]. While maintaining the tension in the liner, engage the pinch roller release lever [I].
18. Press the FEED key on the Hand-Held Terminal.
4.14 **Loading the Ribbon Roll**

Follow the diagram of the ribbon path inside the print engine cover.

1. Raise the printhead lift lever [A].
2. Remove remaining ribbon from the ribbon rewind roller [C].
3. Unwrap ribbon roll from the package. Do not remove the ribbon leader and the adhesive edge.
4. Slide the ribbon roll completely onto the ribbon supply hub [D] so that the ribbon leader feeds off to the left.
5. Feed the leader to the left under the ribbon idler [E].
6. Pass the leader under the printhead mount assembly. Be sure the ribbon passes through the center of the ribbon sensor [F] and above the label edge sensor [G].
7. Pull the leader through, past the ribbon shield [H], and over the top of the ribbon idler roller [B].
8. Pull the leader to the ribbon rewind roller [C].
9. Anchor the leader to the rewind roller [C] with either the clasp or the adhesive edge on the leader. Securing with the adhesive edge requires an empty ribbon fiber core.
10. Wind the leader counter-clockwise onto the rewind roller [C]. Continue until all of the leader wraps onto the rewind roller [C] and only the ribbon is exposed (approx. 12 turns).
11. Make sure that the ribbon is feeding smoothly along its path.
12. Lock down the printhead lift lever [A].
13. Close the print engine cover.

**NOTE:** Clean the printhead every time you replace the ribbon to maintain print quality and extend printhead life.
4.15 Minimum and Maximum Distances for the PA/4000

*Top Down Application*

In this configuration, the PA/4000, with a 6 inch tamp cylinder, applies labels to the top panel of a carton. The height of the conveyor plus the tallest box must be greater than 10 inches and less than 48 inches.
**Side Panel Application, Nose Down**

In this configuration, the PA/4000 applies labels to the side panel of a carton. For this setup, the height of the conveyor must be greater than 22 inches and less than 58 inches.
**Side Panel Application, Nose Up**

In this configuration, the PA/4000 applies labels to the side panel of a carton. The distance from the back of the tamp plate to the floor must be greater than 30 ½ inches and less than 62 inches.
**Bottom Up Application**

In this configuration, the PA/4000 applies labels to the bottom panel of a carton. The distance from the tamp plate to the floor must be greater than 30 inches and less than 65 inches.

---

**4.16 Final Positioning**

1. Disconnect power cords and the air line if they will hinder the movement of the PA/4000.
2. Unlock casters.
3. Carefully push the PA/4000 into its position next to the conveyor.
4. Bolt the PA/4000 to the floor through the holes in the t-base.
5. Make necessary connections such as power cords, airline and photosensor cable.
5.0 CONFIGURATION

5.1 Power Module Configuration

5.1.1 Configuring the Power Module for the 110/120VAC Application

Warning: Failure to use proper fuses and/or install the fuse assembly for correct voltage can damage the PA/4000.

Disconnect the power cord before servicing the power module.

Pop the fuse assembly up and out of the power module with a flat head screwdriver.

Once out of the power module, turn the fuse assembly so that the arrow on the 110/120VAC side of the assembly is lined up with the arrow on the power module.

Replace the fuse assembly.

See Fuse Replacement Kit Instructions 6105-383N when needing to replace a fuse.
5.1.2 Configuring the Power Module for the 220/240VAC Application

Failure to use proper fuses and/or install the fuse assembly for correct voltage can damage the PA/4000.

Disconnect the power cord before servicing the power module.

Pop the fuse assembly up and out of the power module with a flat head screwdriver.

Once out of the power module, turn the fuse assembly so that the arrow on the 220/240VAC side of the assembly is lined up with the arrow on the power module.

Replace the fuse assembly.

See Fuse Replacement Kit Instructions 6105-404N when needing to replace a fuse.
5.2 Hand-Held Terminal Configuration

The Hand-Held Terminal for the PA/4000 is designed for industrial environments. It controls applicator functions that print and apply labels. It features a one-line sixteen character text LCD display, four LED lights that show power on and warn of error conditions and seven control keys that are described below. It sits in its holster attached to the yoke when not in use.

LCD (Liquid Crystal Display) Menu Window [A]

The LCD menu window displays one-line of text allowing up to sixteen characters. It displays menu items (see [D]) or error conditions. “All OK” screen display means the system is printing normally.

LEDs [B]

Four LEDs signal a condition (while the LCD displays the condition, see [A]):

- **Power LED ON** signals all systems go, OFF indicates no power
- **Label LED FLASHING** indicates Label Low
- **Ribbon LED FLASHING** indicates Ribbon Low or Ribbon Out
- **Error LED ON** indicates Ribbon Out, FLASHING indicates Printer Paused, Cylinder Error or Printer Error
**LCD Contrast or Scroll Keys [C]**

Hold the 2nd key down while pressing the up or down arrow keys to control LCD Display contrast. Up key to increase contrast, down key to decrease contrast.

These keys are also used to scroll through menu items as discussed in [D].

**Menu/Select or Display/Cancel Key [D]**

This key is used to toggle between Menu mode and Edit mode.
Review the current count (by pressing and holding the 2nd key followed by the MENU/SELECT key once).

See error messages (by pressing and holding the 2nd key followed by the MENU/SELECT key twice).

Within the MENU screen are menu select items that control the settings to print and apply labels. When the PA/4000 is turned ON the screen will display “ALL OK”. Press the MENU/SELECT key to see the menu screen. From this screen use the arrow keys to scroll through the menu select items as shown in the chart above.

To edit a menu item press the MENU/SELECT key. The menu item will begin flashing. Use the arrow keys to scroll to the correct edit and press the MENU/SELECT key to accept the change, then exit the edit mode. If you make a mistake while in edit mode, hold the 2nd key while display is flashing and press the MENU/SELECT key to cancel.

Definitions of Menu Select Items:

**Clear Count** – Resets the “applied label” counter to zero.

**Tamp Dwell** – Adjusts the amount of time that the tamp pad stays extended before retracting to home position. Adjust from 0-100. The tamp dwell time must be set greater than 30 ms to extend the cylinder.

**Product Delay** – Adjusts the input delay of photosensor 1 causing the tamp pad to delay before extending to apply a label. Adjust from 0-999.

**Output Delay** – Adjusts the amount of time an external device like the PA/4000 secondary wipe-down unit delays before it triggers. Adjust from 0-999.

**Output Pulse** - Adjusts the width of the output pulse used to trigger an external device like the PA/4000 secondary wipe-down unit. Adjust from 0-999. Must be set above 25, with a setting of 25 or lower the secondary wipe-down won’t fire.

**Transfer** – Sets the system for use with direct thermal or thermal transfer ribbon.

- **OFF** for direct thermal label printing.
- **ON** for thermal transfer printing using a black ribbon. Ribbon sensor is enabled and head current temperature is reduced.
- **TR** for thermal transfer printing using a translucent ribbon.*

* Requires ribbons with an opaque trailer.

**Sensor #1 Edge** – Sensed by Photosensor 1, it determines whether the system delay(s) will trigger at the front “L” (called leading edge) or the end “T” (called trailing edge) of a box.

**Sensor #2 Edge** – Sensed by Photosensor 2, it determines whether the output delay will trigger the secondary wipe-down unit at the front “L” (called leading edge) or the end “T” (called trailing edge) of a box.

**Output Sensor** – Determines whether the Output Pulse will be sent through either Photosensor 1, Photosensor 2 or make No Connection. Choose 1, 2, or NC.
Output Sensor Set to Photosensor 1
With the output sensor set to 1 the output pulse will be sent through photosenser 1. The drawing below shows the input signal from Photosensor 1 coming into the PA/4000 triggering the tamp pad, and with the same signal triggering a secondary device (both using the same edge of the product, leading or trailing).

Output Sensor Set to Photosensor 2
In a special situation where the same edge cannot be used, you will need to use two photosensors. With the output sensor set to 2, photosensor 1 will trigger the tamp pad while photosensor 2 triggers a secondary device. The output pulse will be sent through photosensor 2. The drawing below shows the photosensor input signals of both photosensors 1 and 2 entering the PA/4000.

Output Sensor Set to No Connection
In the case where you don’t want the secondary device to be triggered, set the output sensor to NC (NO CONNECT). As shown below, Photosensor 1 will trigger the tamp pad but the system sends no output pulse signal to a secondary device.
**Auto-Retract** - Enables or Disables the Auto-Retract feature of the PA/4000. The Auto-Retract sensor is located on the tamp pad. It senses the product when the tamp pad extends to apply a label, then commands the tamp pad to retract to the home position. If the sensor does not detect a product, or if the sensor is turned OFF from the Hand-Held Terminal, the cylinder will remain in the extended position until the TAMP DWELL time has expired.

**Darkness** – Adjusts the level of darkness (printhead temperature) in a printhead. It is used to balance a new printhead so that it prints at the same level of darkness as the previous head. Darkness values are from 1 to 99. Start with a midrange number and work from there.

**Feed (Apply Label) [E]**

Provided there is not a label present on the tamp pad already, the FEED key will advance the paper automatically to the first print position of the next label. On a new size label, two labels are usually fed before registration occurs. Pressing the FEED key in conjunction with the 2nd key will cause the system to apply a label.

![NOTE:](image)

The tamp assembly will not cycle unless a label is present on the tamp pad.

**Pause/Resume [F]**

The PAUSE/RESUME key allows you to pause the printing of a run of labels. A second depression of the key will resume the job. Activation of this key will do the following:

- Stop the print mechanism when the label being printed is completed
- Stop the label counter, but maintain the count balance
- Hold all data in memory
- Disable tamp applicators and disable photosensor out signal

![NOTE:](image)

On the PA/4020 model, the disabling of the photosensor out signal will in turn prevent the secondary wipe-down from being activated by photosensor 1 or 2.
Stop/Clear [G]

The STOP/CLEAR key deletes the current print job from the PA/4000’s memory. If you press the STOP/CLEAR key twice, you will clear two print jobs from the PA/4000’s memory. Once you press this key, you must press the PAUSE/RESUME key to resume printing.

NOTE: Pressing the STOP/CLEAR key will NOT clear any PA/4000 Error conditions.

2nd Key [H]

The 2nd key works like the shift key on a PC keyboard. Holding the 2nd key down while pressing another key accesses new functions eliminating the need for more keys on the keypad. The chart below shows all the functions that can be accessed with 2nd key.

<table>
<thead>
<tr>
<th>Press</th>
<th>Function Accessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>△ or ▼</td>
<td>Controls contrast</td>
</tr>
<tr>
<td>Press Once</td>
<td>Review current count</td>
</tr>
<tr>
<td>Press Twice</td>
<td>See error messages</td>
</tr>
<tr>
<td>Feed</td>
<td>Apply a label</td>
</tr>
</tbody>
</table>
5.2.1 Error or Indications Menu

The Error Menu indicates problems the system is currently experiencing. An error messages will appear on the Hand-Held Terminal display screen. When the red Error LED lights on the hand-held terminal, you will need to check the Error Menu by holding down the 2nd key and pressing the MENU/SELECT key twice.

There are five possible error messages that could appear on the LDC display screen:

- Ribbon Out – When the ribbon in the printer is completely depleted, the RIBBON LED will flash and the ERROR LED will stay lit. Replace the ribbon, clear the error and resume printing.
- Ribbon Low - The ribbon in the printer is nearly depleted and should be changed soon. The RIBBON LED will flash when this occurs.
- Label Low - The label stock in the printer is nearly depleted and should be changed soon. The LABEL LED will flash when this occurs.
- Printer Error – Whenever a mechanical problem has interrupted printing, the ERROR LED and LABEL LED will flash.
- Printer Paused - The Printer Paused error message will appear if either of the following occurs: The PAUSE switch is pressed or a print job is canceled with the STOP/CLEAR key.

To clear an error in the printer, press PAUSE, FEED and then PAUSE again to resume operation.
5.3 Configuring the DIP Switch Settings

The eight position DIP Switch block labeled SWS1 [A] is located on top of the PA/4000 main unit next to the RS-232 connector. Switches 1, 2 and 3 control the baud rate while switches 4-8 control printer features such as word length, compatibility, present sensor, ribbon sensor and cutter enable. Refer to the chart below.

<table>
<thead>
<tr>
<th>Baud Rate</th>
<th>SW1-1</th>
<th>SW1-2</th>
<th>SW1-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>9600</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>4800</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>2400</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>1200</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>600</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>300</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>19200</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Word Length</th>
<th>SW1-4</th>
</tr>
</thead>
<tbody>
<tr>
<td>8, 1, N-Bit Word</td>
<td>OFF</td>
</tr>
<tr>
<td>7, 2, N-Bit Word</td>
<td>ON</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Compatibility</th>
<th>SW1-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prodigy Plus Offset</td>
<td>OFF</td>
</tr>
<tr>
<td>Prodigy Offset</td>
<td>ON</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Present Sensor</th>
<th>SW1-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disable Sensor</td>
<td>OFF</td>
</tr>
<tr>
<td>Enable</td>
<td>ON</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ribbon Sensor</th>
<th>SW1-7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Sensing</td>
<td>OFF</td>
</tr>
<tr>
<td>Inverted Sensing (Colored and Special Ribbons)</td>
<td>ON</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cutter Enable</th>
<th>SW1-8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote Cut Enabled</td>
<td>ON</td>
</tr>
<tr>
<td>Remote Cut Disabled</td>
<td>OFF</td>
</tr>
</tbody>
</table>

When operating the PA/4000, this switch should be set to OFF.

When operating the PA/4000, this switch should be set to ON.

When operating the PA/4000, this switch should be set to OFF.

When operating the PA/4000, this switch should be set to ON.

If you have the labeling software Performances Series for Windows™ recommended by Diagraph, you can set switches 4 through 8 through it.

5.3.1 Setting the Baud Rate

Switches 1, 2 and 3 control the PA/4000's baud rate. Before you can send printed labels to the PA/4000, you need to set the baud rate. The chart above gives the position of the three switches and the corresponding baud rate for each setting. Set your switches according to your baud rate.
5.3.2 Setting Other Printer Features
The PA/4000 can accept 7 or 8 bit data, while ignoring parity. It also requires at least 1 stop bit. This configuration assures the greatest compatibility with most serial devices, even if the data format arrangement of the host cannot be modified. Set these features manually unless you have Diagraph’s Performance Series for Windows™ software (these settings can be set from inside the software).

**SW1-4 Word Length**
Switch SW1-4, selects the word length.
- **SW4**
  - 7-BIT WORD ON
  - 8-BIT WORD OFF

**SW1-5 Compatibility**
Switch SW1-5 emulates a standard PRODIGY PRINTER. When operating the PA/4000, this switch should be set to OFF.
- **SW1-5**
  - Emulate Prodigy ON
  - PA/4000 OFF

**SW1-6 Present Sensor**
Switch SW1-6 enables the label present sensor. Setting this switch to the ON position enables the sensor. Setting this switch to the OFF position disables the sensor.
- **SW1-6**
  - Enable sensor ON NOTE: This switch must be ON!
  - Disable sensor OFF

**SW1-7 Ribbon Sensor**
This switch is always OFF for PA/4000. This switch enables inverse ribbon sensor logic, which is used for colored ribbons only.
- **SW1-7**
  - Enable ON
  - Disable OFF*

*Must be turned OFF even when translucent (colored) ribbon is used.

**SW1-8 Cutter Enable**
This switch controls the cutter function.
- **SW1-8**
  - Enable Cutter ON (switch should be left ON)
  - Disable Cutter OFF

NOTE: To read the switch settings, the printer must be reset by turning it off and back on.
5.4 Configuring the Air Cylinder/Tamp Pad

This section assumes that you have already made all electrical and air pressure connections and that a label has been sent to the PA/4000 from an outside source; ie: a PC with Performance Series for Windows™ Labeling Software.

You will be manually configuring the air flow controls on the air cylinder/tamp pad to control the force at which the tamp pad is extended and retracted. You will also be setting various menu select items using the Hand-Held Terminal to tell the tamp pad when to extend in order to effectively apply a label to the product and how long the tamp pad will wait before it retracts to the home position.

**Preparation**

Make sure the conveyor isn’t moving and the air is turned off (OSHA shut-off valve is in the closed position). Position the PA/4000 next to the conveyor in the orientation used for production. Power ON the system. Press the PAUSE/RESUME key on the Hand-Held Terminal to pause the system.

5.4.1 Configuring the Air Flow on the Air Cylinder/Tamp Pad

The air flow controls [B] and [C] on the cylinder/tamp pad control the air pressure needed to cause the tamp to extend and retract fully and with the appropriate force. Record these final settings on the PA/4000 Configuration Sheet attached to the PA/4000 (See Section 6). Make sure the cylinder/tamp pad assembly is properly mounted to the extended horizontal support bar and the tamp pad is properly positioned with the peel blade as shown in Section 4.4.2.

