PS200, PS300, and PS300FC

PS Series System Owner's Manual

Versatile Automated Programming System

972-0206-005

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Preface

This Preface describes how to contact Data I/O for technical assistance or repair and warranty services, and how to access Data I/O's Web site.

Contacting Data I/O

You can contact Data I/O for technical assistance by visiting the Data I/O Web site and completing a Web-form, by sending e-mail, or by calling.

To help us give you quick and accurate assistance, please provide the following information:
- PS Series System serial number
- Software version number
- Detailed description of the problem you are experiencing
- Error messages (if any)
- Device manufacturer and part number (if device related)

World Wide Web

The Data I/O Web site at **www.dataio.com** includes links to general information about Data I/O, online information about technical products, a list of sales offices, a Representative Search feature, and technical user information such as application notes, device lists, and Knowledge Base articles.

To contact Data I/O via the World Wide Web, go to **www.dataio.com** and click **Contact Us**. Complete the appropriate Web-form.

E-mail

E-mail the information listed above with your name, phone number, and address to the appropriate Data I/O Customer Support e-mail listed in this Preface.

Telephone

Call the appropriate Data I/O Customer Support number listed in this Preface. When you call, please be at your programmer or computer, have this manual nearby, and be ready to provide the information listed above.

Data I/O Customer Support

Worldwide

Data I/O Corporation
    Shipping Address:
    10525 Willows Road N.E.
    Redmond, WA USA 98052

    Mailing Address:
    P.O. Box 97046
    Redmond, WA   USA 98073-9746

    Telephone: 425-867-6870
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    Fax: 425-867-6898
    E-mail: FSE@data-io.com

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    6725 Airport Road, Suite 102
    Mississauga, Ontario, L4V 1V2

    Telephone: 905-678-0761
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    Telephone: +49-89-85858-66
    Fax: +49-89-85858-10
    E-mail: ccs-europe@data-io.de

Other Countries

For technical assistance, repair or warranty service, contact your local
Data I/O representative. To find your local Data I/O representative, use the
Representative Search feature at:
    www.dataio.com/contact/repsearch.asp

Warranty Information

Data I/O Corporation warrants this product against defects in materials and workmanship at the time of delivery and thereafter for a period of one (1) year. The foregoing warranty and the manufacturers' warranties, if any, are in lieu of all other warranties, expressed, implied, or arising under law, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

Data I/O maintains customer service offices throughout the world, each staffed with factory-trained technicians to provide prompt, quality service.

For warranty service, contact Data I/O Customer Support at the numbers listed on the previous page.

Repair Service

After the warranty period expires, repair services are available at Data I/O Service Centers on a time-and-materials basis, or through a fixed price basis. The fixed price basis is an annual agreement that covers all parts and labor needed to correct normal malfunctions and includes semiannual performance certification.

For more information or to order a Service Contract, call Data I/O Customer Support at the numbers listed in this Preface.

User or Address Change

If the user for this product or your address has changed, please notify Data I/O Customer Support at the numbers listed in this Preface. This ensures that you receive information about product enhancements. Be sure to include the product serial number, if available.

Chapter 1

Introduction

PS Series System models include the PS200, PS300, and PS300FC handling and programming systems designed to automate and increase throughput of programmable devices. The PS200 contains Optima programmers controlled by 486-based Programmer Computers. The PS300 contains Optima programmers controlled by Pentium-based Programmer Computers. The PS300FC contains FlashCORE programmers. Handling traditional and fine-pitched packages, as well as providing various marking and labeling options, PS Series System models are versatile production programmers.

System Features

PS Series System flexibility can be attributed to modular design, allowing the user to optimize and customize the system for any level of production required by the facility. Features include:

- Automated programming, handling, and labeling system for μBGA, PGA, QFP, TQFP, TSOP, SOIC, PLCC, DIP, and other packages
- Configured with 4 to 12 programming sites
- Supports memory, microcontroller, and logic in all device technologies and package types
- Optical vision control system
- Flexible input/output options for tray, tube, and tape
- Laser or label marking
- Modular system design allows configuration for a wide range of applications
- Small mechanical footprint

System Description

The PS Series System moves devices from input media through a programming and marking process to output media for delivery to the next phase of the production process. It combines a device programming system and a high-speed pick and place head (PNP head) to provide expeditious programming of standard pitch devices, as well as ultra-fine pitched devices.

The operator directs the PS Series System to perform programming and marking operations using the automation software (AH400) running on the system's Handler Computer. The software directs the PS Series System to perform a series of process steps, including automatic system handling, programming, marking, and placement of devices in the output media of choice. Operator interaction is reduced by allowing the selection of a ***programming job*** (a set of instructions created by a system administrator that is used to program a series of devices) from a list on the window and starting the system.

Terms Used to Indicate Direction

The PS Series System motion system operates on three primary axes X, Y, and Z. These axes are used throughout this document to describe the motion of the various parts of the system, and are described relative to the front of the machine. They are displayed in *Figure 1-1*:
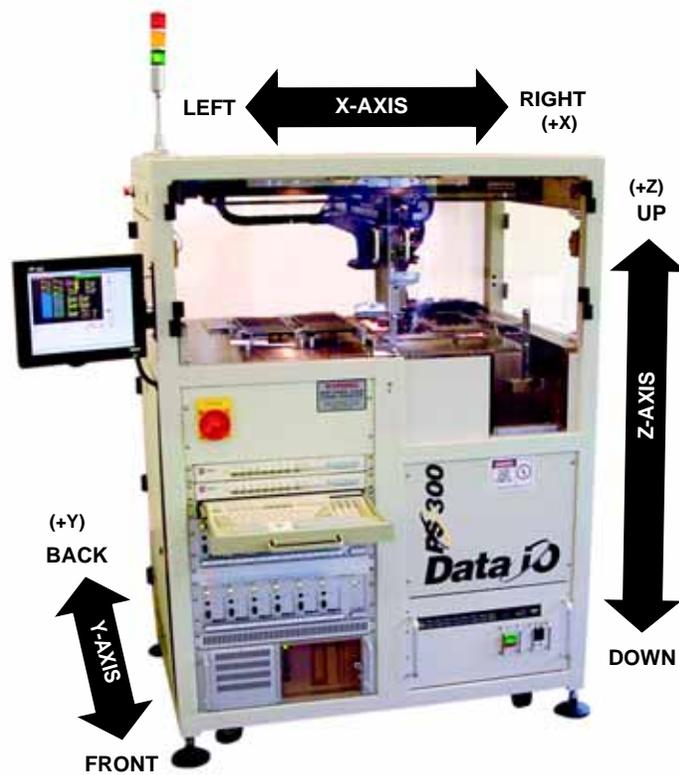
Figure 1-1—PS Series System motion axes

An additional axis, called the R-axis (***theta*** Θ), is used to adjust the angular (rotational) position of devices while they are being handled.

Four Basic Operations

The PS Series System performs four basic operations when processing devices:

1. **Unload devices from the input module—**
   The pick and place head (PNP head) unloads devices from the input tube, tray, or tape modules. These devices are placed in a programming socket for programming or on the marking pedestal for labeling or laser marking.

2. **Program devices—**
   Devices in the programming sockets go through a series of pre-programming tests to make certain they are blank and are correctly inserted in the sockets. If the tests are successful, the devices are programmed with the data contained in programmer RAM using an algorithm approved by the semiconductor manufacturer.

   Data in devices that pass the programming operation are verified against the RAM data to ensure that they have been programmed correctly. Testing, programming, and verifying options can be changed from the default settings using the software.

3. **(Optional) Laser mark or label devices—**
   When selected, devices that pass the programming and verification operations are moved to a pedestal on the laser marker or labeler, then marked for identification.

4. **Load devices onto the output module—**
   All devices are moved by the PNP head from the programming socket or the marking stage and placed in either trays, tubes, or tape output modules. Devices that failed the programming operation or subsequent verification are transported to a dedicated reject tray or other module where they are held for failure analysis or other disposition.

Subassemblies

The PS Series System has several subassemblies that work together to provide for proper operation of the complete system. (Some of these assemblies are optional and are not shown in *Figure 1-2*). Refer to *Figure 1-2* for the physical location on the PS Series System of the primary subassemblies, beginning at the top and moving clockwise:
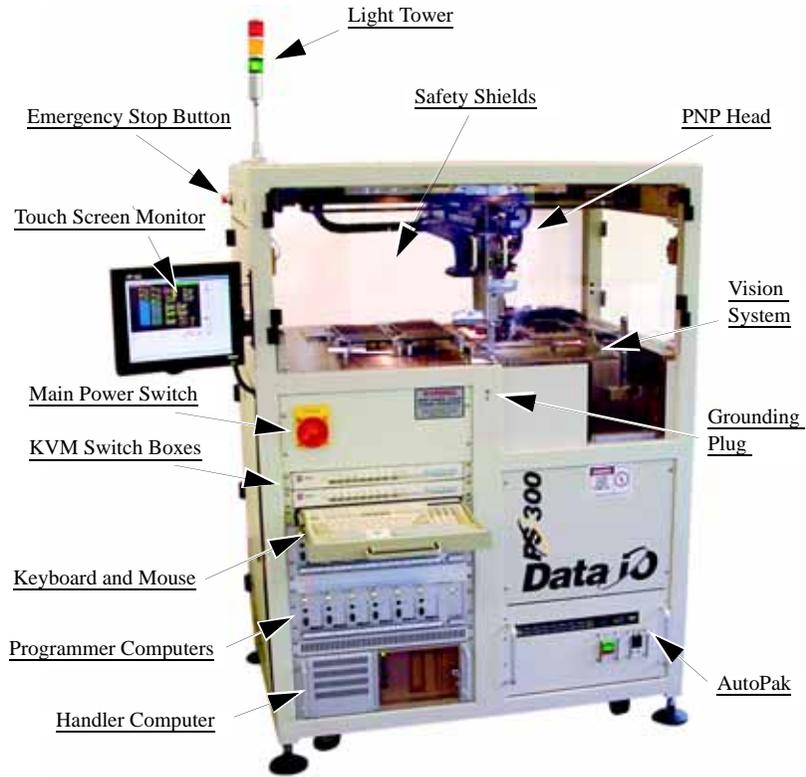
Figure 1-2—PS Series System primary subassemblies

1. **Light tower—**
   Allows monitoring the status of the PS Series System from a distance while the system is processing devices. The following indicate system conditions:

Light	Condition	Action Required	Possible Causes	Machine Status
Red	Major error	Operator intervention is mandatory. Likely that tools and troubleshooting skills required.	Motion control system error; actuator error; vacuum sensor malfunction; insufficient air pressure; possible collision ahead; socket opener sensor error; input shutter error; laser not ready; software exceptions.	Stopped
Yellow/ Red (alternating)	Error	Operator intervention is mandatory. Correction through AH400 or minor hardware adjustment.	Unprogrammed devices on Input/Pass tray; labeler error; setup-related errors; serialization errors; laser error; chip lost; tape input error; no programmer can be used; file read/write error.	Stopped
Yellow	Normal stop	Operator intervention is mandatory.	Output media full or input media empty.	Stopped
Yellow/ Green (alternating)	Normal	Operator intervention is suggested.	End of job; vacuum errors present on programmers; sockets disabled due to errors.	Processing or Stopped (end of job)
Green	Normal	No operator action needed.	Processing devices; clearing sockets to reject output.	Processing

Figure 1-3—Light tower

2. **Safety shields and interlock—**
   Used to protect against personnel and equipment damage when the PNP head is in motion. Safety switches on the safety shields will stop movement of the PNP head if the shields are opened or removed while the robot is in operation.

3. **Marking system (optional; not shown)—**
   Either a laser marking system or label printing system, used to mark devices so they may be identifiable at a later time. Installed on the right rear of the PS Series System.

The laser marking transport is a belt-driven shuttle system that moves programmed devices to and from the marking stage. The shuttle has two pedestals for holding devices, and they are used alternately when the system uses any output media except tape output. Initially, a device is placed in the second pedestal and is transported to the marking area. After the device is marked, the shuttle moves it back to the second pedestal. The system places an unmarked device in the first pedestal, then removes the marked device from the second pedestal and routes it to the output tray. The device in the first pedestal is then marked. This process continues, and alternates pedestals throughout the remainder of the job.

If the selected output media is tape output module, then only one of the pedestals is used. Since the tape output module is placed on the rear of the PS Series System, both pedestals cannot be effectively used in the manner described above. Additionally, if the devices are marked with the label printing system, only one pedestal is utilized.

A CO_2 laser system is used with the PS Series System to mark parts. The laser system applies a user-defined mark that can include letters, numbers, or drawings. The laser system operates as a Class 1 laser system (CDRH classification), and therefore uses integrated interlocks to prevent the laser from firing while any cover is open. The laser should never be operated without safety covers in place.

WARNING: Blindness hazard! Always wear eye protection when the laser safety shields are open, such as during service. Direct or diffuse laser radiation can damage eyes. Goggles must block 10.6 μm laser radiation. Goggles protect against scattered energy but not against direct viewing of the laser beam or reflections from metallic surfaces.

WARNING: Serious burn hazard! Enclose the laser beam path during service by closing the cover. Direct or diffuse laser radiation can cause serious burns.

WARNING: Toxic fume hazard! Laser marking generates vapors, fumes, and particles that may be noxious, toxic, or even fatal. Follow maintenance procedures on the fume extractor. Use proper ventilation.

4. **Pick and place head (PNP head)—**
   The motion system responsible for moving devices to and from their respective stages within the handler. The PNP head moves devices in four axes, X, Y, Z and R (also called Θtheta), within the operating envelope. A computerized vision system allows the PNP head to make adjustments for very accurate device placement.

   The PNP head uses different sized tips to accommodate the great number of device types that are available. During operation, a vacuum is turned on as the tip is lowered toward the device. A vacuum sensor is used to detect when the device has been touched by the probe tip.

The PNP head picks up the device and moves it to the vision system camera where it compares the device position on the tip to a digital image of a known good position. It can then correct for probe misalignments on the *X*, *Y*, and *R* axes (up to 30°) before the device is placed in the programming socket.

Once corrections are made, the PNP head moves the device to the drop location, the probe tip is lowered, and the vacuum is turned off. The drop position of the PNP head tip is slightly higher than the pickup position, as a *blow-off*, a small amount of positive-pressure air, is applied to break the vacuum seal. The short drop from the PNP head tip to the programming socket or output media prevents fine pitched leads from being damaged by excessive pressure.

> *WARNING: The pick and place robot system and associated components move with great speed and force, and have the potential to cause great bodily harm. Do not bypass the safety interlocks or operate the PS Series System with the safety shields open or removed.*

5. **Vision system—**
    The camera and associated components of the vision system are used to verify proper alignment of devices removed from the input media before inserting them into the programming sockets. Misalignments are corrected before placing the device in the programming socket or marking pedestal.