1. Manually retract the tamp pad.
   Ensure the cylinder home switch [A] LED is lit when the cylinder is fully retracted. If not, adjust the position of the sensor by loosening the set screws and moving the sensor up or down until the LED comes on. Retighten the set screws.

2. Make sure both the top (retract) [B] and bottom (extend) [C] Air Flow Controls are turned fully counterclockwise.

3. Place a test product on the conveyor in the stroke path of the tamp pad just as it will be applying in normal production.

4. Make sure the tamp pad is parallel to the product. Manually extend the tamp cylinder until the tamp pad contacts the products surface. If the tamp pad is not completely parallel to the surface of the product, retract the tamp pad slightly, loosen the yoke bolt [D] on the
mounting plate and adjust the yoke until it is level and retighten the bolt. Then loosen the yoke bolts [E] holding the main unit and adjust the main unit until it is level and retighten the bolts. This will make the tamp pad completely parallel to the product surface.

5. For now, move the test product out of the path of the tamp pad but keep it nearby. With the tamp pad fully extended, slowly turn the crank handle on the stand to lower the PA/4000 until the tamp pad extends about 1 inch past the surface of the product.

6. Manually return the tamp pad to the cylinder's fully retracted position and turn ON the air supply. To begin with, adjust the tamp air pressure [F] to 25 psi (between 20-40 psi is the usual range).

   **CAUTION:** DO NOT PLACE YOUR HAND BETWEEN THE PA/4000 MAIN UNIT AND THE TAMP PAD.

7. Press PAUSE-RESUME on the Hand-Held to resume the air cylinder/tamp pad action. This triggers the cylinder/tamp pad to cycle. Adjust the psi until the tamp pad appears to extend equal to the surface of the test product. Replace the test product back into the path of the tamp pad. Notice the force the tamp pad extends and retracts.

8. Press PAUSE-RESUME again to pause the cycling action. To attain the proper force of the air cylinder/tamp pad extension and retraction, adjust the top [B] and bottom [C] air flow controls by turning clockwise one full turn at a time. Count how many full turns are made to get the right amount of force necessary considering the product, label size, etc. Record the turns on the PA/4000 Configuration Sheet (see Section 6). You may have to readjust the tamp air pressure [F] to get the correct amount of air pressure. When you are satisfied with the psi and air flow settings, go to the next section on setting the tamp dwell.
5.4.2 Setting the Tamp Dwell with the Hand-Held Terminal

The Tamp Dwell Menu Select Item on the Hand-Held Terminal adjusts the amount of time that the cylinder waits before returning to its home position. A lower Tamp Dwell value setting will reduce the time that the cylinder waits and because the cylinder extension time is shorter, the cylinder's stroke may be shorter.

To set the Tamp Dwell value:
1. Turn on the air by sliding the OSHA shut-off valve to the ON position.
2. Using the Hand-Held terminal, turn off the auto-retract.
4. From the Menu screen, press the down arrow key twice until the display shows the Tamp Dwell screen.
5. Observe the current Tamp Dwell value by pressing the MENU/SELECT key to enter the Edit mode (the value will flash). To begin with, set the Tamp Dwell value to 30. Note: A six inch cylinder with a three inch tamp distance at 40 PSI completes its cycle in about 0.235 seconds. Tamp cycle times are dependant on air flow control, tamp air pressure psi and photosensor distance. Note the air flow control instructions in Section 5.4.1. Tamp Dwell settings and cycle times for the PA/4000 are in the following chart:

<table>
<thead>
<tr>
<th>Tamp Dwell Setting</th>
<th>Complete Cycle Time in Seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>0.13</td>
</tr>
<tr>
<td>20</td>
<td>0.26</td>
</tr>
<tr>
<td>30</td>
<td>0.39</td>
</tr>
<tr>
<td>40</td>
<td>0.52</td>
</tr>
<tr>
<td>50</td>
<td>0.65</td>
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<td>60</td>
<td>0.78</td>
</tr>
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<td>70</td>
<td>0.91</td>
</tr>
<tr>
<td>80</td>
<td>1.04</td>
</tr>
<tr>
<td>90</td>
<td>1.17</td>
</tr>
<tr>
<td>100</td>
<td>1.30</td>
</tr>
</tbody>
</table>

6. Press the MENU/SELECT key to save the new value. The value you enter will not be used until the MENU/SELECT key is pressed and the display is no longer flashing. Hold the 2nd key and press the MENU/SELECT key while the display is still flashing to CANCEL.
7. Observe how far the cylinder extends before it retracts. Use the arrow keys to increase the DWELL value so that the cylinder extends but does not reach the product. Turn on the conveyor. Adjust the Tamp Dwell setting until labels are reliably applied to every product. Record the final dwell value on the PA/4000 Configuration Sheet. See Section 6.

**NOTE:** Do not set the Tamp Dwell value any longer than the time required for full tamp cylinder extension.
5.4.3 Setting the Tamp Dwell with Auto-Retract ON

When configuring a PA/4000 system using auto-retract, set the tamp dwell value as low as you can with no missed products. Note the air flow control and psi setting instructions in Section 5.4.1. The auto-retract sensor cannot detect an object farther away than $\frac{1}{4}$-inch.

To find the correct tamp dwell setting (assuming normal operating conditions):
- Determine the maximum distance the tamp pad will extend to the product.
- Increase the tamp dwell setting until the tamp pad extends to the maximum distance and reliably applies labels to all products (with no missed products).

**NOTE:** Following this procedure will minimize the possibility of damage to the PA/4000 or the product if the auto-retract does not detect the product.

5.4.4 Setting the Product Delay with the Hand-Held Terminal

The product (input) delay value controls the amount of time after the photosensor senses a product that the tamp pad delays before it extends to apply a label to that product. The possible product delay settings are from 0 to 999. A product delay value of 0 will cause the tamp pad to extend as soon as the photocell sees a product. Setting the product delay too low will cause the tamp pad to extend before the product arrives, which could cause the product to accidentally strike and damage the air cylinder/tamp pad assembly. Typical product delay settings range anywhere from 300-700.

As products pass in front of the photosensor, the tamp pad will extend and apply a label to the product. The product delay value will control exactly where on the product the label is applied. The product delay time should be set so that the tamp pad extends when the area of the product where the label should be arrives at the tamp assembly. The following table gives delay values and their corresponding times (in milliseconds).
<table>
<thead>
<tr>
<th>DELAY (MILLISECONDS)</th>
<th>TIME (MILLISECONDS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>72.2</td>
</tr>
<tr>
<td>5</td>
<td>90.4</td>
</tr>
<tr>
<td>10</td>
<td>111.5</td>
</tr>
<tr>
<td>25</td>
<td>170.9</td>
</tr>
<tr>
<td>50</td>
<td>277.9</td>
</tr>
<tr>
<td>75</td>
<td>376.9</td>
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<tr>
<td>100</td>
<td>479.2</td>
</tr>
<tr>
<td>150</td>
<td>681.7</td>
</tr>
<tr>
<td>200</td>
<td>884.4</td>
</tr>
<tr>
<td>250</td>
<td>1095.7</td>
</tr>
<tr>
<td>300</td>
<td>1300</td>
</tr>
<tr>
<td>350</td>
<td>1497.8</td>
</tr>
<tr>
<td>400</td>
<td>1708.7</td>
</tr>
<tr>
<td>450</td>
<td>1911</td>
</tr>
<tr>
<td>500</td>
<td>2116.3</td>
</tr>
<tr>
<td>550</td>
<td>2321.3</td>
</tr>
<tr>
<td>600</td>
<td>2523.8</td>
</tr>
<tr>
<td>650</td>
<td>2736.8</td>
</tr>
<tr>
<td>700</td>
<td>2939.3</td>
</tr>
<tr>
<td>750</td>
<td>3140.1</td>
</tr>
<tr>
<td>800</td>
<td>3344.9</td>
</tr>
<tr>
<td>850</td>
<td>3548.0</td>
</tr>
<tr>
<td>900</td>
<td>3758.4</td>
</tr>
<tr>
<td>950</td>
<td>3962.5</td>
</tr>
<tr>
<td>999</td>
<td>4160.4</td>
</tr>
</tbody>
</table>
To set the Product Delay value:

1. Start the conveyor.
2. Take the PA/4000 out of pause mode by pressing the PAUSE/RESUME key on the Hand-Held terminal.
3. From the Menu screen, press the down arrow key three times.
4. The display shows the Product Delay screen.
5. Press the MENU/SELECT key to enter Edit mode (the value will flash).
6. Use the arrow keys to increase or decrease the Product Delay value.
7. Press the MENU/SELECT key to accept the changes. The value entered will not be used until the MENU/SELECT key is pressed and the display is no longer flashing.
8. Hold the 2nd key and press the MENU/SELECT key (while the display is still flashing to CANCEL).
9. Repeat this process until the label is applied where you want it on the product.

5.4.5 Setting the Position of the Label Present and Auto-Retract Sensors

The tamp pad assemblies for labels 4 inches long and greater will have more than one location available for mounting the auto-retract sensor. The choice of which location to use will depend on the direction of the product and whether the label is being applied to the leading or trailing edge of the product. The auto-retract sensor should be located in a position that will be towards the inside of the product so that it can be assured of sensing the product regardless of any changes in line speed. The bottom of the label present and auto-retract sensors should initially be set to 0.20 inches from the bottom of the tamp pad. If necessary the sensors can be moved up or down 0.05 inches to detect certain labels or products.
5.5 Example Job Setup

The following section shows an example job setup based on PA/4010.

NOTE: Move the PA/4000 away from the line until your Hand-Held Terminal settings are correct.

STEP 1: After system installation and configuration, check for any errors. If the system is operating normally, the screen will display ALL OK.

STEP 2: Go to the Menu screen.

Press the MENU/SELECT key or the down arrow key. This will take you to the Menu screen.

STEP 3: Clear the Item Count.

- Press the MENU/SELECT key once to enter edit (flashing) mode.
- Use the arrow keys to enter a Clear Count response of YES or NO.
- TO ACCEPT CHANGES: Press the MENU/SELECT key.
- TO CANCEL: While the display is still flashing, press and hold the 2nd key followed by the MENU/SELECT key.

STEP 4: Set the Tamp Dwell value.

- From the Clear Count screen, press the down arrow key once.
- Press the MENU/SELECT key once to enter edit (flashing) mode.
- For example, use the arrow keys to enter a Tamp Dwell value of 80.
- TO ACCEPT CHANGES: Press the MENU/SELECT key.
- TO CANCEL: While the display is still flashing, press and hold the 2nd key followed by the MENU/SELECT key.

STEP 5: Set the Product Delay.

- From the Tamp Dwell screen, press the down arrow key once.
- Press the MENU/SELECT key once to enter edit (flashing) mode.
- Use the arrow keys to enter a Product Delay In value of 100.
- TO ACCEPT CHANGES: Press the MENU/SELECT key.
- TO CANCEL: Press and hold the 2nd key followed by the MENU/SELECT key.

STEP 6: Set the Output Delay.

- From the Product Delay screen, press the down arrow key once.
- Press the MENU/SELECT key once to enter edit (flashing) mode.
- Use the arrow keys to enter an Output Delay value of 0.
- TO ACCEPT CHANGES: Press the MENU/SELECT key.
- TO CANCEL: Press and hold the 2nd key followed by the MENU/SELECT key.
STEP 7: Set the Transfer.
- From the Output Delay screen, press the down arrow key twice.
- Press the MENU/SELECT key once to enter edit (flashing) mode.
- Use the arrow keys to enter a Transfer value of OFF.
- TO ACCEPT CHANGES: Press the MENU/SELECT key.
- TO CANCEL: Press and hold the 2nd key followed by the MENU/SELECT key.

STEP 8: Set the Sensor #1 Edge.
- From the Transfer screen, press the down arrow key once.
- Press the MENU/SELECT key once to enter edit (flashing) mode.
- Use the arrow keys to enter a Sensor #1 Edge value of L for leading edge (we use leading edge because we want to place a label on the front edge of the box.)
- TO ACCEPT CHANGES: Press the MENU/SELECT key.
- TO CANCEL: Press and hold the 2nd key followed by the MENU/SELECT key.

STEP 9: Set the Output Sensor.
- From the Sensor #1 Edge screen, press the down arrow key twice.
- Press the MENU/SELECT key once to enter edit (flashing) mode.
- Use the arrow keys to enter an Output Sensor value of NC for no connect.
- TO ACCEPT CHANGES: Press the MENU/SELECT key.
- TO CANCEL: Press and hold the 2nd key followed by the MENU/SELECT key.

STEP 10: Set the Darkness.
- From the Output Sensor screen, press the down arrow key twice.
- Press the MENU/SELECT key once to enter edit (flashing) mode.
- Use the arrow keys to enter a Darkness value of 25.
- TO ACCEPT CHANGES: Press the MENU/SELECT key.
- TO CANCEL: Press and hold the 2nd key followed by the MENU/SELECT key.
6.0 OPERATIONS

6.1 Start of the Day

Step 1 – Check Configuration.
Look at the configuration sheet attached to the PA/4000 (see page 3 of this section). Check all system settings against those recorded on the sheet.

Step 2 – Check Power.
1. Check that the OSHA air valve is in the CLOSED position.
2. Turn ON the power.
3. Check the air pressure.
4. Check the positions of all switches.

Step 3 – Check Consumables.
1. Check that there is a label roll loaded. Make sure that it is routed correctly. See Section 4.13.
2. Check that there is a ribbon roll loaded. Make sure that it is intact and routed correctly through the print engine. See Section 4.14.

Step 4 – Start Up.
1. If there are no problems or errors, the Hand-Held Terminal will display “All OK”.
2. Press the PAUSE/RESUME key once. The display will read “Printer Paused”.
3. Slide the air shut-off valve to the OPEN position.

Step 5 – Download Format.
1. At the PC send a batch of labels to the PA/4000.
2. Press the PAUSE/RESUME key once to enter print mode.
3. Note that the printer will expel two more labels after you expel the first label. Remove these labels and send one more test label to be sure that the PA/4000 is ready.

Step 6 – Turn on Conveyor.
PA/4000 CONFIGURATION SHEET

Serial No. __________________________________________________________

Production Line ____________________________________________________

THESE VALUES SHOULD ONLY BE CHANGED BY MAINTENANCE OR OTHER TRAINED PERSONNEL

HAND HELD MENU SETTINGS

The values recorded on this sheet will be different from one production line to the next. Factors such as line speed, distance from the PA4000 tamp pad to the product, and the location of the product sensor will determine the actual values.

* Not a stored variable
** Line speed, tamp distance and other factors will determine actual value.

AIR CONTROL PSI SETTINGS

See Section 5.4.1 for instructions on how to set air flow controls. After air flow has been adjusted, record here as a reference how many full turns clockwise was made to attain the final settings. Once set, do not change these settings.

TAMP CYLINDER FLOW CONTROLS

* Number of turns clockwise relative to fully ccw position

REVISION 2.0 3/17/00
6.2 Adjustments during Operation

**Print Quality** PA/4000 Print engine has adjustments for controlling the quality of print on the labels. Two of most important adjustments are print darkness (printhead temperature) and print speed.

If you are using Performance Series for Windows™ software, review chapter 5 on Printing Formats in the Performance Series User’s Manual to achieve the best contrast in print.

If your message contains bar codes, use a bar code verifier to adjust for optimum print quality.

6.3 Stopping Label Application

Stop the unit by pressing the STOP/CLEAR key on the Hand-Held Terminal.

6.4 End of the Day

**Step 1 – Stop Label Application.**
Press STOP/CLEAR key on the Hand-Held Terminal.

**Step 2 – Stop the Conveyor.**

**Step 3 – Power OFF the PA/4000.**

**Step 4 – Slide the air shut-off valve to the CLOSED position.**
Do not close the air shut-off valve before shutting off the conveyor. The air cylinder/tamp pad assembly could fall and damage a product.

**Step 5 – Clear the Label off the Tamp Pad.**

**Step 6 – Clean the Sensors.**
If available, use compressed air to clean the sensors. Wiping the sensors to clean them is not nearly as effective as an air gun.
7.0 Prodigy Plus™ Internal Fonts and Bar Code Examples

This section describes all character fonts and bar codes internally available in the Prodigy Plus™ print engine.

7.1 Explanation of Fonts and Bar Codes

All character fonts and bar codes available in the Prodigy Plus™ print engine are illustrated on the following pages. Each character font and bar code has a “name” associated with it for use in programming. Character fonts have been given numeric names while bar code fonts are selected by alpha names. Bar code fonts in uppercase alpha names will print bar codes with human readable interpretations. Bar code fonts in lowercase alpha names will be the same codes printed as bars only.