6. **Operator grounding plug—**
    To prevent damage to devices from ESD, operators should wear an antistatic wrist strap and insert in grounding plug.

7. **Tray input—**
    The standard configuration is tray input at fixed locations in the operation envelope. The style of trays and their mappings are "taught" to each job so that it may properly locate the device position. Tray input accepts JEDEC standard trays.

8. **Tray output—**
    The standard configuration is tray output at fixed locations in the operation envelope. The style of trays and their mappings are "taught" to each job so that it may properly locate the device position. Tray output accepts JEDEC standard trays.

9. **Tube input (optional; not shown)—**
    Tube input uses tubes to provide blank devices to the system for programming. Tube input device types include PLCC, DIP, and SOIC. Vibration mechanisms keep devices sliding freely by gently vibrating the tubes to reduce the likelihood of device jams.

10. **Tube output (optional; not shown)—**
    Tube output uses tubes to collect devices following programming. Tube output device types include PLCC, DIP, and SOIC. Vibration

mechanisms keep devices sliding freely by gently vibrating the tubes to reduce the likelihood of device jams.

11. **Vibration adjustment controls (optional; not shown)—**
Located on the right front of the PS Series System when the optional tube input or output modules are installed, the vibration adjustment controls are used to control vibration the tubes receive to reduce the likelihood of device jams when unloading or loading the tubes.

12. **Tape input (optional; not shown)—**
Tape input uses a reel of sealed carrier tape containing unprogrammed devices to provide devices for programming. Each device is picked from a carrier tape pocket and placed into a programming socket after alignment by the vision system. A sprocket wheel advances the tape one carrier pocket to align the next device into the pick position. Carrier tape comes with either pressure seal or heat seal cover tape. As the carrier tape advances, the cover tape is peeled off so that the PNP head can pick up the device.

 For more information about tape input, refer to *Chapter 4—System Theory*.

13. **Tape output (optional; not shown)—**
Tape output uses a reel of empty carrier tape to hold devices after they are programmed. Each programmed device is placed into an empty pocket on the carrier tape. The carrier tape then advances through either a heat seal or pressure seal unit that applies cover tape to the filled carrier tape.

 For more information about tape output, refer to *Chapter 4—System Theory*.

14. **Fume extractor (optional; not shown)—**
Used with the laser marking option, the fume extractor removes harmful smoke and hazardous materials from the marking area and safely stores them for proper disposal.

WARNING: Laser marking generates vapors, fumes, and particles that may be noxious, toxic, or even fatal. The fume extractor is required for use with the laser marking option and must not be disabled. Analysis of filter contents obtained following marking a representative variety of devices has revealed a sufficient level of hazardous materials, such as antimony and other heavy metals, to require that the filter be treated as hazardous waste. Filters must be disposed of in accordance with government hazardous waste regulations.

15. **Input panel (not shown)—**
Fittings on this panel, located on the rear of the PS Series System, allow for the attachment of power and compressed air. Compressed air is used with the PS Series System to generate the necessary vacuum

and positive-pressure air to manipulate devices and operate optional assemblies. See *Figure 2-1*.

16. **Circuit breakers (not shown)—**
    Four circuit breakers located on the input panel provide circuit protection and a source of power removal for the various assemblies in the PS Series System. See *Figure 6-31*.

17. **AutoPak (including main power circuit breaker and start button)—**
    Provides 115 VAC for computers and associated components, as well as PNP head. Also provides 24VDC for the various sensor systems throughout the PS Series System. The AutoPak provides a transfer point for all sensor signals within the PS Series System and optional assemblies, and sends the signals to the Handler Computer for processing.

18. **Handler computer—**
    Hosts the operating software for the PS Series System, monitors all sensors and safety interlocks for proper operation and safety, and hosts the computer vision system.

19. **Programmer computers—**
    A small rack-based computer used to operate one programming site. There are as many Programmer Computers as there are programming sites. Each is viewable and manually operable from a keyboard and monitor port. The physical form factor of these computers is PC-104, and they are also sometimes referred to as "PC-104."

20. **Keyboard and mouse—**
    The keyboard and mouse are used to set up system operation, and can be used instead of the monitor touch screen if desired. Through a KVM (keyboard, video, and mouse) switch box, the keyboard and mouse may be used with the Handler Computer, Programmer Computers, and the computer vision system.

NOTE: Throughout this manual, the term "click" is used to mean "touch" when using the touch screen.

21. **KVM switch boxes—**
    Used in association with the Programmer Computers to view the status of each and make changes as necessary. Provides switching to the Handler Computer, Programmer Computers, and computer vision systems. Allows a single keyboard, monitor, and mouse to be used with all systems for space savings.

22. **Main power switch—**
    Used to switch primary power for the PS Series System.

23. **Touch screen monitor—**
    The central display mechanism for the PS Series System. The system status, programming jobs, and computer vision systems are monitored

and operated from this display. The touch screen may be used instead of the mouse if desired.

24. Emergency stop (E-Stop) buttons—
Used to stop the PNP head in case of an emergency. When an E-Stop button is pressed, the PNP head stops moving immediately.

NOTE: Do not press the E-Stop button except in a physical emergency. When pressed, data may be lost, and the job may have to be restarted.

25. Server computer (not shown)—
The Server Computer, a single computer attached to the PS Series System on its left side, hosts the ***Optima programmer software*** used by each of the Programmer Computers to control the programmer modules, and stores device data files for later use. The Server Computer is attached to the PS Series System, and is used only with the machine to which it is attached.

CAUTION: The PS Series System should never have any software added to the computers unless instructed to do so by Data I/O Customer Support. Adding software to the PS Series System can cause damage and/or cause the systems to operate improperly. Adding software without specific instruction from Data I/O Customer Support will void the warranty and may incur service charges.

Input/Output Module Combinations

The standard configuration for the PS Series System is with tray input and tray output modules. Other input and output modules are tube input, tube output, tape input, and tape output. **Any** combination of input and output modules may be used to provide devices to the PS Series System for processing and provide a method to repackage devices for use in later stages of manufacture. For example, the system can be configured with tray input and tube output, tape input and tray output, or tube input and tape output, *etc*.

Safety Systems

The PS Series System has several safety systems on board to reduce the likelihood of personal injury and machine damage. These systems include:

1. Emergency stop (E-Stop) buttons—
Two large, red Emergency Stop buttons are located near the top of the PS Series System, one on either side of the machine. The buttons are easily reached in an emergency. When the E-Stop button is pressed, the PNP head stops moving immediately.

Figure 1-4—Emergency stop button

NOTE: Do not press the E-Stop button except in a physical emergency. When pressed, data may be lost, and the job may have to be restarted.

WARNING: Pressing an E-Stop button stops only the motion of the PNP head. Pressing an E-Stop button does not remove power from the machine.

To restart the system, turn the E-Stop button clockwise (follow the direction of the arrows on the button) until it springs back to its full height. Follow onscreen messages to resume operation.

2.   **Safety shields and interlocks—**
    During operation, when the high-speed PNP head is processing devices, the clear plastic shields around the system are closed to protect personnel from injury. If a shield is opened, the PNP head will move to the ***home position***, a safe position toward the rear of the PS Series System operating envelope, and will not continue until the shield is closed.

WARNING: The high speed and force behind a moving robot will expose anyone working inside the operating envelope to serious bodily injury. When working within the machine, moving the PNP head must be the responsibility of only one qualified individual. All other personnel near the system must stay clear of the operating envelope and any machine controls to prevent injury to the person working within the PS Series System. Never operate the PS Series System with the safety shield open or any interlock bypassed.