Bar code human readable fonts use the slash zero convention for distinguishing between the zero and the alphabetic O.

Character Fonts 0, 1 and 2 include the upper and lowercase ASCII characters, which include commonly used international characters. Character Font 9 is the CG Triumvirate smooth font. Point sizes are 6, 8, 10, 12, 14, 18, 24, 30, 36 and 48.

7.1.1 Eight Standard Character Fonts (203 dots/inch)

<table>
<thead>
<tr>
<th>Font</th>
<th>Dot H</th>
<th>Dot W</th>
<th>Dot Sp</th>
<th>Point Size</th>
<th>Prodigy Plus 152 Print Engine</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>7</td>
<td>5</td>
<td>1</td>
<td>0.005</td>
<td>0.010</td>
</tr>
<tr>
<td>1</td>
<td>13</td>
<td>7</td>
<td>2</td>
<td>2.256</td>
<td>11.28</td>
</tr>
<tr>
<td>2</td>
<td>18</td>
<td>10</td>
<td>2</td>
<td>16.92</td>
<td>8.46</td>
</tr>
<tr>
<td>3</td>
<td>27</td>
<td>14</td>
<td>2</td>
<td>12.69</td>
<td>6.34</td>
</tr>
<tr>
<td>4</td>
<td>36</td>
<td>18</td>
<td>3</td>
<td>9.67</td>
<td>4.83</td>
</tr>
<tr>
<td>5</td>
<td>52</td>
<td>18</td>
<td>3</td>
<td>9.67</td>
<td>4.83</td>
</tr>
<tr>
<td>6</td>
<td>64</td>
<td>32</td>
<td>4</td>
<td>5.64</td>
<td>2.82</td>
</tr>
<tr>
<td>7</td>
<td>32</td>
<td>15</td>
<td>5</td>
<td>10.15</td>
<td>5.08</td>
</tr>
<tr>
<td>8</td>
<td>28</td>
<td>15</td>
<td>5</td>
<td>10.15</td>
<td>5.08</td>
</tr>
</tbody>
</table>
### 7.1.2 Bar Codes

Ratio Based Bar Codes with Human Readable fonts (UPPERCASE)

<table>
<thead>
<tr>
<th>narrow BarName</th>
<th>2 1</th>
<th>5 2</th>
<th>3 1</th>
<th>2 1</th>
<th>5 2</th>
<th>3 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>narrow BarName</td>
<td>0.005</td>
<td>0.005</td>
<td>0.005</td>
<td>0.010</td>
<td>0.010</td>
<td>0.010</td>
</tr>
<tr>
<td>a</td>
<td>3CF9</td>
<td>15.62</td>
<td>7</td>
<td>12.09</td>
<td>7.81</td>
<td>3.5</td>
</tr>
<tr>
<td>B</td>
<td>ZOF5</td>
<td>14.5</td>
<td>6.34</td>
<td>11.28</td>
<td>7.25</td>
<td>3.17</td>
</tr>
<tr>
<td>H</td>
<td>HBC</td>
<td>15.62</td>
<td>7</td>
<td>12.09</td>
<td>7.81</td>
<td>3.5</td>
</tr>
<tr>
<td>I</td>
<td>CODABAR</td>
<td>14.5</td>
<td>6.34</td>
<td>11.28</td>
<td>7.25</td>
<td>3.17</td>
</tr>
<tr>
<td>J</td>
<td>ZOF5W</td>
<td>16.02</td>
<td>7.25</td>
<td>12.09</td>
<td>8.46</td>
<td>3.63</td>
</tr>
<tr>
<td>K</td>
<td>PLESSEY</td>
<td>20.3</td>
<td>9.23</td>
<td>16.82</td>
<td>10.15</td>
<td>4.61</td>
</tr>
<tr>
<td>L</td>
<td>UPC CASE</td>
<td>14.5</td>
<td>6.34</td>
<td>11.28</td>
<td>7.25</td>
<td>3.17</td>
</tr>
</tbody>
</table>

Element Based Bar Codes

<table>
<thead>
<tr>
<th>narrow BarName</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>6</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>narrow BarName</td>
<td>0.0049</td>
<td>0.0049</td>
<td>0.0049</td>
<td>0.0049</td>
<td>0.0049</td>
<td>0.0049</td>
</tr>
<tr>
<td>B</td>
<td>UPC-A</td>
<td>38%</td>
<td>76%</td>
<td>114%</td>
<td>152%</td>
<td>227%</td>
</tr>
<tr>
<td>C</td>
<td>UPC-E</td>
<td>38%</td>
<td>76%</td>
<td>114%</td>
<td>152%</td>
<td>227%</td>
</tr>
<tr>
<td>E</td>
<td>CODE128 B</td>
<td>9.23</td>
<td>3.69</td>
<td>6.15</td>
<td>4.61</td>
<td>1.85</td>
</tr>
<tr>
<td>F</td>
<td>EAN-13</td>
<td>38%</td>
<td>76%</td>
<td>114%</td>
<td>152%</td>
<td>227%</td>
</tr>
<tr>
<td>G</td>
<td>EAN-8</td>
<td>38%</td>
<td>76%</td>
<td>114%</td>
<td>152%</td>
<td>227%</td>
</tr>
<tr>
<td>M</td>
<td>UPC 2D</td>
<td>ADD</td>
<td>38%</td>
<td>76%</td>
<td>114%</td>
<td>152%</td>
</tr>
<tr>
<td>N</td>
<td>UPC 5D</td>
<td>ADD</td>
<td>38%</td>
<td>76%</td>
<td>114%</td>
<td>152%</td>
</tr>
<tr>
<td>O</td>
<td>CODE93</td>
<td>11.28</td>
<td>4.51</td>
<td>7.52</td>
<td>5.64</td>
<td>2.26</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>narrow BarName</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>6</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>narrow BarName</td>
<td>0.0065</td>
<td>0.0065</td>
<td>0.0065</td>
<td>0.0065</td>
<td>0.0065</td>
<td>0.0065</td>
</tr>
<tr>
<td>B</td>
<td>UPC-A</td>
<td>50%</td>
<td>100%</td>
<td>150%</td>
<td>200%</td>
<td>300%</td>
</tr>
<tr>
<td>C</td>
<td>UPC-E</td>
<td>50%</td>
<td>100%</td>
<td>150%</td>
<td>200%</td>
<td>300%</td>
</tr>
<tr>
<td>E</td>
<td>CODE128 B</td>
<td>6.99</td>
<td>2.8</td>
<td>4.66</td>
<td>3.5</td>
<td>1.60</td>
</tr>
<tr>
<td>F</td>
<td>EAN-13</td>
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<td>100%</td>
<td>150%</td>
<td>200%</td>
<td>300%</td>
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<tr>
<td>G</td>
<td>EAN-8</td>
<td>50%</td>
<td>100%</td>
<td>150%</td>
<td>200%</td>
<td>300%</td>
</tr>
<tr>
<td>M</td>
<td>UPC 2D</td>
<td>ADD</td>
<td>50%</td>
<td>100%</td>
<td>150%</td>
<td>200%</td>
</tr>
<tr>
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<td>UPC 5D</td>
<td>ADD</td>
<td>50%</td>
<td>100%</td>
<td>150%</td>
<td>200%</td>
</tr>
<tr>
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<td>8.65</td>
<td>3.42</td>
<td>5.70</td>
<td>4.27</td>
<td>1.71</td>
</tr>
</tbody>
</table>
7.2 Internal Font Examples

These font examples are of all nine Prodigy Plus™ standard internal fonts. They are numerically named. All examples are printed with a 10 x 10 mil pixel size, and a 1x magnification on the horizontal and vertical dot patterns.

**Font 0**
Identifies a 96-character alphanumeric font. Uppercase and lowercase. Characters are 7 dots high, 5 dots wide, and 1 dot spacing.

<table>
<thead>
<tr>
<th>Prodigy Plus</th>
<th>Prodigy Plus 152</th>
</tr>
</thead>
<tbody>
<tr>
<td>!&quot;#$%&amp;'()*+,-./ 0123456789:;&lt;=&gt;? @ABCDEFGHIJKLMNOPQRSTUVWXYZ]^_ `abcdefghijklmnopqrstuvwxyz</td>
<td>!&quot;#$%&amp;'()*+,-./ 0123456789:;&lt;=&gt;? @ABCDEFGHIJKLMNOPQRSTUVWXYZ]^_ `abcdefghijklmnopqrstuvwxyz</td>
</tr>
</tbody>
</table>

**Font 1**
Identifies a 145-character uppercase and lowercase alphanumeric font that includes descenders and ascenders. Characters are 9 dots high, 9 dots wide, and 2 dots spacing (International characters are 13 dots high, 7 dots wide, and 2 dots spacing).

<table>
<thead>
<tr>
<th>Prodigy Plus</th>
<th>Prodigy Plus 152</th>
</tr>
</thead>
<tbody>
<tr>
<td>!&quot;#$%&amp;'()**+-,-./ 0123456789:;&lt;=&gt;? @ABCDEFGHIJKLMNOPQRSTUVWXYZ]^_ `abcdefghijklmnopqrstuvwxyz</td>
<td>!&quot;#$%&amp;'()**+-,-./ 0123456789:;&lt;=&gt;? @ABCDEFGHIJKLMNOPQRSTUVWXYZ]^_ `abcdefghijklmnopqrstuvwxyz</td>
</tr>
</tbody>
</table>
**Font 2**
Identifies a 138-character alphanumeric upper and lowercase font. Characters are 18 dots high, 10 dots wide, and 2 dots spacing.

<table>
<thead>
<tr>
<th>Prodigy Plus</th>
<th>Prodigy Plus 152</th>
</tr>
</thead>
<tbody>
<tr>
<td>!&quot;#$%&amp;'()*+,-./</td>
<td>!&quot;#$%&amp;'()*+,-./</td>
</tr>
<tr>
<td>0123456789:;&lt;=&gt;?</td>
<td>0123456789:;&lt;=&gt;?</td>
</tr>
<tr>
<td>@ABCDEFGHIJKLMNOPQRSTUVWXYZ</td>
<td>@ABCDEFGHIJKLMNOPQRSTUVWXYZ</td>
</tr>
<tr>
<td>`abcdefghijklmnopqrstuvwxyz</td>
<td>`abcdefghijklmnopqrstuvwxyz</td>
</tr>
<tr>
<td>PQRSTUVWXYZ[]^</td>
<td>PQRSTUVWXYZ[]^</td>
</tr>
<tr>
<td>pqrstuvwxyz{[]}~</td>
<td>pqrstuvwxyz{[]}~</td>
</tr>
<tr>
<td>ÇüéâàãçéêëïîïãÇüéâàãçéêëïîïã</td>
<td></td>
</tr>
<tr>
<td>Эёоöóýóёоёëё 0×f</td>
<td>Эёоöóýóёоёëё 0×f</td>
</tr>
<tr>
<td>áíóúññöç</td>
<td>áíóúññöç</td>
</tr>
<tr>
<td>Б</td>
<td>Б</td>
</tr>
</tbody>
</table>

**Font 3**
Identifies a 62-character alphanumeric font, uppercase. Characters are 27 dots high, 14 dots wide, and 2 dots spacing.

<table>
<thead>
<tr>
<th>Prodigy Plus</th>
<th>Prodigy Plus 152</th>
</tr>
</thead>
<tbody>
<tr>
<td>#$$%&amp; ()*+,-.</td>
<td>#$$%&amp; ()*+,-.</td>
</tr>
<tr>
<td>0123456789:</td>
<td>0123456789:</td>
</tr>
<tr>
<td>ABCDEFGHIJKLMNOPQRSTUVWXYZ</td>
<td>ABCDEFGHIJKLMNOPQRSTUVWXYZ</td>
</tr>
<tr>
<td>PQRSTUVWXYZ</td>
<td>PQRSTUVWXYZ</td>
</tr>
<tr>
<td>çñàâééöúúüññß</td>
<td>çñàâééöúúüññß</td>
</tr>
</tbody>
</table>
Font 4
Identifies a 62-character alphanumeric font, uppercase. Characters are 36 dots high, 18 dots wide, and 3 dots spacing.

Prodigy Plus

```plaintext
#$%& ( )*+-./
0123456789:
ABCDEFGHIJKLMNOPQRSTUVWXYZ
ÇÄÁÆÖÜÜÝÑß
```

Prodigy Plus 152

```plaintext
#$%& ( )*+-.
0123456789:
ABCDEFGHIJKLMNOPQRSTUVWXYZ
ÇÄÁÆÖÜÜÝÑß
```
Font 5

Identifies a 62-character alphanumeric font, uppercase. Characters are 52 dots high, 18 dots wide, and 3 dots spacing.

Prodigy Plus

```
#$%& ()*+,-./
0123456789:
 ABCDEFGHIJKLMNOPQRSTUVWXYZ
 CÄÄÉÆÖÜŒÑŽß
```

Prodigy Plus 152

```
#$%& ()*+,-.
0123456789:
 ABCDEFGHIJKLMNOPQRSTUVWXYZ
 CÄÄÉÆÖÜŒÑŽß
```
Font 6
Identifies a 62-character alphanumeric font, uppercase. Characters are 64 dots high, 32 dots wide, and 4 dots spacing.

Prodigy Plus

\#$%& ( )*+,-
0123456789: 
ABCDEFGHIJKLMNOPQRSTUVWXYZÇÄÆÆÖÜÜÆÑŽß
Prodigy Plus 152

#\$%^()***+
01234567
ABCDEFGHIJKLMNOPQRSTUVWXYZ
WXYZ
IJKLMNOP
,
. /
ÇÀÅÉŒÖÜô
Font 7
Identifies a font that prints OCR-A, size I. Characters are 32 dots high, 15 dots wide, and 5 dots spacing.

<table>
<thead>
<tr>
<th>Prodigy Plus</th>
<th>Prodigy Plus 152</th>
</tr>
</thead>
<tbody>
<tr>
<td>.,:;=+/&quot;'(){}%&amp;</td>
<td>.,:;=+/&quot;'{}%&amp;</td>
</tr>
<tr>
<td>',-$^[]&lt;&gt;()!#ã\</td>
<td>',-$^[]&lt;&gt;()!#ã\</td>
</tr>
<tr>
<td>0123456789</td>
<td>0123456789</td>
</tr>
<tr>
<td>ABCDEFGHIJKLM</td>
<td>ABCDEFGHIJKLM</td>
</tr>
<tr>
<td>NOPQRSTU VWXYZ</td>
<td>NOPQRSTU VWXYZ</td>
</tr>
<tr>
<td>abcdefghijklm</td>
<td>abcdefghijklm</td>
</tr>
<tr>
<td>nopqrstuvwxyz</td>
<td>nopqrstuvwxyz</td>
</tr>
</tbody>
</table>

Font 8
Identifies a font that prints OCR-B, size III. Characters are 28 dots high, 15 dots wide, and 5 dots spacing.

<table>
<thead>
<tr>
<th>Prodigy Plus</th>
<th>Prodigy Plus 152</th>
</tr>
</thead>
<tbody>
<tr>
<td>CENSTXZ+&lt;&gt;I</td>
<td>CENSTXZ+&lt;&gt;I</td>
</tr>
<tr>
<td>0123456789</td>
<td>0123456789</td>
</tr>
</tbody>
</table>
Font 9
Identifies the CG Triumvirate smooth font. The characters are available in upper and lowercase. Point sizes are selected by number in the bar code height.

Prodigy Plus

6pt: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 0 1 2 3 4 5 6 7 8 9 a b c d e f g h i j k l m n o p q r s
8pt: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 0 1 2 3 4 5 6 7 8 9 a b c d e f g h i j k l m n o p q r s
10pt: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 0 1 2 3 4 5 6 7 8 9 a b c d e f g h i j k l m n o p q r s
12pt: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 0 1 2 3 4 5 6 7 8 9 a b c d e f g h i j k l m n o p q r s
14pt: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 0 1 2 3 4 5 6 7 8 9 a b c d e f g h i j k l m n o p q r s
18pt: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 0 1 2 3 4 5 6 7 8 9 a b c d e f g h i j k l m n o p q r s
24pt: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 0 1 2 3 4 5 6 7 8 9 a b c d e f g h i j k l m n o p q r s
30pt: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 0 1 2 3 4 5 6 7 8 9 a b c d e f g h i j k l m n o p q r s
36pt: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 0 1 2 3 4 5 6 7 8 9 a b c d e f g h i j k l m n o p q r s
48pt: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 0 1 2 3 4 5 6 7 8 9 a b c d e f g h i j k l m n o p q r s

ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyzABCDEFGH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@^_`{|}~ÇüéâäàëêööôûüýÖüøféø×ťárioúñΩ½¼;iÁâÀ©¥ãśőÔöōµµØûûýÝ±¾÷±°""
(Font 9 Continued)

Prodigy Plus 152

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<th>Sample</th>
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<td>48pt</td>
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7.3 Bar Code Examples

**Bar Code A**
Identifies the Code 3 of 9 bar code with a human readable font. Code 39 is an uppercase, alphanumeric bar code that is variable in length. The valid ASCII characters for this font are: 32, 36-37, 42-43, 45-47, 48-57, 65-90. Code 3 of 9’s normal wide to narrow bar ratio is 3:1.