CAUTION: Do not use solvents such as acetone, lacquer thinner, mineral spirits, isopropyl alcohol, or any type of abrasive compound on the safety shield surfaces. Use of these products will damage the safety shield surfaces and reduce visibility within the operating area.

Software and User Interface Components

During programming operations, the PS Series System is controlled using the keyboard, mouse, or touch screen, and three software interfaces. The software components reside in several locations in the various computers on the PS Series System.

Computer Systems

The PS Series System is a complete system with various subsystems within it, such as the robotics system, power supplies, programmers, and computers. In order to operate properly, the PS Series System must remain intact.

The Handler Computer, with an additional Network Interface Card (NIC), can communicate with a corporate Windows NT network over TCP/IP. The primary logon for the Handler Computer will be Novell Client and the secondary logon will be MS Client, so that the Handler Computer first logs on to the PS Series System network server (as P01_HDL) and then the user can log on to the corporate network. Once the required software and data files are downloaded from the corporate network to the Handler Computer or the network server, the user must log off the corporate network.

Customer-supplied antivirus software can be loaded on the Handler Computer. However, the antivirus software should not be scheduled to run while the PS Series System is in operation.

The PS Series System should never have any software added to the computers unless instructed to do so by Data I/O Customer Support.

CAUTION: Adding software to the PS Series System can cause damage and/or cause it to operate improperly. Adding software without specific instruction from Data I/O Customer Support will void the warranty and may incur service charges.

CAUTION: Windows system parameters and network parameters should not be changed unless instructed to do so by Data I/O Customer Support. Changing Windows or network system parameters can cause failure and/or damage to these systems or cause improper programming.

Switching Between Interfaces

Either the keyboard or the KVM switch boxes can be used to switch interfaces.

Keyboard—
1. On the keyboard, press <Ctrl> twice. A list of all computers is displayed on the touch screen monitor.
2. Use the up and down arrows to select a computer.
3. Press <Enter>.

KVM switch boxes—
1. Press a switch on the KVM switch boxes. See *Figure 1-5*.

On the upper switch box:
- **A** - switches screen to **Handler Computer interface**
- **B** - switches screen to **Server Computer interface**
- **C** - switches screen to **Laser Computer interface** (optional)
- **D** - switch location not currently used
- **E through H** - switches screen to **Programmer Computer 1-4 interfaces** respectively

On the lower switch box:
- **A through H** - switches screen to **Programmer Computer 5-12 interfaces** respectively
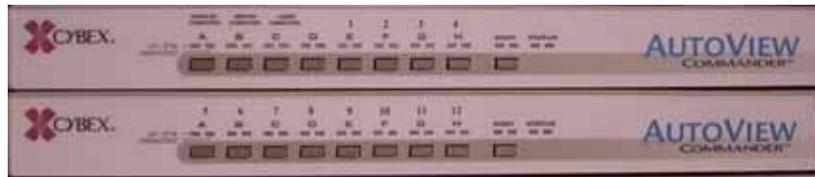
Figure 1-5—KVM switch boxes

Handler User Interface

The Handler software interface is a Microsoft® Windows®-based system, and allows an operator to begin programming operations, as well as set up various system parameters such as input/output configurations, marking options, vision system setup/monitoring, and PNP head calibration. This system operates from the Handler Computer at the bottom left of the PS Series System. See *Figure 1-6* for an example of the Handler user interface window. More information follows in *Chapter 2—Set Up* and *Chapter 3—Operation*.
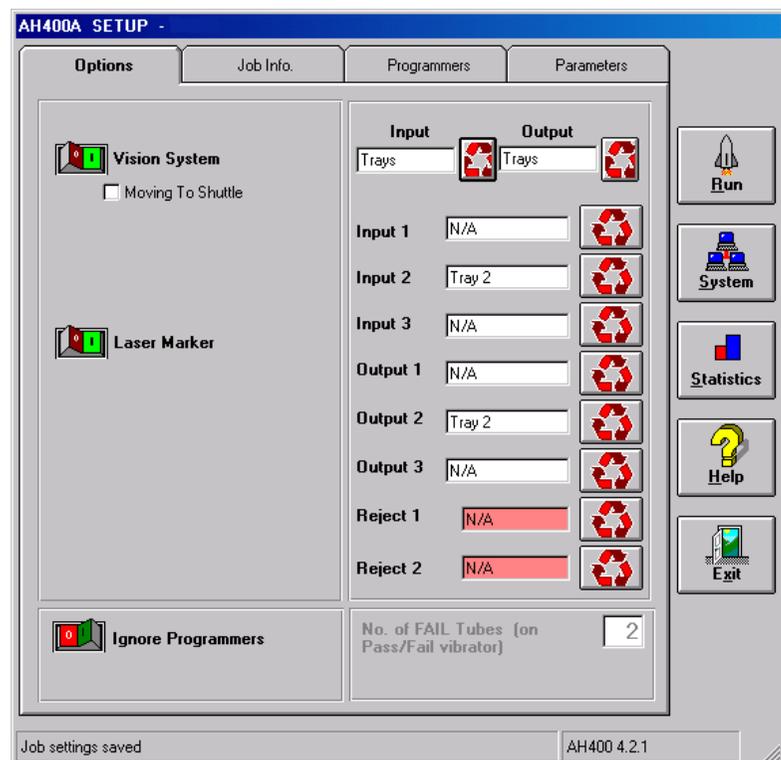
Figure 1-6—Handler user interface example

Programmer User Interface

The Programmer software job-creation interface is Microsoft® DOS®-based, and allows a system administrator to save a set of parameters to be reused as future jobs. This system operates from each of the Programmer Computers. While this interface exists on *all* Programmer Computers, a job needs to be created on a single Programmer Computer only, after which the job is *uploaded*, or transferred, to the Server Computer for use by the entire system. See *Figure 1-7* for an example of a job-creation window. More information about the job creation interface follows in *Chapter 3—Operation*.
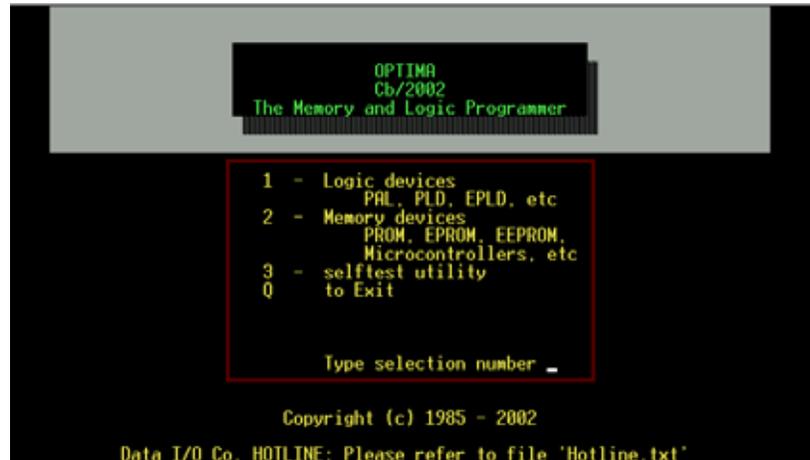
Figure 1-7—Opening window for job creation interface