**Bar Code B**
Identifies the UPC-A bar code. Numeric-only bar code with a fixed length of 12 characters. Eleven digits supplied by host or application software, 12th digit checksum supplied by printer. If the 12th digit is sent by the host, the printer will check that character against the calculated checksum and will print the bar code as all zeros if they do not match. Addendum codes for this font are described by fonts M and N. The normal ratios that the printer can print are 1:1, 2:2, 3:3, 4:4, 6:6, and 8:8. These ratios actually specify size of elements since UPC type bar codes are element based and not ratio based. (Maximum 10 bar codes per label.)
Option V - Identifies Random Weight UPC bar code. The seventh digit supplied by the host or application software must be an uppercase V followed by 4 digit weight information. Eleven digit checksum is supplied by the printer.

**Prodigy Plus**

![Prodigy Plus Option V](image1)

**Prodigy Plus 152**

![Prodigy Plus 152 Option V](image2)

**Bar Code C**

Identifies the truncated UPC-E bar code. Numeric-only bar code with a fixed length of 7 characters. Six digits supplied by host or application program, 7th digit checksum supplied by printer. If the 7th digit is sent by the host, the printer will check that character against the calculated checksum and will print the bar code as all zero if they do not match. Addendum codes for this font are described by fonts M and N. The normal ratios that the printer can print are 1:1, 2:2, 3:3, 4:4, 6:6, and 8:8. These ratios actually specify size of elements since UPC type bar codes are element based and not ratio based.

**Prodigy Plus**

![Prodigy Plus Bar Code C](image3)

**Prodigy Plus 152**

![Prodigy Plus 152 Bar Code C](image4)

**Bar Code D**

Identifies the Interleaved 2 of 5 bar code. I 2 of 5 is a numeric-only code. The ASCII range for the numeric codes is 48-57. Code I 2 of 5’s normal wide to narrow bar ratio is 5:2. (Maximum 8 bar codes per label.)

**Prodigy Plus**

![Prodigy Plus Bar Code D](image5)

**Prodigy Plus 152**

![Prodigy Plus 152 Bar Code D](image6)
Bar Code E
Identifies the Code 128 variable length bar code with modulo 103 checksum calculation. Code 128 can encode the entire 128 ASCII character set, including both uppercase and lowercase alpha characters. Code 128 is an element based bar code similar to the UPC fonts. Therefore ratios must be equal to one. The valid ratios are 1:1, 2:2, 3:3, 4:4, 6:6 and 8:8.

The Prodigy Plus™ supports Code 128 Code Subset A, B, and C. You can select the printer to start on any code subset and switch to another with the data area (default is subset B).

Code Subset A includes all of the standard upper case alphanumeric keyboard characters plus the control and the special characters. To select Code Subset A, precede the data to be encoded with an ASCII A (DEC 65, HEX 41).

Code Subset B includes all of the standard upper case alphanumeric keyboard characters plus lower case alphabetic and special characters. To select Code Subset B, precede the data to be encoded with an ASCII B (DEC 66, HEX 42). If no start character is sent for the 128 font, Code Subset B will be selected by default.

Code Subset C includes the set of 100 digit pairs from 00 through 99 inclusive, as well as special characters. Code Subset C is used for double density encoding of numeric data. To select Code Subset C, precede the data to be encoded with an ASCII C (DEC 67, HEX 43). You must not try to encode alpha data if you select Code Subset C.

**Special Character Handling**

Characters above ASCII value 95 are considered special characters. To access these values, a two character reference table has been built into the Prodigy Plus™ Label Printer. The following table describes this reference.

<table>
<thead>
<tr>
<th>ASCII</th>
<th>2 CHAR</th>
<th>CODEA</th>
<th>CODEB</th>
<th>CODEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>96</td>
<td>&amp;A</td>
<td>FNC3</td>
<td>FNC3</td>
<td>-NA-</td>
</tr>
<tr>
<td>97</td>
<td>&amp;B</td>
<td>FNC2</td>
<td>FNC2</td>
<td>-NA-</td>
</tr>
<tr>
<td>98</td>
<td>&amp;C</td>
<td>SHIFT</td>
<td>SHIFT</td>
<td>-NA-</td>
</tr>
<tr>
<td>99</td>
<td>&amp;D</td>
<td>CODEC</td>
<td>CODEC</td>
<td>-NA-</td>
</tr>
<tr>
<td>100</td>
<td>&amp;E</td>
<td>CODEB</td>
<td>FNC4</td>
<td>CODEB</td>
</tr>
<tr>
<td>101</td>
<td>&amp;F</td>
<td>FNC4</td>
<td>CODEA</td>
<td>CODEA</td>
</tr>
<tr>
<td>102</td>
<td>&amp;G</td>
<td>FNC1</td>
<td>FNC1</td>
<td>FNC1</td>
</tr>
</tbody>
</table>
As an example, to get FNC2 to be encoded into a Code Subset A bar code, send the ASCII & (ASCII 38, HEX 26) followed by an ASCII B (DEC 66, HEX 41), code FNC2 will be encoded.

Example: ATEST&B123
Data Encoded: TEST<FNC2>123

Control Codes
Control characters can be encoded into Code Subset A by sending the lowercase ASCII characters a-z, a = SOH, b = STX, c = ETX and so on.

Font Sizing
The font sizing for a 128 on Rotation #2 is not consistent because of the variable character code to character correlation. Therefore the row address may have to be adjusted to place it properly.

Prodigy Plus

Prodigy Plus 152
Bar Code F
Identifies the standard EAN-13 bar code, Numeric-only bar code; fixed in length. Twelve digits are supplied by host or application software, 13th digit checksum supplied by printer. If the 13th digit is sent by the host, the printer will check that character against the calculated checksum and will print the bar code as all zeros if they do not match. Addendum codes for this font are described by fonts M and N. The normal ratios that the printer can print are 1:1, 2:2, 3:3, 4:4, 6:6 and 8:8. These ratios actually specify size of elements since EAN type bar codes are element based and not ratio based. Maximum 12 bar codes per label.

Bar Code G
Identifies the truncated EAN-8 bar code. Numeric-only bar code; fixed in length. Seven digits are supplied by host or application software, 8th digit supplied by printer. If the 8th digit is sent by the host, the printer will check that character against the calculated checksum and will print the bar code as all zeros if they do not match. Addendum codes for this font are described by fonts M and N. The normal ratios that the printer can print are 1:1, 2:2, 3:3, 4:4, 6:6 and 8:8. These ratios actually specify size of elements since EAN type bar codes are element based and not ratio based.
Bar Code H
Identifies the HIBC (modulo 43 checksum) version of the code 3 of 9 bar code. The checksum will be placed at the end of the data string that is received from the host. The host device must supply a leading + to identify the data format type. Code 39 is an uppercase, alphanumerical bar code that is variable in length. The valid ASCII characters for this font are 32, 36-39, 42-43, 45-47, 48-57 and 65-90. Code 3 of 9’s normal wide to narrow bar ratio is 3:1.

<table>
<thead>
<tr>
<th>Prodigy Plus</th>
<th>Prodigy Plus 152</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="prodigy_plus.png" alt="Barcode Image" /></td>
<td><img src="prodigy_plus_152.png" alt="Barcode Image" /></td>
</tr>
</tbody>
</table>

Bar Code I
Identifies the 20-character CODABAR bar code. CODABAR is basically a numeric bar code with some special additional characters. These characters are 0123456789ABCD$+-./. The length of the code is variable and is normally printed with a 3:1 ratio. CODABAR needs a start and stop character.

<table>
<thead>
<tr>
<th>Prodigy Plus</th>
<th>Prodigy Plus 152</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="prodigy_plus.png" alt="Barcode Image" /></td>
<td><img src="prodigy_plus_152.png" alt="Barcode Image" /></td>
</tr>
</tbody>
</table>
Bar Code J
Identifies an I 2 of 5 bar code with modulo 10 checksum calculation. The ASCII range for the numeric codes is 48-57. Code I 2 of 5’s normal wide to narrow bar ratio is 5:2. Font D and L also print different forms of the I 2 of 5 bar code. Maximum 8 bar codes per label.

Bar code K
Identifies the Plessey bar code.
Bar Code L

Identifies an I 2 of 5 bar code with modulo 10 checksum (UPC shipping container symbology) that does the special human readable formatting for and adds bearer bars to the top and bottom of bars when encoding 13 digits. The ASCII range for the numeric codes is 48-57. Code I 2 of 5’s normal wide to narrow bar ratio of 5:2. Font d and L also print different forms of the I 2 of 5 bar code. There must be a maximum of 8 bar codes per label.

![Bar Code L examples](image)

Bar Code M

Identifies the 2 digit addendum code for UPC fonts. It is a numeric-only bar code with a fixed length of 3 characters. Two characters supplied by the host or application software, the third digit checksum supplied by printer. If the third digit is sent by the host, the printer will check that character against the calculated checksum and will print the bar code as all zero if they do not match. Addendum codes for this font are described by fonts M and N. The normal ratios that the printer can print are 1:1, 2:2, 3:3, 4:4, 6:6 and 8:8. These ratios actually specify size of elements since UPC type bar codes are element based and not ratio based. It must be placed after the UPC/EAN code manually. This code should be placed 9 moduli away from the end of preceding bar codes.

![Bar Code M examples](image)
Bar Code N
Identifies the 5 digit addendum code for UPC fonts. It is a numeric-only bar code with a fixed length of 6 characters. Two characters supplied by the host or application software, the sixth digit checksum supplied by printer. If the sixth digit is sent by the host, the printer will check that character against the calculated checksum and will print the bar code as all zeros if they do not match. Addendum codes for this font are described by fonts M and N. The normal ratios that the printer can print are 1:1, 2:2, 3:3, 4:4, 6:6 and 8:8. These ratios actually specify size of elements since UPC type bar codes are element-based and not ratio based. It must be placed after the UPC/EAN code manually. This code should be placed 9 moduli away from the end of preceding bar codes.

Bar Code O
Identifies the Code 93 bar code. Code 93 is an upper and lower case alpha numeric bar code. The normal ratios that the printer can print are 1:1, 2:2, 3:3, 4:4, 6:6 and 8:8. These numbers actually specify size of magnification and are element-based, not ratio based. The ASCII characters that are permissible for Code 93 are:

',&0$%**+
ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789
abcdefghijklmnopqrstuvwxyz.

Prodigy Plus
Prodigy Plus 152
Bar Code P

Postnet bar code. This is the small bar code on letters encodes Zip codes. It usually contains a 9 digit code followed with a checksum value. Sometimes a two digit post office code will be attached to the zip code.

Bar Code Q

UCC/EAN 128 bar code. This code must have 19 digits sent to the printer for the code to print out.

Bar Code R

UCC/EAN 128 bar code. This bar code is set up for the K-MART specifications. This code must have 18 digits sent to the printer for the code to print out.
7.4 Sample Label Parameters and Fonts
The sample label parameters and fonts illustrated apply to the standard Prodigy Plus 203 dpi.

```
^BL
D11
191100900000055CM2160-CAM
1a6204000800015CM2160-CAM
11220000650065CM2160-CAM
191100502600020BMM CAMCORDER
191100502350020WITH REMOTE
191100302050020* Autofocus
191100301850020* High-Fidelity Sound
191100301570020* 8:1 Speed Zoom
191100301380020* 2 Lux Light Sensitivity
1X1100001300010B200160002002
1X1100001800012L196002
1X110002300012L196002
1Y110001270250CAM
1Y110002950013LOGO

NOTE: Field with font type Y specifies an image loaded in a memory module.
```
^BL
D22
1911002014500552345
1E221250000005C005940928123401&E^}
1X1100001450010B300060002002
1X1100001750012L296002
1X1100001470115L002028
1X1100001470235L002028
1X1100001770235L002026
1X1100001770185L002026
101100011500015NUMBER
101100011600015SERIAL
101100011500118PRODUCT
10110001150240BRAND
101100011800240LINE
101100011800015PLANT
191100301740070P-12621
191100301740190KK
19110030174027501
191100201450159005940
191100201450268928
4a3104000000380ABCDE12345
121100103000000PRODIGY PLUS WITH RIBBON SAVER
^BL
D11
4911006008503330000001
+01
4a9305000100380S000001
+01
42110000100328 (S)
421100001003128SERIAL
1X1100004130305L002090
1X1100005030305L002090
4a9305000100300V032380
42110000100248 (V)
42110000100238SUPPLIER
491100600850252032380
1X110000100225L002590
4a9305000100220Q30
42110000100135 (Q)
42110000100125QUANTITY
49110090085016830
1X110000100113L002590
4a9305000100108P72715-FE3-0030
42110000100030 (P)
42110000100020PART NO.
4911009008506272715-FE3-0030
491100200100393
1X1100002900115L110003
1X1100004100227L175003
1X1100005100227L175003
491100804220380AA
421100004220320ZONE
491100805220380CC
491100803020170LF DOOR
421100003020125DESCRIPTION
E
^BL
D11
4a62050002000853312111111
4911006002000353312111111
43110002300025(1P)
4a6205000200174AA1000
491100600200123AA1000
431100001700115(S)
4911005001002103300 12X12 CORDED TABLET WITH
491100500100230 BUTTON INLINE CURSOR - PC
491100500100250 100/110
1X1100000040180L004392
1X1100000040270L004392
491100400100295 DIAGRAPH CORPORATION
491100400100312 3401 RIDER TRAIL SOUTH
491100400100347 USA
491100400100363 (800) 521-3047
4a620500270036097598
4911006270030597598
431100003500300 (2V)
1X1100002500274L092004
491100400100330 EARTH CITY, MO 63045
E

33121111111 (1P)

AA10000 (S)

3300 12X12 CORDED TABLET WITH
BUTTON INLINE CURSOR - PC
100/110

DIAGRAPH CORPORATION
3401 RIDER TRAIL SOUTH
EARTH CITY, MO 63045
USA
(800) 521-3047

97598 (2V)
8.0 PRINTING LABELS WITH PERFORMANCE SERIES FOR WINDOWS™

For optimum performance, ease and convenience, Diagraph recommends the labeling software package called Performance Series for Windows™.

Diagraph’s Performance Series for Windows™ creates labels and combines a database for storage with capabilities for serialized fields. It has on screen graphics that accurately represent the format while it is being built field by field. It supports many windows features. With the Window Recorder Function you can record a sequence of keystrokes and mouse actions called a macro. Using a macro can shorten any frequently used phrase or steps of any routine. This software supports the fonts and barcodes resident in the Prodigy Plus™ print engine. It also supports the graphic file types, .BMP, .PCC and .PCX.

This section describes printer configuration and label formatting specifically for the PA/4000. This section does not contain information about creating, editing or deleting labels from your database. For information on these topics, consult your Diagraph Performance Series for Windows™ Software Manual.

8.1 Printer Configuration Setup

From the Windows Program Manager, double-click on the Performance Series icon.

The Performance Series Main Menu will appear:
Click on the Settings from the Menu bar. Click on Printer Configuration.

You will see the Printer Configuration menu. Click on the printer you will use. A configuration menu appears:

You must set three options under Printer Configuration to use Performance Series with the PA/4000.

1. Click on Printer Model and set the to PA4000.
2. Set the Offset Adjustment to 0 (Default setting is 0).
3. Set Translucent Ribbon to NO regardless of the type of ribbon used. The Hand-Held Terminal allows the system to print with translucent ribbon using the Transfer function.

Restart program to activate changed options.
8.2 Label Format Setup

After the Printer Configuration options have been set, you are ready to open an existing label and format it. To do this:

Click on the Open icon from the Menu bar and choose an existing label. Click on View then on Change Format Specification.

You will see the Format screen.

Change the options by clicking on the item.

Set the options:

1. Set the Label Offset to 0.

(May need to be adjusted. If you are driving the PA4000 directly with custom software, set the DIP switch positions DSW1 as shown below).
2. Set the Presentation Position to 0.
(May need to be adjusted. If you are driving the PA4000 directly with custom software, set the DIP switch positions DSW1 as shown below).

SW1-1  Depends on RS-232 Baud Rate
SW1-2  Depends on RS-232 Baud Rate
SW1-3  Depends on RS-232 Baud Rate
SW1-4  depends on number of databits
SW1-5  OFF PA4000
SW1-6  ON Enable label present sensor*
SW1-7  OFF Standard ribbon
SW1-8  ON Enable cutter*
*Required

3. Set the Cut Option to 1

4. For label offset of 95 must transmit 0198.

5. For presentation position of 155 must transmit f283.

Refer to Datamax Prodigy Plus™ Print Engine programming guide for more information. The guide can be downloaded free from www.datamaxcorp.com.

Please note that the offset and presentation position may need to be adjusted to get label properly dispensed and print position set correctly.

Click OK to set the new format.

The Performance Series for Windows™ Software allows you to control two different label offsets.

1. All LABEL OFFSET ADJUSTMENT - controls the offset value for all of the labels in your database. This is found under the Settings - Printer Configuration menu. Click twice on the printer chosen and this screen appears:
2. **SPECIFIC LABEL OFFSET** - controls the offset value for a specific label in your database. This is found under the View – Change Format Specification menu when you have an existing label opened.

![Image of Format Emerald window](image)

**IMPORTANT:** The total offset value of the label is determined by adding the OFFSET ADJUSTMENT and LABEL OFFSET values together.
8.3 Printing a Label

Double-click on the Performance Series icon.

The Performance Series Main Menu will appear.

Click on the Printer icon.

The Print Format screen will appear. Click on a label to be printed and click Open. When the label opens click the printer icon to send that label to the printer.
Once you have sent a label to print, the Print Request screen will appear.

![Print Request Screen]

Click OK to download the selected label to the PA/4000.
9.0 MAINTENANCE

9.1 Daily Maintenance

*Clean the Printhead.*
- Turn OFF the printer and unplug the unit from the outlet before cleaning the printhead. Clean the printhead after each ribbon/label change. Clean with alcohol and swabs.

*Clean the Air Filter.*
- Purge by cycling the OSHA valve ON and OFF.
- Check air pressure setting.

9.2 Weekly Maintenance

*Clean the Label Low Sensor located behind the Label Supply Disc.*
- Blow off with dry shop air to remove dust and adhesive.

*Clean the Label Present Sensor on the Tamp Pad.*
- Blow off with dry shop air to remove dust and adhesive.

*Clean the Auto-Retract Sensor on the Tamp Pad.*
- Blow off with dry shop air to remove dust and adhesive.

9.3 Monthly Maintenance

*Clean the Label Low Sensor located behind the Label Supply Disc.*
- Clean with an alcohol swab.

*Clean the Leading Edge Sensor on the Print Engine.*
- Clean with an alcohol swab.

*Clean the Ribbon Sensor on the Print Engine.*
- Clean with an alcohol swab.

*Clean the Label Rollers and Guides of Label Residue.*
- Clean with an alcohol swab.

*Clean the Ribbon Rollers and Guides of Ribbon Residue.*
- Clean with an alcohol swab.
9.4 Six Month Maintenance

*Replace the Vacuum Filter.*

- This filter—6150322—is available in the PA/4000 Filter Kit, 6150-806.

9.5 Intermittent Maintenance

- Clean the printhead each time the label and/or ribbon is replaced.
- Replace the printhead when any degradation in print quality is noticed.

⚠️ CAUTION: Utilize the appropriate safety equipment as prescribed by your supervisor during the performance of routine periodic maintenance.

⚠️ WARNING: Loss of air pressure can cause the tamp head assembly to drop into the path of the oncoming product. This can damage the PA/4000. To prevent this, be sure there are no products on the line or pull the PA/4000 away from the line before sliding the air valve to OFF.

9.6 Yearly

Inspect the print engine drive roller for debris, cuts or other wear or damage.
10.0 TROUBLESHOOTING

Attention to detail and common sense will greatly reduce the risk of accidents. For safety, always stop the conveyor first.

Whenever troubleshooting, always start by checking for error messages on the Hand-Held Terminal.

Cautions

• Triple check the photosensor distance.
• Disable the secondary wipe-down when not in use. Change the output pulse value to 25 with the Hand-Held terminal, the cylinder will not fire if the output pulse value is 25 or lower.
• Make sure the edge value for the photosensor 1 is correct.
• Check that the tamp dwell setting is correct.

10.1 POWER PROBLEMS

<table>
<thead>
<tr>
<th>Problem:</th>
<th>The power LED light is not lit.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possible Cause:</td>
<td>Loss of power.</td>
</tr>
<tr>
<td>ACTION:</td>
<td>1. Make sure that the power cord is undamaged and plugged into a 120V outlet.</td>
</tr>
<tr>
<td></td>
<td>2. Make sure that the power switch is turned ON.</td>
</tr>
<tr>
<td></td>
<td>3. Check the fuses.</td>
</tr>
<tr>
<td></td>
<td>4. Check for bad electrical outlet.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Problem:</th>
<th>On start up, the solenoids continue cycling, there is no digital on the hand-held and all lights are on or flashing.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possible Cause:</td>
<td>Applicator board is bad.</td>
</tr>
<tr>
<td>ACTION:</td>
<td>Replace the applicator board.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Problem:</th>
<th>No motor voltage, engine will not run.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probable Cause:</td>
<td>Prodigy Plus™ board is bad.</td>
</tr>
<tr>
<td>ACTION:</td>
<td>Check the printhead cable. Check motor for continuity. Check the input voltage to the Prodigy Plus™ board from the transformer and diode block. If all is well, replace the Prodigy Plus™ board.</td>
</tr>
</tbody>
</table>
**Problem:** No motor response and printer error shows on hand-held after 2 seconds following pushing of the feed button.

Probable Cause: Prodigy Plus board or motor is bad.

**ACTION:** Check the voltage to the Prodigy Plus™ board. Check that the cables are properly plugged in. Check the solder joints on the stepper motor. If solder is bad replace the motor. If there is still no response, replace the Prodigy Plus™ board.

**Problem:** No voltage from Prodigy Plus™ board to Applicator board.

Probable Cause: Applicator board is bad.

**ACTION:** Check the motor voltage at TP4.

### 10.3 PRINTING PROBLEMS

**Problem:** No power.

**ACTION:** Power Problems, see Section 10.2.

**Problem:** Won’t print

Possible Cause: Printer could be in pause mode.

**ACTION:** Press PAUSE/RESUME key to resume printing.

Possible Cause: Printer could be stopped.

**ACTION:** Press PAUSE/RESUME key to resume printing.

Possible Cause: PC has not sent a batch of labels to the PA/4000.

**ACTION:** Send the labels.

Possible Cause: Label present sensor saturated.

**ACTION:** Shade the PA/4000 from all ambient light.

Possible Cause: Bad cable connection.

**ACTION:** Check cable connection.

Possible Cause: Printhead lift lever is not locked down.

**ACTION:** Push lever down.

Possible Cause: Ribbon or labels not routed correctly.

**ACTION:** Re-route ribbon or label. See Sections 4.13 and 4.14.

Possible Cause: The label-present sensor is dirty or blocked.

**ACTION:** Clean the sensor with a soft-tipped swab and isopropyl alcohol.
Possible Cause: Ribbon or label roll may be bad.
ACTION: Change ribbon or label roll.

**Problem:** Printer skips every other label
Possible Cause: Line is moving too fast for selected print speed.
ACTION: Select new print speed with your labeling software package.

**Problem:** Printer continues to run after ribbon has run out.
Possible Cause: Transfer menu select item in the hand-held terminal is set to OFF.
ACTION: Set transfer to ON via the hand-held terminal.

**Problem:** The print engine is feeding out blank labels.
Blank labels can be the result of a label problem, a ribbon problem or a software problem.
Possible Cause: The ribbon is loaded incorrectly.
ACTION: Compare the path of the ribbon with the path shown on the label inside the print engine housing.

Possible Cause: Wrong ribbon is loaded
ACTION: Different print engines have different ribbon requirements. Make sure that the ribbon loaded in your print engine is compatible. Check the print engine manual or call Diagraph at 1-800-526-2531.

Possible Cause: Failed true type font and/or graphic download.
ACTION: Check both the manual for your label-formatting software and the print engine manual. Verify parameters, reset and try again.

Possible Cause: Low darkness setting
ACTION: 1. Check the Performance Series™ or other label-formatting software manual for appropriate label darkness settings.
2. Check the Hand-Held terminal darkness setting. See Section.5.2.

Possible Cause: Blank label format downloaded.
ACTION: Check the Performance Series™ or other software manual for label formatting procedures.

Possible Cause: The ribbon and the label are incompatible
ACTION: Unsatisfactory printing occurs when the print engine has been set for direct-thermal printing but has been loaded with labels that require a
ribbon for good print contrast. To avoid this situation, make sure that you use labels designed for direct-thermal printing. If your print engine has been set to print with a ribbon in the thermal transfer mode, use ATS labels—Diagraph labels designed for thermal transfer printing.

**Possible Cause:** Right-hand vs. left-hand print engine driver configuration.

**ACTION:** Refer to the Performance Series™ or other label-format software manual for correct configuration.

**Possible Cause:** The ribbon is broken.

**ACTION:** Check for error messages on the Hand-Held terminal LCD. Replace broken ribbon and check ribbon tension.

**Possible Cause:** The ribbon has been loaded upside down.

**ACTION:** When the ribbon is loaded upside down, the ink adheres to the printhead and not to the label. Remove the ribbon and install it correctly. Clean the printhead with isopropyl alcohol.

**Software Causes:** The message is blank, has incorrect parameters (such as Offset) or is requesting something the printer does not understand such as a special font or graphic.

**ACTION:** Examine the message and all its requirements. If all print demands seem to fall within the capabilities of the print engine, run a test label. If the label still prints blank, exit the software and reenter. Try printing the label again. Often, a warm reboot will produce a successful printing.

**Problem:** The labels are only partially printed.

**Probable Cause:** Accumulated material on the label drive roller located behind the peel blade.

**ACTION:** Pause the PA/4000. Release the printhead lift lever. Remove label stock from printer. Clean debris from the label drive roller. Roller can be turned by hand. Reload label stock and lower printhead lift lever to lock the printhead in place.

**Problem:** Gaps in line of print.

**Probable Cause:** Label drive roller needs replacing on the engine assembly.

**ACTION:** Replace label drive roller.
**Problem:** No cutter signal.

**ACTION:** Check cutter cable connections and conditions. May need to replace Prodigy Plus™ Board.

**Problem:** No solenoid reset (clicking) on turning switch ON.

**Probable Cause:** Transformer is bad or there is a bad cable.

**ACTION:** Check the input voltage from voltage regulator to applicator board. It should read 0, 5, 25, 0 (white, green, red, black). If the green lead is below 5V, check the voltage across the blue to blue and red to red on the Prodigy J5 plug. It should read 8.5+ volts on each side. If it doesn’t read that, the transformer is bad. Unplug all the prodigy cables except J5, J9, J6 and J7 from the rectifier block. Replug one at a time while checking the 5 volt lead on J3. A bad cable will cause a voltage drop, replace the cable.

**Problem:** Ribbon and Label won’t back up after each label prints.

**Probable Cause:** Label drive roller gear set screw is stripped.

**ACTION:** Replace set screw.

**Problem:** Edge sensor voltage of 5V will not adjust.

**Probable Cause:** Edge sensor or applicator board is bad.

**ACTION:** Pull edge sensor plug J2. If the voltage drops replace the edge sensor. If the voltage remains the same, replace the applicator board.

**Problem:** Label is only printing on one or more lines or part of lines.

**Probable Cause:** Printhead is bad.

**ACTION:** Check printhead cable. If it is ok, replace the printhead.
10.4 TAMPING PROBLEMS

The problems analyzed in this section are based on the premise that the print engine has successfully dispensed a label and that label is adhering to the pad before the problem occurs.

**Problem:** Cylinder does not extend to apply label.

**Possible Cause:** System is in pause-mode.

**ACTION:** Press PAUSE/RESUME key to resume printing.

**Possible Cause:** Tamp dwell time is too small.

**ACTION:** The tamp dwell time must be set greater than 30 ms to extend the cylinder. If the dwell time is less than 30 ms, increase the value no more than 10 ms at a time. Adjust the tamp dwell-time using the procedure described in Section 5.4.2.

**Possible Cause:** Cylinder air pressure set too low.

**ACTION:** Adjust the airflow to the cylinder by turning the tamp air regulator clockwise until the gauge reads 20-40 psi.

**Possible Cause:** Photosensor 1 problem.

**ACTION:**
1. Check the cable connection between the photosensor and PA/4000.
2. Clean the photosensor lens with a soft-tipped swab and isopropyl alcohol.
3. Adjust and direct Photosensor 1 at the product.
4. Adjust the sensing distance of the photosensor with the potentiometer at the rear of the photosensor.

**Possible Cause:** Label-present sensor is not detecting a label on the tamp pad.

**ACTION:**
1. Make sure DIP switch 7 is switched ON. See Section 5.3.
2. Make sure that the sensor is .20 inches up and not flush with the bottom of the tamp pad. See Section 5.4.5.

**Possible Cause:** Cable connections

**ACTION:** Make sure that the Cables are properly connected.

**Possible Cause:** Cylinder rods are bent

**ACTION:** Determine what caused the cylinder to bend and call Diagraph Service (1-800-526-2531) for replacement cylinder kit: 6150-830 for 6-inch cylinder assembly; 6150-831 for 12-inch cylinder assembly; or 6150-832 for an 18-inch cylinder assembly.

**Possible Cause:** Cylinder airflow control is set incorrectly.

**ACTION:** Review Section 4.17.1.
Problem: **Cylinder extends but retracts before reaching products.**

Possible Cause: Tamp dwell time set too small

ACTION: 1. The dwell time must be greater than 30 ms to extend the cylinder. If it is less than 30 ms, increase the value no more than 10 ms at a time.

2. Adjust the tamp dwell-time using the procedure as described in Section 5.4.2.

Possible Cause: Tamp dwell time with auto-retract ON is set too small for slow-descent cylinder stroke.

ACTION: The auto-retract sensor cannot detect an object farther away than ¼-inch. A slow-descent cylinder stroke does not sustain enough momentum to reach the sensed product. If this is the case, increase the tamp dwell by no more than 10 ms at a time until the tamp pad consistently applies labels to all products.

Possible Cause: Cylinder air pressure set too low.

ACTION: Set the tamp air pressure regulator to 20-40 psi.

Possible Cause: Cylinder airflow control is set incorrectly.

ACTION: Review Section 5.4.1.

Problem: **Label does not adhere properly**

Possible Cause: Tamp-pad is not parallel to the product surface.

ACTION: Set the tamp pad so it can make parallel contact with the product by adjusting the chassis yoke. See Step 4 in Section 5.4.1.

Possible Cause: Tamp dwell time set too low.

ACTION: The tamp dwell time must be greater than 30 ms to extend the cylinder. If the dwell time is less than 30 ms, increase the value no more than 10 ms at a time. Adjust the dwell-time using the procedure described in Section 5.4.2.

Possible Cause: Irregular product surface.

ACTION: Adjust the product orientation or the system orientation to apply labels on a flat and solid surface of the product.

Possible Cause: Cylinder air pressure set too low.

ACTION: Adjust the tamp air regulator to 20-40 psi.

Possible Cause: Cylinder airflow control is set incorrectly.

ACTION: Review Section 5.4.1.
Possible Cause: Vacuum pressure set too high
ACTION: Adjust the vacuum pressure.

Possible Cause: Label adhesive is not aggressive enough
ACTION: Call Diagraph for recommended label stock for your application.

Problem: The cylinder extends but does not retract right way.

Possible Cause: Auto-retract sensor disabled
ACTION: 1. Determine if the auto-retract sensor should be enabled or disabled.
       2. If the sensor is to be enabled but is disabled, determine why it has been changed. If the sensor was disabled as a test or by mistake, enable the auto-retract sensor.
       3. If the sensor should be disabled, reduce the dwell time to limit the cylinder stroke distance.
       4. Carefully re-examine the above operation before running the conveyor.

Possible Cause: Auto-retract sensor is enabled but the tamp dwell time is too long
ACTION: 1. Since the tamp dwell delays retraction, it also delays the auto-retract sensor’s product detection. To compensate, reduce the tamp dwell by no more than 10 ms at a time.
       2. Carefully re-examine the above operation before running the conveyor.

Possible Cause: Auto-retract sensor is not properly sensing the product
ACTION: The auto-retract sensor is a light-reflective device that may not be able to detect transparent products such as shrink-wrap or have difficulty sensing light from a rough surface. Adjust the product orientation or system orientation to apply labels on the best available product surface.

Possible Cause: Cylinder rods are bent
ACTION: Determine what caused the cylinder to bend and call Diagraph Service for replacement cylinder kit (6150-830 for a 6-inch cylinder assembly, 6150-831 for 12-inch cylinder assembly and 6150-832 for an 18-inch cylinder assembly).

Possible Cause: Loss of cylinder air pressure.
ACTION: Check that the OSHA valve is ON.