Laser User Interface

The Laser software interface is Windows®-based, and allows for the creation of parameters required for laser jobs, as well as job initiation. The software resides on a computer within the laser marking system, and is accessible through the KVM switch box at **Port C**. When the laser marking system is set up and initialized, it receives commands from the Handler Computer software initiating the marking sequence. See *Figure 1-8* for an example of the laser interface configuration window. More information about the laser interface follows in *Chapter 2—Set Up* and *Chapter 3—Operation*.
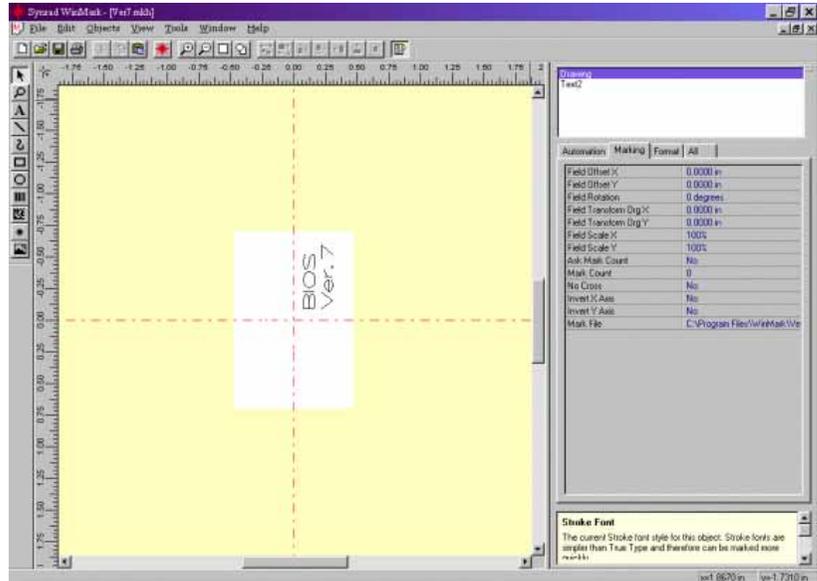
Figure 1-8—Laser computer interface example

Required Facilities for Operation

The PS Series System is a self-contained unit that creates most of its own power supply voltages and signals required for proper operation. It does, however, require two outboard facilities, both of which are connected to the input panel on the rear of the machine. Refer to *Figure 1-9* for connecting locations for the power cable, external air line, and air filter.
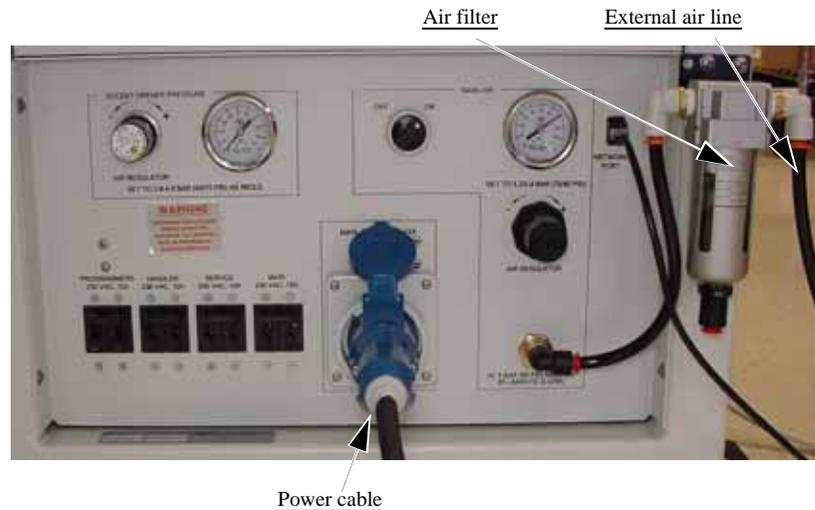
Figure 1-9—Connecting locations

Input Power

The PS Series System requires 208–240 VAC, 50/60 Hz, single phase electrical power. The **power cable** is inserted into the input panel as shown above.

WARNING: *If the main power switch is in the **ON** position, power is applied to the entire PS Series System.*

Input Air

The PS Series System requires clean, dry, oil free air, input rated between 90 and 100 PSI (620 to 689 kilo Pascals) from an industrial grade compressor with a tank of sufficient size to maintain constant air pressure at 3 Standard Cubic Feet per Minute (85 liters per minute).

A 3/8-inch quick connect introduces the facility's air supply to the PS Series System's internal air network, where it is routed to air solenoids and vacuum generators for the PNP head probe, socket actuator, and transfer shuttle.

Air enters the PS Series System through the *external air line* and passes through an *air filter*, which traps debris and extracts moisture. The external air line should be at least 10 feet (3.05 meters) long to allow the supplied air to cool enough so that any water vapor contained in the air can condense and be extracted.

[Refer to *Figure 1-10* for locations of the main air pressure regulator and socket actuator pressure regulator on the input panel.]

Socket actuator pressure regulator   Main air pressure regulator
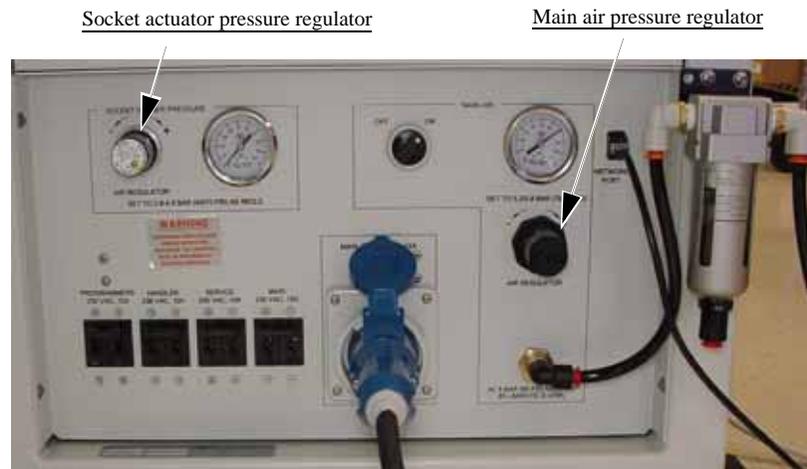
Figure 1-10—Regulator locations

Main Air Pressure Regulator—
The PS Series System input panel contains the *main air pressure regulator* to control the air pressure that the PS Series System uses to internally generate vacuum and air operations. Air pressure should be set to 75-80 PSI (517-552 kilo Pascals) as read on the gauge on the input panel by adjusting the regulator knob.

Socket Actuator Pressure Regulator—
The socket actuator pressure regulator, also found on the input panel, controls air pressure used to lower the actuator and open the socket when the robot is over a socket. This pressure should be kept at 20–40 PSI as shown on the *socket actuator pressure gauge* in the upper left of the input panel, and is adjustable with the adjacent knob. This pressure should remain in the

20–40 PSI range but may be adjusted within that range depending on the socket in use.

> *NOTE: The socket actuator must be turned on from the operator interface before the regulator gauge will display a reading. See Chapter 3—Operation for more information.*

If the PNP head does not pick up the devices in a socket, the socket may not be opening completely. It is possible that the socket actuator pressure may be set too low. To remedy this, increase the socket actuator air pressure slightly, restart the job, and check the action of the sockets.