Possible Cause: Auto-retract turned off on the Hand-Held terminal.
ACTION: Enable the auto-retract on the Hand-Held.
Possible Cause: **Auto-retract sensor sitting even with or below the tamp pad.**

**ACTION:**  
1. Check that the auto-retract sensor is not damaged.  
2. Check that the auto-retract sensor is positioned above, but not more than ¼ inch higher than the bottom of the tamp pad. See Section 5.4.5.

Possible Cause: **Substrate is too dark for the sensor to read its reflected beam.**

**ACTION:** Choose a lighter substrate.

Possible Cause: **Label may be misaligned on the tamp pad.**

**ACTION:** Make sure the tamp pad is parallel to the product. See Section 5.4.1, step 4. Auto-retract sensor may not be set correctly. See Section 5.4.5.

Possible Cause: **Dirt contaminates the sensor.**

**ACTION:** Clean the photosensor lens with a soft-tipped swab and isopropyl alcohol.

Possible Cause: **Faulty sensor or sensor cable.**

**ACTION:** Replace the sensor or sensor cable.

**Problem:** **Auto-retract does not work.**

Possible Cause: **Auto-retract not ON on the hand-held.**

**ACTION:** Turn auto-retract ON.

Possible Cause: **Auto-retract sensor is saturated.**

**ACTION:** Shade the PA/4000 from all ambient light.

Possible Cause: **Auto-retract sensor is out of its focal range.**

**ACTION:** Align the tamp cylinder with the product by extending the tamp cylinder until the tamp pad makes contact with the product, or rotate the yoke until the pad lays flat against the product. See Sections 5.4.1 and 5.4.5.

Possible Cause: **Voltage is wrong.**

**ACTION:** Check the voltage between the 9 and 7 pins on the J5 sensor cable plug on the connector board. It should read 5VDC. If it doesn’t, try a new connector cable between connector board and the applicator board. Recheck 9 and 7 voltage.

Possible Cause: **Ground is bad or voltage on pin 12 on chip U10 is wrong.**

**ACTION:** Ground and check the voltage at pin 12 on chip U10 on the applicator board. With the retract sensor uncovered it should
read 5VDC. With paper under the retract sensor it should read under 1/2 V.

**Possible Cause:**   Applicator board is bad.

**ACTION:** If there is still no voltage, replace the applicator board.

**Problem:**   Label applied too early.

**Possible Cause:**   Photosensor distance is set too short.

**ACTION:**
1. Carefully measure the distance from the peel blade to Photosensor 1.
2. Verify the photosensor distance setting. Change if incorrect.
3. Carefully re-examine the above operation before running the conveyor.

**Possible Cause:**   Incorrect setting for the photosensor type.

**ACTION:**
1. Determine the type of photosensor you are using as Photosensor 1.
2. Carefully re-examine the above operation before running the conveyor.

**Possible Cause:**   Incorrect setting for the photosensor edge.

**ACTION:**
1. Determine which edge you want to use to sense the product (leading or trailing).
2. Verify Photosensor 1 edge setting.
3. Carefully re-examine the above operation before running the conveyor.

**Possible Cause:**   Product Delay distance set too short.

**ACTION:**
1. Increase the product delay time by following the directions in Section 5.4.4.
2. Run sample labels to determine the change in label placement.
3. If necessary, continue to increase the product delay in small increments until the labels are applied correctly on the product.

**Possible Cause:**   Incorrect product detection by Photosensor 1.

**ACTION:**
1. Check the cable connection between the photosensor and PA/4000 connection.
2. Clean the photosensor lens with a soft-tipped swab and isopropyl alcohol.
3. Adjust and direct Photosensor 1 at the product.
4. Adjust the sensing distance of the photosensor with the potentiometer at the rear of the photosensor.
5. Carefully re-examine the above operation before running the conveyor.

**Problem:** Label applied too late.

**Possible Cause:** Photosensor distance set too long.

**ACTION:**
1. Carefully measure the distance from the peel blade to Photosensor 1.
2. Adjust the sensing distance of the photosensor with the potentiometer at the rear of the photosensor.
3. Carefully re-examine the above operation before running the conveyor.

**Possible Cause:** Incorrect setting for the photosensor edge.

**ACTION:**
1. Determine which edge you want to use to sense the product: leading or trailing.
2. Verify Photosensor 1 edge setting in hand-held. Alter if necessary.
3. Carefully re-examine the above operation before running the conveyor.

**Possible Cause:** Product delay distance set too long.

**ACTION:**
1. Decrease the product delay time.
2. Run sample labels to determine the change in label placement.
3. If necessary, continue to decrease the product delay in small increments until the labels are applied correctly on the product.

**Possible Cause:** Incorrect product detection by Photosensor 1.

**ACTION:**
1. Photosensor 1 may be detecting extraneous movement such as people or equipment moving near the conveyor.
2. Clean the photosensor lens with a soft-tipped swab and isopropyl alcohol.
3. Adjust and direct Photosensor 1 at the product.
4. Adjust the sensing distance of the photosensor with the potentiometer on the back of the photosensor.

**Possible Cause:** Cylinder airflow control is set incorrectly.

**ACTION:** See Section 5.4.1.

**Possible Cause:** Tamp air pressure set too low

**ACTION:** Increase the tamp air pressure.
Possible Cause: Cylinder rods are bent
ACTION: Determine what caused the cylinder to bend and call Diagraph Service for replacement cylinder kit (6150-830 for 6-inch cylinder assembly, 6150-831 for 12-inch cylinder assembly, or 6150-832 for 18-inch cylinder assembly).

Problem: Inconsistent label placement.
Possible Cause: Inconsistent conveyor line-speed reading
ACTION: 1. Check the drive belt tension.
2. Check the edge sensor voltage.

Possible Cause: Inconsistent product detection by Photosensor 1.
ACTION: 1. Check the cable connection between the photosensor and PA/4000 connection.
2. Clean the photosensor lens with a soft-tipped swab and isopropyl alcohol.
3. Adjust and direct the Photosensor 1 at the product.
4. Adjust the sensing distance of the photosensor by turning its potentiometer clockwise.

Possible Cause: Label is not adhering correctly.
ACTION: 1. If the label placement is skewed, adjust the yoke so that the tamp is parallel with the product.
2. If the labels are not adhering firmly to the product due to inadequate tamp pressure, increase the tamp pressure.
3. If the label stock is incorrect, call Diagraph to order correct label stock.

Possible Cause: Cylinder rods are bent
ACTION: Determine what caused the cylinder to bend and call Diagraph Service for replacement cylinder kit (6150-830 for 6-inch cylinder assembly, 6150-831 for 12-inch cylinder assembly, or 6150-832 for 18-inch cylinder assembly).

Problem: PA/4000 not applying labels on every product.
Possible Cause: Photosensor distance set too short
ACTION: 1. Carefully measure the distance from the peel blade to Photosensor 1.
2. Verify the photosensor distance setting. Change if incorrect.
3. Carefully re-examine the above operation before running the conveyor.
**Possible Cause:**  Conveyor line-speed too fast

**ACTION:**  Conveyor line speed must be slowed to a speed that falls within the printing capability of the print engine.

**Possible Cause:**  Photosensor distance is too long

**ACTION:**
1. Move the photosensor closer to the print engine peel blade.
2. Measure the distance from the peel blade to the photosensor.
3. Adjust the sensing distance of the photosensor by turning its potentiometer clockwise.
4. Carefully re-examine the above operation before running the conveyor.

**Possible Cause:**  Intermittent product detection

**ACTION:**
1. Check the cable connection between the photosensor and connection J2 on the back of the print engine.
2. Clean the photosensor lens with a soft-tipped swab and isopropyl alcohol.
3. Adjust and direct the Photosensor 1 at the product.
4. Adjust the sensing distance of the photosensor with the potentiometer on the back of the photosensor.

**Possible Cause:**  Print speed set too slow.

**ACTION:**  Increase the print speed of your print engine.

**Problem:**  PA/4000 feeds label correctly, but will not tamp.

**Possible Cause:**  Cutter cable from applicator board to J11 on the circuit board is not connected in the correct orientation.

**ACTION:**  Make sure cables are connected as shown:
Problem: **PA/4000 feeds too many labels at a time and air assist will not shut off.**

Possible Cause: Cutter cable from applicator board to J11 on the circuit board is not connected in the correct orientation.

ACTION: Make sure cables are connected as shown:

Problem: **Label appear to be thrown off the tamp.**

Possible Cause: Cutter cable from applicator board to J11 on the circuit board is not connected in the correct orientation.

ACTION: Make sure cables are connected as shown:

Problem: **After PA/4000 dispenses a label, air assist will not shut off for 5 seconds.**

Possible Cause: Cutter cable from applicator board to J11 on the circuit board is not connected in the correct orientation. Once the air assist shuts off, the tamp cylinder applies the label on the pad to the next product.
ACTION: 1. Make sure cables are connected as shown:

2. If this doesn’t work, replace the Prodigy Plus™ board.

**Problem:** Performance Series Software appears to have a Lost Batch

**Possible Cause:** A failed label is in the printer.

**ACTION:** 1. The batch is not lost, remove the failed label and the PA/4000 will print and apply the entire batch.
10.5 Error and Warning Messages

The LCDs on the Hand-Held Terminal reports both error and warning messages. An error message appears when:

- The system can not print or apply
- The safety of the system is in jeopardy
- The performance of the system is not ideal

A warning message appears when:

- The system needs new supplies
- The system needs to describe an event that did not take place

With the optional warning tower, a red light indicates an error, and a yellow light indicates a warning. When an error and a warning occur simultaneously, only the red lamp lights.

A table of error messages appears below:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Warning Tower</th>
<th>Hand-Held Terminal</th>
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</thead>
<tbody>
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<td>Green</td>
<td>Yellow</td>
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<tr>
<td>Label Low</td>
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<td>Flash</td>
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<tr>
<td>Label Low/Ribbon out</td>
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<td>Off</td>
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<tr>
<td>Label Low/Pause</td>
<td>Flash</td>
<td>On</td>
</tr>
<tr>
<td>Label low/Cylinder Error</td>
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<td>Off</td>
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<tr>
<td>Label low/Printer Error</td>
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<td>Off</td>
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<td>Ribbon Low</td>
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<td>Ribbon Low/Printer Error</td>
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<td>Ribbon Low/Label Low/Printer Error</td>
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APPENDIX A

ASCII Control Code Chart

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ASCII Control Code Chart


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<td>244</td>
<td>F4</td>
</tr>
<tr>
<td>ë</td>
<td>149</td>
<td>95</td>
<td>ÿ</td>
<td>181</td>
<td>B5</td>
<td>ÿ</td>
<td>213</td>
<td>D5</td>
<td>Þ</td>
<td>245</td>
<td>F5</td>
</tr>
<tr>
<td>ë</td>
<td>150</td>
<td>96</td>
<td>ÿ</td>
<td>182</td>
<td>B6</td>
<td>ÿ</td>
<td>214</td>
<td>D6</td>
<td>Þ</td>
<td>246</td>
<td>F6</td>
</tr>
<tr>
<td>ë</td>
<td>151</td>
<td>97</td>
<td>ÿ</td>
<td>183</td>
<td>B7</td>
<td>ÿ</td>
<td>215</td>
<td>D7</td>
<td>Þ</td>
<td>247</td>
<td>F7</td>
</tr>
<tr>
<td>ë</td>
<td>152</td>
<td>98</td>
<td>ÿ</td>
<td>184</td>
<td>B8</td>
<td>ÿ</td>
<td>216</td>
<td>D8</td>
<td>Þ</td>
<td>248</td>
<td>F8</td>
</tr>
<tr>
<td>ë</td>
<td>153</td>
<td>99</td>
<td>ÿ</td>
<td>185</td>
<td>B9</td>
<td>ÿ</td>
<td>217</td>
<td>D9</td>
<td>Þ</td>
<td>249</td>
<td>F9</td>
</tr>
<tr>
<td>ë</td>
<td>154</td>
<td>9A</td>
<td>ÿ</td>
<td>186</td>
<td>BA</td>
<td>ÿ</td>
<td>218</td>
<td>DA</td>
<td>Þ</td>
<td>250</td>
<td>FA</td>
</tr>
<tr>
<td>ë</td>
<td>155</td>
<td>9B</td>
<td>ÿ</td>
<td>187</td>
<td>BB</td>
<td>ÿ</td>
<td>219</td>
<td>DB</td>
<td>Þ</td>
<td>251</td>
<td>FB</td>
</tr>
<tr>
<td>ë</td>
<td>156</td>
<td>9C</td>
<td>ÿ</td>
<td>188</td>
<td>BC</td>
<td>ÿ</td>
<td>220</td>
<td>DC</td>
<td>Þ</td>
<td>252</td>
<td>FC</td>
</tr>
<tr>
<td>ë</td>
<td>157</td>
<td>9D</td>
<td>ÿ</td>
<td>189</td>
<td>BD</td>
<td>ÿ</td>
<td>221</td>
<td>DD</td>
<td>Þ</td>
<td>253</td>
<td>FD</td>
</tr>
<tr>
<td>ë</td>
<td>158</td>
<td>9E</td>
<td>ÿ</td>
<td>190</td>
<td>BE</td>
<td>ÿ</td>
<td>222</td>
<td>DE</td>
<td>Þ</td>
<td>254</td>
<td>FE</td>
</tr>
<tr>
<td>ë</td>
<td>159</td>
<td>9F</td>
<td>ÿ</td>
<td>191</td>
<td>BF</td>
<td>ÿ</td>
<td>223</td>
<td>DF</td>
<td>Þ</td>
<td>255</td>
<td>FF</td>
</tr>
</tbody>
</table>
APPENDIX B

Cable and Pin connections

For most applications, the interface between the Prodigy Plus™ and the PC will be RS-232C. The cable needed to connect the printer to the PC will be either a straight through or null modem cable.

CJ Pin Connections

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>Connections</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chassis</td>
</tr>
<tr>
<td>2</td>
<td>TXD (RS-232)</td>
</tr>
<tr>
<td>3</td>
<td>RXD (RS-232)</td>
</tr>
<tr>
<td>4</td>
<td>RTS (4.7K ohm to +5VDC)</td>
</tr>
<tr>
<td>5</td>
<td>CTS (input)</td>
</tr>
<tr>
<td>7</td>
<td>Logic Ground</td>
</tr>
<tr>
<td>20</td>
<td>Busy (output)</td>
</tr>
<tr>
<td>9</td>
<td>T Data + (RS-422)</td>
</tr>
<tr>
<td>10</td>
<td>T Data - (RS-422)</td>
</tr>
<tr>
<td>18</td>
<td>R Data + (RS-422)</td>
</tr>
<tr>
<td>19</td>
<td>R Data - (RS-422)</td>
</tr>
<tr>
<td>13</td>
<td>Logic Ground</td>
</tr>
<tr>
<td>14</td>
<td>+5VDC (100mA Max.)</td>
</tr>
<tr>
<td>25</td>
<td>+9V (unregulated)</td>
</tr>
</tbody>
</table>
Cable Connections

Straight Null Modem Cable (MXM)

<table>
<thead>
<tr>
<th>HOST</th>
<th>PA/4000</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SHIELD</td>
</tr>
<tr>
<td>TXD2</td>
<td>3RXD</td>
</tr>
<tr>
<td>3</td>
<td>2TXD</td>
</tr>
<tr>
<td>7</td>
<td>GROUND</td>
</tr>
<tr>
<td>4</td>
<td>4RTS</td>
</tr>
<tr>
<td>5</td>
<td>5CTS</td>
</tr>
</tbody>
</table>

NOTE: Cable used for typical connection to other DCE equipment with XON/XOFF flow control.

Straight Cable (MM)

<table>
<thead>
<tr>
<th>HOST</th>
<th>PA/4000</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SHIELD</td>
</tr>
<tr>
<td>TXD2</td>
<td>2TXD</td>
</tr>
<tr>
<td>RXD3</td>
<td>3RXD</td>
</tr>
<tr>
<td>7</td>
<td>GROUND</td>
</tr>
<tr>
<td>4</td>
<td>4RTS</td>
</tr>
<tr>
<td>5</td>
<td>5CTS</td>
</tr>
</tbody>
</table>

PC (DB25P) To PA/4000

<table>
<thead>
<tr>
<th>PC</th>
<th>PA/4000</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SHIELD</td>
</tr>
<tr>
<td>TXD2</td>
<td>3RXD</td>
</tr>
<tr>
<td>RXD3</td>
<td>2TXD</td>
</tr>
<tr>
<td>5</td>
<td>CTS</td>
</tr>
<tr>
<td>7</td>
<td>GROUND</td>
</tr>
<tr>
<td>6</td>
<td>4RTS</td>
</tr>
<tr>
<td>8</td>
<td>5CTS</td>
</tr>
<tr>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: Cable used for connection to PC compatible with DB25P communication ports. Flow control is either XON/XOFF or CTS/DTR.
## PC (DB9P) to PA/4000

<table>
<thead>
<tr>
<th>PC</th>
<th>PA/4000</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC</td>
<td>SHIELD</td>
</tr>
<tr>
<td>TXD3</td>
<td>3RXD</td>
</tr>
<tr>
<td>RXD2</td>
<td>2TXD</td>
</tr>
<tr>
<td>8</td>
<td>CTS</td>
</tr>
<tr>
<td>5</td>
<td>GROUND</td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4RTS</td>
</tr>
<tr>
<td></td>
<td>5CTS</td>
</tr>
</tbody>
</table>

### NOTE: Cable used for connection to PC compatible with DB25P communication ports. Flow control is either XON/XOFF or CTS/DTR.