> *CAUTION: Setting the socket actuator air pressure too high can cause premature wear of the sockets.*

Precautions for Safe Operation

The PS Series System has many safety features designed to make the system safe and efficient to operate. **The system can be dangerous if the safety precautions and features in the manual are ignored.**

To avoid possible personal injury or damage to the equipment, please observe the following practices:

- Do not use the PS Series System for any application other than its intended use.
- Do not operate the system if the guards or safety devices are not in their normal operating positions.
- Do not operate the system when any of the outer sheet metal panels are removed.
- Only qualified personnel trained by Data I/O to service and maintain the PS Series System (including laser safety training) should install, maintain, repair, or troubleshoot this system.
- Do not operate a system while servicing, replacing, or adjusting any component unless directed to do so in this manual. Make sure that the system is properly shut down before performing any of these operations.
- Shut off pressurized air, or disconnect external air line, before servicing pneumatic parts.
- Do not operate the PS Series System unless you have been thoroughly trained and have read and understand the instructions in this manual, particularly those that describe the system's safety features.
- Do not place any part of your body near or in the direct path of moving parts.
- Do not disable or attempt to defeat any of the protective safety features of this system. Serious personal injury and/or equipment damage can occur if any safety systems on the PS Series System are disabled. If you suspect that a safety feature of the system is damaged or malfunctioning, stop using the PS Series System immediately and contact your local Data I/O Support office.
- Read and follow the laser vacuum filter disposal requirements described later in this section. Always dispose of any other hazardous

or residual by-products of the production process in accordance with governing laws and regulations.

- Use extra caution when using the tape input/output modules or device labeling option. The system's safety shields do not cover or fully enclose these modules. It is possible that an operator's hands, other body parts, or loose clothing can get caught or pinched in these mechanisms.

Warnings, Cautions, and Safety Symbols

Special paragraphs in this manual warn about potentially hazardous situations and recommend safe practices to help avoid personal injury (***WARNING***) or damage to equipment (***CAUTION***). They are included to help use the system safely and efficiently.

Laser Marker Safety

The laser marker system on the PS Series System has been designed in accordance with the following safety guidelines:

- Operates as a Class 1 laser (CDRH classification).
- Fume extractor traps marking fumes and other by-products of the laser marking operation.
- System designed to comply with OSHA guarding standards.
- Integrated interlocks prevent the laser from firing while any interlock on the laser cover is open.
- Refer to and follow the laser and safety precautions in ANSI X136.1-1993, *American National Standard for the Safe Use of Lasers*. Procedures listed under the Standard include: appointment of a Laser Safety Officer, operation of the product in an area of limited access by trained personnel, servicing of the equipment only by trained and authorized personnel, and posting of signs warning of the potential hazards.

WARNING: Blindness hazard! Always wear eye protection when the laser safety shields are open, such as during service. Direct or diffuse laser radiation can damage eyes. Goggles must block 10.6 μm laser radiation. Goggles protect against scattered energy but not against direct viewing of the laser beam or reflections from metallic surfaces.

WARNING: Serious burn hazard! Enclose the laser beam path during service by closing the cover. Direct or diffuse laser radiation can cause serious burns.

WARNING: Toxic fume hazard! Laser marking generates vapors, fumes, and particles that may be noxious, toxic, or even fatal. Follow maintenance procedures on the fume extractor. Use proper ventilation.

Disposal of Laser Vacuum Filters

The PS Series System uses a vacuum system to remove the smoke and other by-products of the laser marking process. The smoke fumes pass through a series of filters designed to remove airborne particles from the operating environment. Material Safety Data Sheets (MSDS) for materials being processed should be thoroughly evaluated and the adequacy of provisions for fume extraction, filtering, and venting should be carefully considered.

The exact composition of the materials trapped by the filters depends upon the materials used by the semiconductor manufacturer to create the device package. Analysis of filter contents obtained after marking a representative variety of devices has revealed a sufficient level of potentially hazardous material, such as antimony and other heavy metals, to require that you handle and dispose of the filters with other hazardous waste within the facility. Dispose of the filters in accordance with the facility's hazardous waste policy and in a manner that meets all applicable government (local, state, and federal—or equivalent) regulations.

Review the following references for further information regarding exposure criteria:
*   ANSI Z136.1-1993, *Standards for the Safe Use of Lasers*, section 7.3.
*   U.S. Government's Code of Federal Registers: 29 CFR 1910, subpart Z.
*   *Threshold Limit Values* (TLVs) published by the American Conference of Environmental Industrial Hygienists (ACEIH).

Laser Filter Replacement Intervals

Replace the top two filters in the fume extractor once for each month of regular laser marking. Replace the bottom two filters each year. If the filters are not replaced as required, the laser vacuum system will not be able to prevent fumes and marking by-products from escaping into the work environment.

WARNING: Do not clean the laser vacuum filters by blowing with compressed air, shaking, or using any method that allows the particulate trapped by the filters to be released into the work environment. Dispose of the filters as directed in your fume extractor manual.

WARNING: Failure to replace the laser vacuum filters at the required intervals could create a hazardous operating environment.

Determining Filter Contents

The company contracted to dispose of the facility's hazardous waste may be required to perform a profile of the filter contents to determine the specific composition of the particulate matter. The manufacturer of the semiconductor devices being marked may be able to provide a profile sheet describing the composition of their packaging material.

Standard plastic IC packages typically contain *antimony hydroxide* as a fire retardant, the source of the antimony in the vacuum filters. Other hazardous

materials may also be present depending upon the type of IC packages that are laser marked.

After the initial profile is performed and on record with the company that disposes of the facility's hazardous waste, additional testing of contaminated filters should not be needed unless the contents of the IC packages or type of IC packages being marked changes significantly.

The licensed hazardous waste disposal company can provide the necessary information to label the bags containing the filters and will complete the paperwork required for transportation and disposal in a manner that meets applicable government (local, state, and federal—or equivalent) hazardous waste regulations.

Filter Handling and Storage

The procedure for replacing the laser vacuum filters is described in the fume extractor manual. Following the precautions listed below will help ensure a safe work area for all personnel using the PS Series System.

Ensure that protective gloves (disposable latex or vinyl) are worn during the removal of the contaminated filters. Handle the contaminated filters in a manner that minimizes the release of the particulate on the filters.

Dispose of the contaminated filters in a tightly sealed plastic bag (such as a bag with a reusable locking seal). When all filters have been carefully placed in the bag, pull off the disposable gloves (inside out), place them in the bag, and seal the bag.

If it is determined that the by-products of laser marking contain potentially hazardous materials, a hazardous waste label that meets government requirements (local, state, and federal—or equivalent) needs to be affixed to this bag or other hazardous waste container.

WARNING: Numerous government regulations apply to the storage of hazardous waste. Ensure that contaminated filters are properly labeled and stored in your hazardous waste storage area. Also, make sure that they are not stored on your site longer than government regulations allow (the typical limit is 90 days). Check your government (local, state, and federal—or equivalent) regulations for hazardous waste storage requirements.

Room Ventilation

The PS Series System, its laser marking system, and labeling system contain mechanical components, a laser, and associated electrical systems that generate heat and extremely low levels of particulate matter.

The PS Series System should be located in a room with adequate space to allow easy access to all enclosures (a minimum of 36 inches [one meter] of clearance on all sides) and easy removal of system components.

The room should be provided with suitable levels of general room heating, ventilation, and air conditioning. For an occupied office area, the American Society of Heating, Refrigeration, and Air Conditioning Engineers, Inc. (ASHRAE) standard 62-1992 specifies a minimum of 15 cubic feet per minute (CFM) of air per occupant. This level of ventilation is intended to provide the occupants of the room with sufficient air movement to provide a comfortable environment. The air movement is intended to dissipate heat, odors, and other exhalation products from respiration (such as carbon dioxide and water vapor).

Because the PS Series System generates heat, an additional 85 CFM is recommended, bringing the total room air exchange rate to 100 CFM. In a room with dimensions of 10 feet by 10 feet, with an 8 foot ceiling (800 cubic feet of total interior area), 100 CFM would provide approximately six room air changes per hour.

Based on industrial hygiene monitoring performed during the worst case operating scenario of a PS Series System laser marking system, this rate of air movement is sufficient to provide a safe and healthy airborne work environment.

WARNING: Operating the PS Series System in an area that does not meet the minimum ventilation requirements could result in a hazardous operating environment.

Electrostatic Discharge (ESD) Precautions

The circuit boards inside the PS Series System are susceptible to electrostatic discharge (ESD), which can damage the circuitry of the programming electronics. Also, devices processed through the PS Series System are very sensitive to static and can be damaged by accidental and unintended electrostatic discharge while being handled by an operator.

The easiest way to prevent damage from ESD is to make sure a common electric potential (ground) exists between static-sensitive devices or components, its environment, and the operator.

Handling Devices Safely

To prevent damage to device leads, use a vacuum tool to move devices or to pick them up if they are dropped. The vacuum tool is designed to handle devices without damaging them.

CAUTION: Do not touch devices with your hands or any implement other than the vacuum tool. Damage to fine-pitched leads may result.

To pick up a device using the vacuum tool, squeeze the bladder, place its rubber tip on the device body, release pressure on the bladder, and lift up. Depending upon the physical size of the device, a different sized rubber tip may need to be used to adequately handle the device. See *Figure 1-11* for details.
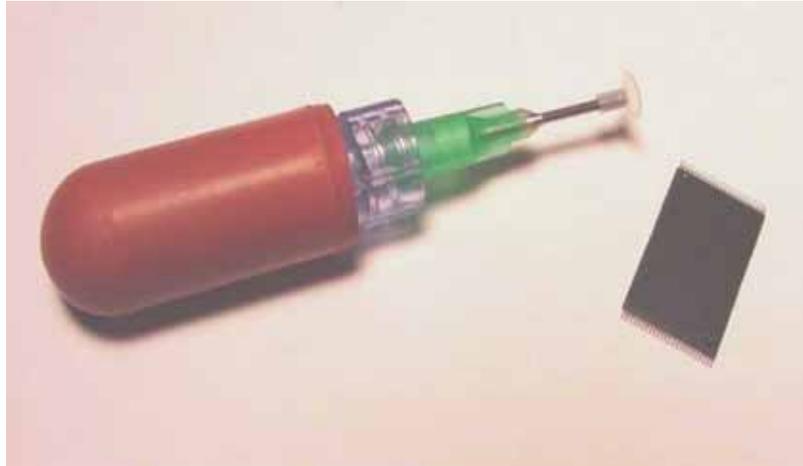
Figure 1-11—Semiconductor device vacuum tool (PN 565-8000-001)

Chapter 2

Set Up

Unpacking and setting up the PS Series System is a simple process, as the machine arrives preassembled. All that is required to operate the PS Series System is an operating location and two external facilities.

The system arrives stored within a wooden crate. Ensure that there is no damage to the exterior of the crate that may indicate damage to the machine on the interior. If there is noticeable damage to the crate, notify Data I/O Customer Support immediately.

Carefully remove the crate surrounding the PS Series System, ensuring that tools are kept safely away from the machine as the crate is removed. Once the crate has been removed and the system is sitting on the pallet, inspect for damage that may have occurred during shipping. If the system has sustained damage during shipping, notify Data I/O Customer Support immediately.

If there appears to be no damage, unbolt the PS Series System from the shipping pallet and move to the floor. Ensure that the operating area allows at least 36 inches (one meter) of area around its perimeter for opening and removing panels, as well as repair and replacement of internal assemblies.

Place the PS Series System onto a solid foundation and adjust so that it is level. The feet on the bottom of the system are adjustable for easy leveling.

WARNING: Use only the adjustable feet provided on the PS Series System for leveling the machine. Do not use shims of any kind to assist in leveling. The PS Series System contains a fast-moving robot with sizable mass. Instability may occur if all four of the installed feet do not make suitable contact with the floor. The operating area for the PS Series System must be stable, solid, and mostly level prior to installation. If this is not achievable, consider moving the system to another location.

Making the Necessary Connections

The PS Series System requires only two outboard facilities: low pressure air and electrical power. Both outboard facilities connect to the PS Series System through the input panel found on the rear of the machine. With these two facilities, all unique electrical voltages and signals, as well as pneumatic requirements, are generated on board.

Pneumatic Input Requirements

The PS Series System requires clean, dry, oil free air, input rated between 90 and 100 PSI (620 to 689 kilo Pascals) from an industrial grade compressor. The compressor's tank should be of sufficient size to maintain constant air pressure at 3 Standard Cubic Feet per Minute (85 liters per minute).

The low pressure air source is supplied to the system through the ***external air line*** connected to the ***air filter.*** (See *Figure 2-1* below for the location of the external air line and air filter.) The PS Series System air filter is a secondary filter only. The main filter should be a ***10 micron filter/regulator*** installed between the factory compressor and the PS Series System. The external air line should be at least 10 feet (3.05 meters) long to allow the supplied air to cool enough so that any water vapor contained in the air can condense and be extracted.

CAUTION: Oil, excessive moisture, or poorly filtered air will obstruct the system's internal air network, affect performance, and void the warranty related to air system failure. If oil or excessive moisture is detected, call Data I/O Customer Support immediately.

NOTE: If the compressor cannot maintain the correct air pressure, system performance will be affected.

Electrical Input Requirements

The PS Series System uses 208–240 VAC, 50-60 Hz, single phase, for the generation of electrical signals throughout. The required power is supplied through a single connection on the input panel. See *Figure 2-1* for the location of the ***power cable*** as it connects to the input panel.
.

Air filter External air line

Power cable
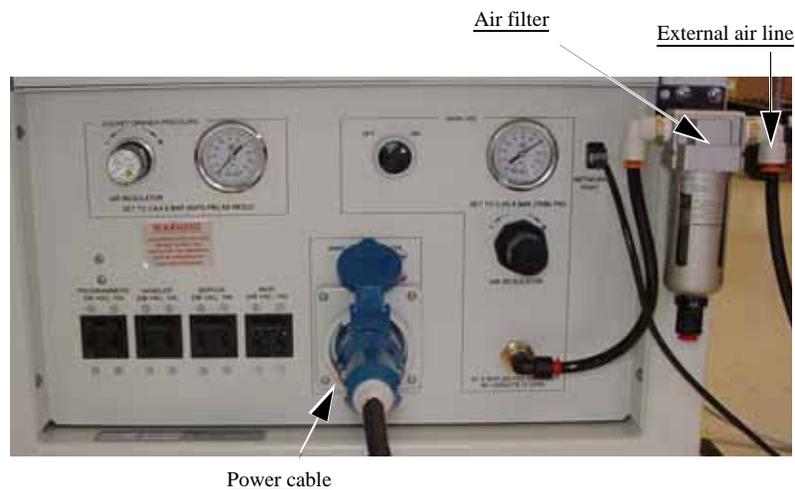
Figure 2-1—Input panel

Applying Power for the First Time

Before the PS Series System is turned on the first time, ensure the following:

☞ The external air line is connected, the air pressure switch is in the **ON** position, and input air pressure is set between 75 and 80 PSI (517 to 552 kilo Pascals) by adjusting the air regulator knob above the input air fitting.