## RS-422 Connection

<table>
<thead>
<tr>
<th>HOST</th>
<th>PA/4000</th>
</tr>
</thead>
<tbody>
<tr>
<td>RXD+</td>
<td>SHIELD</td>
</tr>
<tr>
<td>RXD-</td>
<td>9</td>
</tr>
<tr>
<td>TXD+</td>
<td>10</td>
</tr>
<tr>
<td>TXD-</td>
<td>GROUND</td>
</tr>
<tr>
<td></td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

DB25P
APPENDIX C

PA/4000 Remote I/O (P/N 6100-121) Configuration

This section covers the configuration and usage of the Diagraph Remote I/O (RIO) module board in the PA/4000 with an Allen-Bradley PLC. For successful implementation, you should be able to program and operate an Allen-Bradley PLC and be able to program block transfer instructions. You will also need access to the PA/4000 host commands and their parameters.

Minimum Requirements

- Rack: One quarter
- Power Supply: Allen-Bradley
- PLC: Allen-Bradley (see the compatibility list in section 5.2.4)
- Cables: Power cable to PLC power supply
  - PLC to Diagraph RIO board-Belden 9463 with Phoenix connectors
  - PC to PLC-RS-232
  - Optional (Ethernet connection from PC to PLC, useable with A-B PLC model 5/11 or higher)
- Controller: PC with Allen-Bradley 6200, Release 5.0 software or other software capable of programming PLCs.

Communication Specifications

Cable Type

Use Twinax cable to connect the PLC to the RIO board-Belden 9463 blue PVC jacket cable (Allen-Bradley P/N 1770-CD). Contact Allen-Bradley if other cable is under consideration.

Cable Length

Use a minimum of ten feet for all connections. Shorter lengths may cause signal reflections. Maximum lengths depend on the RIO data rate: 10,000 feet for 57.6k bit/s and 5,000 feet for 115.2k bit/s.

Contact Allen-Bradley if you are considering an application that will employ a data rate of 230.4k bit/s.

Cable Connections

Use three position MSTB plugs (Phoenix P/N 1754465 or equivalent) for connections to the PLC and to the RIO board. Connect all three conductors-blue, shield and clear-at each wiring point and avoid making additional ground connections to the shield.
Defaults

**RS-232 Defaults**

Switches are set for factory defaults when shipped:
- 9600 baud
- 8 data bits
- 1 stop bit
- no parity
- handshaking is disabled

**Remote I/O Defaults**

- Rack address 3
- Rack size 1/4
- Starting quarter 1
- Data rate 57.6k bit/s
- Last rack Yes

A-B Compatible Equipment Table

**Allen Bradley PLC Models**
- PLC-5/10
- PLC-5/11B
- PLC-5/12
- PLC-5/15
- PLC-5/20B, 5/20E
- PLC-5/25
- PLC-5/30B
- PLC-5/40B, 5/40L, 5/40E
- PLC-5/60B, 5/60L
- PLC-5/80E

**Allen Bradley SLC Models**

Remote I/O is supported on Models SLC5/02 or higher only. In addition, the SLC model that is used must have a Remote I/O Scanner 1747-SN module installed.

Configuring the PLC

The instructions in this section cover setting the backplane switches in an Allen-Bradley 1771 I/O chassis and the DIP switches in a PLC. Specifically, they cover the configuration of an Allen-Bradley PLC to run the Diagraph sample program through RIO on the PA/4000.

Use a ball-point pen when setting the backplane and PLC switches. Avoid using pencils since pencil points can break off and short switches.
### Backplane Chassis Switches

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
</tr>
</tbody>
</table>

![Backplane Chassis Switches Diagram]
PLC Switches

**DIP Switch Bank S1**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
</tr>
</tbody>
</table>

Switch 7 is not used.

**DIP Switch Bank S2**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS-232C</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>RS-422A</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>RS-423</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
</tr>
</tbody>
</table>

Set the switches in S2 for RS-232C to run the sample program.
RIO Access and Configuration

Location

The RIO board is in the RIO box [A] located on top of the electrical box.

Disconnect the power from the PA/4000 and remove the four screws that secure the top (the plate with the LED status markings). Note the DIP switch positions in the illustration above. Switch settings follow.
RIO DIP Switch Settings

DIP Switch Bank S1

DIP switch bank S1 sets both the rack quarter and the rack address. Use the tables below to set the switches to match your PLC configuration. A valid rack address depends on the type of PLC in use. The tables below show available variations. Asterisks mark PA/4000 RIO factory-default settings.

<table>
<thead>
<tr>
<th>Bit 1</th>
<th>Bit 2</th>
<th>Quarter</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON*</td>
<td>ON*</td>
<td>First Quarter</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>Second Quarter</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>Third Quarter</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>Fourth Quarter</td>
</tr>
</tbody>
</table>

Bit 3

ON OFF* Rack Address 3

Bit 4

ON OFF*

Bit 5

ON* OFF

DIP Switch Bank S2

<table>
<thead>
<tr>
<th>Bit 1</th>
<th>Bit 2</th>
<th>Quarter</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON*</td>
<td>ON*</td>
<td>57.6 Kbits/sec</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>115.2 Kbits/sec</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>230.4 Kbits/sec</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>230.4 Kbits/sec</td>
</tr>
</tbody>
</table>

Bit 3

ON OFF* Rack Address 3

Bit 4

ON OFF*

Bit 5

ON* OFF

Bit 6

ON* OFF

Bit 7

ON* OFF

Bit 8

ON* OFF

Last Rack

ON Not the last module on this rack
OFF* Last module on the rack*

NOT USED
Bank S3 Switch 3

<table>
<thead>
<tr>
<th>Bit 1</th>
<th>Bit 2</th>
<th>Baud Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON*</td>
<td>ON*</td>
<td>19200 bits/sec</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>9600 bits/sec</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>2400 bits/sec</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>1200 bits/sec</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bit 3</th>
<th>Stop Bits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON*</td>
<td>1 Stop bit</td>
</tr>
<tr>
<td>OFF</td>
<td>2 Stop bits</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bit 4</th>
<th>Data Bits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>7 data bits</td>
</tr>
<tr>
<td>OFF*</td>
<td>8 data bits</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bit 5</th>
<th>CTS/RTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>CTS/RTS handshaking enabled</td>
</tr>
<tr>
<td>OFF*</td>
<td>CTS/RTS handshaking disabled</td>
</tr>
</tbody>
</table>

Bits 6-8 Not Used

RIO Status LEDs

The RIO board has seven LEDs that report the status of communications between the PLC and the RIO board. Use the listing below to monitor their signals and identify any irregularities.

Red LED Indicates a reset. It flashes when a reset occurs and goes out when reset is complete. Normal state is off.

Green LEDs 1 & 4 Signals a handshake. If enabled, they flash during a handshake. If disabled, they remain off. Normal state is off.

Green LEDs 2 & 5 Signals communication to the PLC from the PA/4000. It flashes during send or receive. LED 5 blinks when communication occurs between the RIO board and the controller.

Green LED 3 Indicates when power is on.

Green LED 5 Communication state.

Green LED 6 Indicates the state of the PLC- it stays on steadily when the RIO is in RUN mode and flashes when it is in the PROGRAM mode.

During normal operation, LED 3 and 6 will be on. LED 3 will change to a flash when the system goes into programming mode.
**Message Parameters for RIO**

RIO Module drops null characters (ASCII \00).

A message can be up to 64 words or 128 ASCII characters long.

Messages of less than 64 words or 128 ASCII characters need to be padded with null characters-ASCII \00. If null characters are omitted, transmission will not occur.

The RIO uses discrete transfer to send data back to the PLC-not block transfer.

Slot 8 of the first rack indicates data availability. If the data is not read for six seconds, it is lost.

**Sample Program for RIO**

The diskette included with this system has a sample ladder logic program that prints messages with a PA/4000. It can serve as a first step in establishing successful communication between the PA/4000 and the PLC.

**Equipment used to set up Sample Program**

The listing below details a configuration verified by Diagraph that successfully ran the Sample Program.

Software Allen-Bradley's software 6200, Release 5.0

PA/4000 Factory installed RIO

```plaintext
Rung 1
  83  BT10:1
  61  BT10:2

Rung 2
  BT10:2

Rung 3
  I:030

END OF FILE
```
Sample Program 1 Rung-by-Rung

Rung 1 - Message Creation and Print/Apply

When B3/1 bit is latched the PLC transmits data to create and print/apply labels:

\02(STX)RN    disable ribbon saver
\02(STX)f283   set distance to peel off position to 283
\02(STX)O0188  set from edge offset to 188
\02(STX)V5     set pseudo-switch setting
\02(STX)L      enter label formatting command input mode
D12           set height and width (horizontal dot size 1; vertical dot size 2)
PM            set print speed to 7.0” per second
SO            set slew rate 8.0” per second
H10           set head value to 10
z             zero conversion to “0” to eliminate slash

1h420500040012712345678
  rotation - 1 (0 degrees)
  font - h
  width multiplier - 4
  height multiplier - 2
  bar code height - 050
  row position - 0040
  column position - 0127
  data string - 12345678

141100001000160DIAGRAPH
  rotation - 1 (0 degrees)
  font - 4
  width multiplier - 1
  height multiplier - 1
  bar code height - 000
  row position - 0100
  column position - 0160
  data string - DIAGRAPH

10310000024016512345678
  rotation - 1 (0 degrees)
  font - 0
  width multiplier - 3
  height multiplier - 1
  bar code height - 000
  row position - 0024
  column position - 0165
  data string - 12345678

:0001    set cut-by amount to 1
W        wait mode
Q0001    set quantity of print to label to 1
E        terminate label formatting mode and print label
Rung 2 - When the transfers in rung 2 are complete, the B3/2 bit is automatically unlatched (set back to 0).

Rung 3 - When the Remote I/O Module receives data from the PA/4000 that needs to be transmitted back to the PLC, it sets a discrete bit. When the module resides on Rack Address 3 Group 0, that bit is I:030/10. When this bit is set by the module, the PLC will poll data from the module and write the data to file A12, location 200. Any data located at that position will be overwritten.

As you can see in the Data Report above, a null character \00 will be ignored by the Remote I/O Module. Note that filling the data table with null characters enables you to insert additional new data later and not have to relocate existing data.

### Running the Program

Reconnect the power cord to the PA/4000. Do not replace the cover of the PA/4000 until after a successful run of the Sample Program.

Diskette 5700-315 has a sample program that was developed with Allen-Bradley 6200 software.

Copy the PA/4000 files on the diskette to C:\IPDS\ARCH\PLC5\.
Starting Allen-Bradley 6200 Software

1. Set the current directory to \IPDS.

2. Type `ABMENU` and press Enter. The MAIN MENU appears.

3. Press F5 to choose PLC-5. The PLC-5 Programming Software menu appears.
4. Press F2 for Online Configuration

5. Use the function keys and change the configuration parameters to match those shown in the screen sample above.

6. Save the configuration with F9.

7. Press ESC to return to the PLC Programming menu.

**Program Directory for Processor**

1. Press F1 to access the Program Directory.
2. Press F2 for Save/Restore.

3. Press F4 to start the Restore Program process.

4. Select "PA4000" with the arrow keys.
5. Press **F1** to begin the restore process.

6. Press **F7** for General Utility.
7. Press **F4** for Channel Overview.

8. Use the arrow keys to pick Channel 1A.

9. Press **F5** for the Configuration Menu and set the variables as shown below:
   - Rack Address: 3
   - Starting Group: 0
   - Rack Size: 1/4

   The range will automatically change to 030-031
10. Press **ESC** three times to return to the Program Directory for Processor.

11. Press **F8** for the Monitor File.
APPENDIX D

REPLACEABLE COMPONENTS AND MEDIA SUPPLIES

Replaceable components and media supplies can be ordered from Diagraph. To order call 1-800-521-3047.

Replaceable Components

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Component Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1770-078</td>
<td>Regulator</td>
</tr>
<tr>
<td>1770-036</td>
<td>Gauge</td>
</tr>
<tr>
<td>2801-828</td>
<td>Dampener spring</td>
</tr>
<tr>
<td>2801-827</td>
<td>Dampener pulley</td>
</tr>
<tr>
<td>2801-822</td>
<td>48GR timing pulley</td>
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<tr>
<td>2801-817</td>
<td>Label assist roller</td>
</tr>
<tr>
<td>2801-811</td>
<td>Rectifier bridge</td>
</tr>
<tr>
<td>2801-759</td>
<td>Spring 1” rewind retrofit</td>
</tr>
<tr>
<td>2801-758</td>
<td>Hub flat spring 1” core</td>
</tr>
<tr>
<td>2801-638</td>
<td>Spring</td>
</tr>
<tr>
<td>2801-637</td>
<td>Supply tension spring</td>
</tr>
<tr>
<td>2801-635</td>
<td>Head adjust spring</td>
</tr>
<tr>
<td>2801-590</td>
<td>Spring washer</td>
</tr>
<tr>
<td>2804-321</td>
<td>PC board assy. Prodigy Plus, Mod.</td>
</tr>
<tr>
<td>2804-320</td>
<td>Prodigy Plus CE front panel cable assy.</td>
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<tr>
<td>2801-131</td>
<td>Prodigy Plus slip pulley</td>
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<tr>
<td>2801-130</td>
<td>Friction ribbon disk</td>
</tr>
<tr>
<td>2801-033</td>
<td>Label drive roller</td>
</tr>
<tr>
<td>2801-022</td>
<td>Prodigy Plus Printhead</td>
</tr>
<tr>
<td>5700-216</td>
<td>Photocell Assembly</td>
</tr>
<tr>
<td>6105-593</td>
<td>Xmas tree hole plug</td>
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<tr>
<td>6105-592</td>
<td>Bridge cable assembly</td>
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<tr>
<td>6105-535</td>
<td>Cylinder switch cable assembly</td>
</tr>
<tr>
<td>6105-534</td>
<td>Long tamp pad sensor cable assembly</td>
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<tr>
<td>6105-533</td>
<td>Short tamp pad sensor cable assembly</td>
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<tr>
<td>6105-391</td>
<td>Transformer assembly</td>
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<tr>
<td>6105-386</td>
<td>Printhead cable jig</td>
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<tr>
<td>6105-384</td>
<td>+24V regulator assembly</td>
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<tr>
<td>6105-383</td>
<td>Fuse, 2.0 AMP</td>
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<tr>
<td>6105-367</td>
<td>Clutch and pulley assembly</td>
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<tr>
<td>6105-296</td>
<td>Low label sensor</td>
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<tr>
<td>6105-276</td>
<td>Blow tube assembly</td>
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<td>6105-260</td>
<td>Hand-Held controller</td>
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<tr>
<td>6105-124</td>
<td>Vacuum unit</td>
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<td>6105-123</td>
<td>24VDC valve</td>
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<td>6105-119</td>
<td>Applicator board</td>
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<td>6105-117</td>
<td>Retainer belt</td>
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<td>6105-066</td>
<td>Collar spring 5/8 in. I.D.</td>
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<td>6105-064</td>
<td>Rewind driver pulley</td>
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<tr>
<td>6105-063</td>
<td>Ribbon drive belt</td>
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<td>6105-062</td>
<td>Paper drive belt</td>
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## Replaceable Components Continued

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<tr>
<th>Part Number</th>
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<tr>
<td>6105-322</td>
<td>Vacuum filter cartridge</td>
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<tr>
<td>6105-061</td>
<td>Rewind belt</td>
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<td>6105-050</td>
<td>Stepper motor cable assembly</td>
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<tr>
<td>6105-048</td>
<td>Transformer cable assembly</td>
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<tr>
<td>6105-047</td>
<td>Label low sensor cable assembly</td>
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<tr>
<td>6105-046</td>
<td>Paper edge sensor cable assembly</td>
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<tr>
<td>6105-045</td>
<td>Ribbon sensor cable assembly</td>
</tr>
<tr>
<td>6105-036</td>
<td>Peel blade</td>
</tr>
<tr>
<td>6105-026</td>
<td>Pinch roller spring</td>
</tr>
<tr>
<td>6600-202</td>
<td>Heat sink compound</td>
</tr>
<tr>
<td>7501-021</td>
<td>Filter replacement element</td>
</tr>
</tbody>
</table>

## Media Supplies

### Labels

Diagraph recommends its LTS line of labels for thermal transfer printing, and its ATS line for direct-thermal printing. Stock sizes can range from 2 inches (50.8 mm) wide by 1 inch (25.4 mm) long to 4.5 inches (114.3 mm) wide to 13.00 inches (330.2 mm) long, printable area 4.1 inches left justified. LTS labels are made from a coated, thermal transfer facestock, which readily accepts ribbon transfer. Labels are sold in full case quantities only.

ATS labels are made from a premium thermal face sheet for optimum environmental resistance. They are designed to provide excellent print contrast when printing bar codes.

Label edge sensing is carried out by an adjustable photosensor. This sensor locates the leading edge of a label, by measuring the level of opaqueness. You can move it left and right to accommodate different sensing locations (label edge or backprinted, black stripe). The black stripe sensor locates the leading edge of a label by measuring the level of reflectivity instead of a change in opaqueness. Media thickness can range from 0.0023-inch (0.06 mm) to 0.01-inch (0.25 mm).

Supply rolls have cores with a minimum inside diameter of 3 inch (38 mm). The maximum roll diameter should not exceed 12 inches (203 mm).
Ribbon

**Direct Thermal:** Consider three important factors when selecting direct thermal ribbon:

1. The abrasive qualities of the material that covers the thermal reactive layer of the paper.
2. The ability of that layer to control the chemical reaction that occurs when the image is “burned,”
3. The amount of heat required to image the paper.

If the coating layer is too abrasive, the printhead will be “sanded off” at a faster rate than would normally occur. If the layer cannot contain the reaction, the printhead will become “pitted,” and the dots across the web of the printhead will fail.

The reaction temperature, the temperature at which the chemical process produces an image, is important because the greater the degree of heat required to image the paper, the greater the amount of time needed for the printhead and paper to cool. This process reduces the maximum print speed that can be obtained with the stock.

The abrasive qualities of the stock are not as critical in thermal transfer applications because the thermal transfer ribbon is in direct contact with the printhead when the ribbon is installed.

**Thermal Transfer:** Consider two important factors when selecting thermal transfer ribbon and label combinations.

1. Image quality is affected by the label top coating and ribbon combinations. The top coating provides a layer to contain the substrate fibers and to provide a base for the ribbon to adhere to. Ribbons are formulated to provide various levels of smudge resistance and print quality. Typically, the more expensive media combinations perform better than the cheap combinations.
2. Ribbon backcoating is highly recommended because it provides protection for the printhead. Many models also provide a desirable anti-static coating.

Diagraph thermal transfer ribbons are selected specifically for use with the Prodigy Plus™ print engine. Use of ribbons other than those supplied by Diagraph Value Added Resellers (VARs) or by Diagraph may result in a poor quality printing of bar codes and their ability to be scanned. This may invalidate the printhead warranty.
Diagraph ribbons feature:

- Ribbons are also available in Black, Red, Blue, Green, Gold, White and Brown. Call your Diagraph Sales Representative for more information on colored ribbons. Ribbons are scratch, and smudge resistant
- 1182 feet long (360 meters), 4.6 microns thick
- 1 inch core (no notch required)
- Ink side in
- 1 foot clear trailer for opaque ribbons; opaque trailer for transparent ribbons
- Backcoating highly recommended
- One ribbon has the capacity to image two full 8 inch diameter rolls of labels wound on 3 inch ID cores.

The width of the thermal transfer ribbon should be within 10% of the label width. Additional sizes other than those listed above are available on a custom order basis.

**Lists of Approved Media**

For a current list of Diagraph approved standard media for use in Diagraph thermal and thermal transfer printers, please contact your Diagraph Sales Representative at 1-800-521-3047.
acronym—Word formed from the first letter or letters of the words in a name, a term, or phrase. Well-known acronyms include scuba (self-contained under-water breathing apparatus) and sonar (sound navigation ranging).

alignment—1) Text alignment defines how text is aligned within the left and the right indent paragraph: either flush left, flush right, centered, or justified; 2) Graphic alignment defines how objects align along their sides, centers, tops or bottoms.

alphanumeric—Contraction of the words alphabetic and numeric. A set of alphanumeric characters usually containing letters, numbers, punctuation marks and symbols.

ANSI—Abbreviation for the American National Standards Institute, the US government organization responsible for the development and promulgation of data processing standards. It is USA’s member body to the International Standards Organization.

ASCII—(ASK-key) Acronym for American Standard Code for Information Interchange: the character set and code described by the American National Standard Code for Information Interchange, a standard for representing characters as binary numbers.

ASCII text file—Unformatted files that contain readable ASCII characters. If they contain commands and arguments, they will probably end in a .BAT or .CMD extension. If the files contain data, they will probably end in .TXT or .DAT extensions.

aspect ratio—The proportional measurement of image size in terms of horizontal length versus vertical height. For example, an image with an aspect ratio of 4:3 has a horizontal length that is 4/3 the vertical height.

AUTOEXEC.BAT—File that is executed by the computer as soon as the boot process is completed. This type of file is used in building a turnkey application that requires very little input from a user before starting.

Auto-Retract—Feature of the PA/4000 that causes the tamp cylinder to return to the home position when it encounters resistance. background—In bar codes, the lighter portion of the printed code which includes the quiet zones.

bar—Darker element of a printed bar code. It can be either wide or narrow.

bar code—an array of parallel rectangular bars and spaces in a predetermined pattern that represents data elements or characters.

bar code character—a group of bars and spaces that represent a number, letter or symbol.

bar code density—the number of characters which can be represented in a linear inch. Bar code densities are expressed in characters per inch.

bar code reader—Device used to scan bar code symbols.

bar height—Dimension of the bar measured perpendicular to the bar width.

bar width—Edge-to-edge measurement across a bar in a bar code.

baseline—the line on which both capital and lower case letters stand.
**baud**—A unit that measures the speed of data transmission: one baud equals one bit per second.

**bearer bar**—Printed box which frames a bar code.

**binary code**—Code which employs only the characters 0 and 1 to represent values.

**buffer**—Storage area to temporarily hold data being transmitted between a peripheral device and a computer that allows for the differences in their respective working speeds.

**byte**—1) Fixed number of bits, often corresponding to a single character and operated on as a single unit; 2) Collection of eight bits capable of representing an alphanumeric or special character.

**character**—1) In bar codes, a single group of bars and spaces which represents an individual number, letter or other symbol; 2) In computers, it is any symbol that can be stored and processed by a computer; 3) Letter, digit or other special symbol used as part of the organization, control or representation of data.

**character pitch**—Number of characters printed per horizontal inch of space. Twelve pitch (elite) prints twelve characters per inch; ten pitch (pica) prints ten characters per inch.

**character string**—A group of characters, such as “JOHN SMITH” or “DIAGRAPH.”

**check digit**—Character used in a bar code to provide additional data security and checks errors; derived with an algorithm employing the other digits in the code.

**check valve**—Valve that allows liquid to flow in one direction only.

**checksum**—Entry at the end of a block of data corresponding to the binary sum of all information in the block. Used in error-checking procedures.

**Code 2 of 5**—Bar code used in the late sixties for warehouse storage systems and sequentially numbered airline tickets. The code is read through the width of the bars and the spaces between the bars.

**Code 39**—Bar code; a discrete, self-checking, variable length symbology that can readily be printed by a variety of technologies. Its bars can be read in either direction and is sometimes referred to as “3 of 9 Code”.

**Code 39 MOD 43**—Bar code required by the Health Care Industry, alphanumeric, variable-length, self-checking and includes a Modulus 43 check character for greater data integrity.

**COM**—Abbreviation for a serial communications port on a computer. Usually expressed as “COM port” or associated with a number, “COM 1” or “COM 2.”

**configuration**—Selection of compatible hardware devices and software programs to focus the application technology on specific tasks.

**controller**—Device or program that operates automatically to regulate a controlled variable.

**cpi**—characters per inch

**CPU**—Abbreviation for the Central Processing Unit that controls the operation of the entire computer system and executes its arithmetical and logical functions. In a microcomputer, the CPU is a single chip.

**data**—Plural of the word datum, “a single fact.” Data then are facts and figures.

**disk**—Memory storage device on which information is stored on one or both sides of a magnetically sensitive rotating disk. Information is retrieved by heads mounted on moving or fixed arms.
download - Transmission of data from a central computer to a smaller computer or a computer at a remote site. To upload is the exact opposite.
downtime — Periods of time when a computer or manufacturing system is not available to perform work.
dpi — dots per inch.
element — Single bar or space in a bar code. A combination of elements makes up a character.
executable file — Computer files of machine readable instructions that cannot be accessed or edited using a normal editor. They typically have an extension of .EXE.
ETX — ASCII control code for the end of text. A signal that specifies the end of a text string.
field — Pre-determined section of a record that contains a specific portion of information.
file — Computer term for a named set of data items stored in machine-readable form.
firmware — Computer programs, instructions or functions implemented in user-modifiable hardware. Programs and instructions stored permanently in programmable, read-only memories, constitute a fundamental part of the system hardware.
flush left — Text with an even left margin and an uneven, ragged right margin.
flush right — Text with an even right margin and an uneven, ragged left margin.
font — A complete set of characters—alphabetic, numeric, and punctuation—in one typeface. The font of this glossary is Times.
friction bearers — Tire(s) on the edge of encoder cylinders.
full duplex — Transmission of data in two directions simultaneously.
half duplex — Transmission of data in only one direction at a time.
handshaking — The exchange of signals between computers that acknowledges compatible protocol for data exchange.
header — Text or graphics that appear on the top of a page, such as the chapter or section title.
Hertz (HZ) — A unit of measurement for frequency or bandwidth. 1HZ=1 cycle/second
HMIS — Hazardous Material Information Sheet
host computer — Primary computer in a multi-computer network. The unit issues commands, has access to the most important data and is the most versatile processing element in the system.
human readable text — The text in a spoken language associated with a bar code.
Hz (see Hertz)
I 2 of 5 — Short form of “Interleaved 2 of 5”. System using five bars and their spaces. Each character is represented by five characters or five spaces and two of the five elements are wide.
Interleaved 2 of 5 — Numeric only bar code with an even number of characters.
Interleaved 2 of 5 MOD 10 (SCS) — Bar code that conforms to the UPC Council Shipping Container Standard for labeling corrugated shipping containers. It is numeric only, with an even number of characters and employs a Mod 10 check digit for greater data integrity.
justified — Text that has even left and right margins. See also Flush left and Flush right.
K — Abbreviation for the Greek prefix kilo-, meaning thousand. In computer terms, K usually represents $2^{10}$ or 1024.

Kbyte (Kb) — 1024 bytes.

LCD — Liquid crystal display

liner — material employed as backing or carrier medium for labels.

margin (see Quiet Zone)

MEK — Methyl ethyl ketone: base or vehicle for ink

memory — Hardware in microcomputers used to store and recall data.

microcomputer — Computer based on a microprocessor, used primarily by only one person at a time. Microcomputers work with data words of 4, 8, 16 or 32 bits.

MSDS — Material Safety Data Sheet

noise — Undesirable electrical interference that degrades a signal. Sources of noise include computer displays, AC power lines and digital switching circuits.

OCR — Optical Character Recognition, the machine recognition of printed characters by light-sensing techniques; 2) Acronym for Optical Character Reader. An information processing device that accepts prepared forms and converts data from them to computer output.


OCR-B — Abbreviation for the character set contained in the ANSI Standard X3.49-1975: a stylized font used for optical character recognition printing.

opacity — 1) Optical property of a substrate material that quantifies transmission from the back side or the next sheet; 2) Property of an ink that prevents the substrate from showing through.

operating system — Structured set of system programs that controls the activities of a computer system and associated peripheral devices as well as the execution of programs and the flow of data.

OSHA — Occupational Safety and Health Administration

parity — An error-checking procedure in which the number of 1’s must always be the same — either odd or even — for each group of bits transmitted without error.

PCS — Print Contrast Signal, measure of the ratios of the reflectiveness between the bars of a bar code.

PCX — File extension for bit-mapped graphics file for PC-Paintbrush and other applications that support the PCX format (300 dpi).

Peel Blade — A metal plate inside the PA/4000’s print engine that separates the label stock from its non-adhesive leader.

Photocell — A light-sensing device that detects a product on a conveyor line and triggers the PA/4000 to print and apply a label.

Pixel — The smallest element with controllable color and brightness in a video display or computer graphics.

pressure differential (ΔP) — Increases and decreases in pressure as measured by ink or air pressure gauges.

program — Set of instructions for a computer to execute that is written in a programming language or assembly language.

programming — Process of writing instructions for a computer to execute.
**quiet zone**— The left and right margin spaces at the beginning and end of a bar code. No dark print is located in these areas.

**ragged type**— Type that is flush to either the left or the right margin but not to both.

**RAM** — Acronym for Random access memory, semiconductor memory that can be read and changed during microcomputer operation. RAM is volatile, so all data is lost when power is down.

**raster**— Line pattern traced by rectilinear scanning in display systems.

**reflectance**— Ratio of the amount of light of a specified wavelength reflected from a test surface to the amount of light reflected from a barium oxide or magnesium oxide standard under similar lighting conditions.

**repeatability**— An instrument’s ability to produce the same output repeatedly under identical conditions.

**RJ-11**— A telephone-type connector used to connect the Hand-Held Terminal to the PA/4000

**RJS**— Manufacturer of bar code verifiers.

**ROM** — Acronym for Read Only Memory, semiconductor memory containing fixed data that cannot be changed once programmed in manufacture.

**RS-232**— Serial communication standard employed by personal computers. It defines three types of connection: electrical, functional and mechanical—usually used with 25 or 9-pin D-shaped connectors.

**sensor**— Device that produces an electrical output that corresponds to a physical input.

**serial data transmission**— Most common method of sending data from one data terminal to another. To transmit data serially is to transmit it one bit at a time over a single channel.

**slew rate**— The rate at which unprinted label stock advances when no printing is taking place.

**software**— Set of programs that direct a computer. Common types of software include programming language interpreters and compilers; word processing and page layout programs; electronic spreadsheets; and database management programs.

**SOH ASCII**— control code for Start Of Header: a signal that specifies the beginning of a transmission (Hex. 01).

**space**— The lighter element of a bar code formed by the background between bars.

**STX**— ASCII control code for Start of text: a signal that specifies the beginning of a text string (Hex. 02).

**substrate**— Surface that receives ink or a label.

**symbol**— A combination of characters, including start/stop characters and check characters, as required, which form a complete scanable entity.

**symbol length**— Length of the symbol in a bar code measured from the beginning of the quiet area adjacent to the start character to the end of the quiet area adjacent to the stop character.

**Tamp-Pad**— A rubber pad with holes in it used to provide a backing surface for the label as it is applied.

**thermal printing**— Printing technology that uses rapidly-heated pins to activate a heat-sensitive coating on a face material; the selectively-heated areas darken and form characters and pictures.
**thermal transfer printing**— An imprinting method that uses heat and pressure to melt a wax-based ink onto a label.

**transducer**— Device that converts signal from one physical form to another.

**UCS**— Uniform Container Symbols

**UPC E/UPC Version E0**— The zero suppression version of UPC A. Specified for use in the Retail environment. Numeric only, it employs a fixed-length and a Modulus 10 check character.

**UPC EXT (2)**— UPC/EAN two digit extension, typically used on magazines.

**UPC EXT (5)**— UPC/EAN five digit extension, typically used on books for price information.

**UPC SCC (Interleaved 2 OF 5)**— Symbology used for the UPC Council Shipping Contained Standard for the labeling of corrugated shipping containers. It is numeric only and 14 characters long.

**UPC Shipping**— All numeric version of Code 128 used specifically for the UPC Serial Shipping Container Standard. It generates a special MOD 10 check character that is a part of the specification.

**UPC Version A**— Symbology specified for use in the retail environment. It is numeric only, fixed-length and employs a Modulus 10 check character.

**UPC Version E1**— Symbology used for shelf labeling in the Retail environment. It is numeric only and fixed length.

**VOC**— Volatile Organic Compounds

**volatile memory**— Memory that does not retain its content when power is lost.

**web**— 1) a continuous roll of paper, such as newsprint, especially of the kind used in web presses; 2) a continuous surface for printing as contrasted to separate surfaces on multiple cartons; 3) the path that paper or label stock travels through a printer.

**web mode**— Continuous printing.

**web width**— The width of label stock.

**weeping**— Condition of low buildup of ink on the orifice of an ink jet printhead.