☞ All E-Stop buttons are in the released (operating) positions (refer to *Chapter 1—Introduction* for details on locating the E-Stop buttons).

☞ All safety shields are closed (refer to *Chapter 1—Introduction* for details on locating the safety shields).

☞ The four circuit breaker switches on the input panel on the back of the PS Series System are in the **ON** position (refer to *Chapter 1—Introduction* for details on locating the circuit breakers).

☞ The circuit breaker switch on the AutoPak is set to the **ON** position (refer to *Chapter 1—Introduction* for details on locating the circuit breakers and switches).

☞ The power switch on the Handler Computer is set to the **ON** position (refer to *Chapter 1—Introduction* for details on locating the Handler Computer).

☞ The network cable is connected and the Server Computer is turned on (refer to *Chapter 1—Introduction* for details on locating the Server Computer).

☞ The adapters required for the job to be run have been installed on all necessary programmer sites.

Once the above conditions have been checked, turn the main power switch on the front of the PS Series System in a clockwise direction to the **ON** position. Then press the AutoPak **START** button. All power should be applied to the PS Series System at this time.

> **WARNING:** *Power is applied to the programmer assemblies when the main power switch is turned* ***ON****, even when the AutoPak is turned off. Use great caution when working behind the panels of the PS Series System while main power is turned on.*

After power is applied, verify that all mechanical assemblies appear to be at rest, and no obvious failures or electrical anomalies occur. Verify that the Handler Computer boots properly, and is waiting at a network login window. If electrical or mechanical problems are noted, turn off the PS Series System and notify Data I/O Customer Support immediately.

Verifying Proper Operation of the Safety Systems

There are several safety systems on the PS Series System to ensure safe operation of the programmer for both operators and trained service personnel. Operation of these safety systems is verified upon installation of the PS Series System. Perform the following test after setting up the system:

Test the E-Stop Buttons

Test each E-Stop button by depressing it while the AutoPak is on. Make sure that the AutoPak turns off, and the PNP head can be moved by hand. To reset the E-Stop button, turn it clockwise (in the direction of the arrows on the button), until the button releases. When the operating envelope is clear of personnel or obstructions, the AutoPak **START** button may be pressed to reapply power to the system.

> *WARNING: Never insert any body part inside the operating envelope while the robot is in motion. The robot moves with great speed and force and can cause serious bodily injury.*

> *WARNING: Power is applied to the programmer assemblies when the main power switch is turned **ON**, even when the AutoPak is turned off. Use great caution when working behind the panels of the PS Series System while main power is turned on.*

Setting up the Tray Input/ Output Modules

The PS Series System comes with tray input and output modules in its standard configuration.

> *NOTE: When using the tray input and output modules, ensure that blank devices are loaded with the correct pin 1 orientation. Pin 1 orientation is set when the PNP head locations are taught during job setup. For more information, see "Teach Tray Locations" on page 3-45.*

To set up the tray input and tray output modules:

1. **Prepare system**—
1a) If a job is running, press **Stop** on the Run window.
1b) Press **Exit** to return to the Setup window.
1c) Click the Options tab.
1d) Open the front safety shields.

Figure 2-2—Tray orientation

2.   Install Tray 1—

2a)   On the work surface, pull out the spring loaded knob and plunger.

2b)   Hold the tray so that the beveled edge is in the lower right corner. See *Figure 2-2*.

2c)   Slip it into the Tray 1 location. Ensure that the tray seats against the back right corner of the work surface so that the optic sensor is blocked. See *Figure 2-3*.

Figure 2-3—Tray seated with optic sensor blocked

2d)   Release the spring loaded knob and plunger. If the plunger does not make contact with the corner of the tray, turn the spring loaded knob until the plunger engages the corner of the tray.

3.   Install Tray 2—

3a)   Hold Tray 2 with the beveled edge in the lower right corner and slip it into the Tray 2 location. Ensure that the tray seats against the back right corner of the work surface so that the optic sensor is blocked.

NOTE: If a job is Paused and a tray is removed from the Tray 1 or Tray 2 location and then returned to the Tray 1 or Tray 2 location, the software detects that the optic sensor was uncovered and resets all devices in a tray to new. Therefore, use caution when removing partially programmed trays.

4.   Install optional reject bin/box—

4a)   Place a small bin or box on the "reject" location near the Park position on the work surface, as shown in *Figure 2-4*.
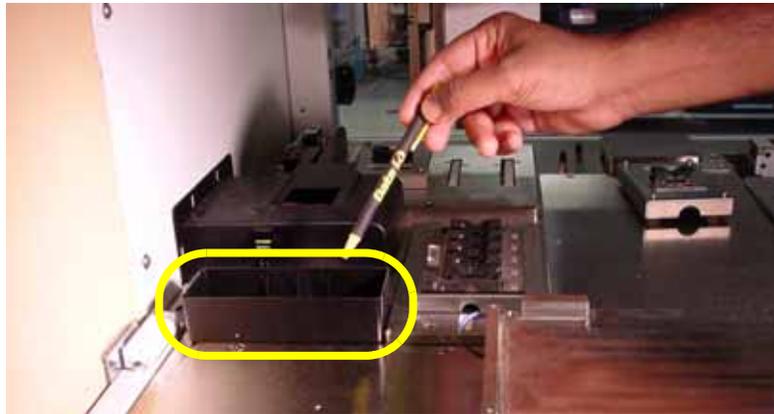
Figure 2-4—Reject bin/box located on work surface

*NOTE: Within the AH400 software, the reject bin/box is represented with the **RTr** yellow position label.*

This completes the procedure for physically setting up of the tray input and tray output modules.

Before running a job for the first time, it is necessary to:
*   Teach locations to the PNP head. For information, see "Teach the Package File" on page 3-40.
*   Select tray input/output settings in the AH400 software. For information, see "Configure the Input/Output Settings in the AH400 Software" on page 3-6.

(Option) Setting up the Tube Input and Tube Output Modules

As an option, the PS Series System can be configured with tube input and tube output modules.

To set up the tube input and output modules:

1.   Collect materials—

1a)   Determine the size of the devices to be programmed and select tubes that match device size.

1b)   Identify the input tube loader. See *Figure 2-5*.
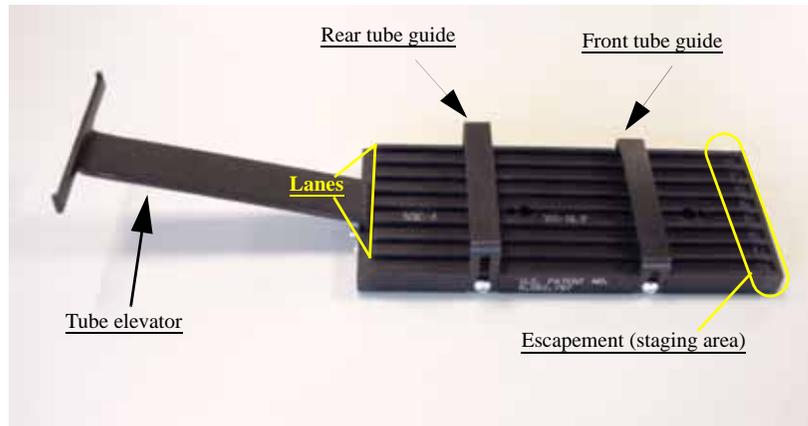
Figure 2-5—Input tube loader

2.   Install input tube loader—
2a)   Open the front safety shield.
2b)   Install the input tube loader to the input Vibrator Motor 1 (V1) on the left side of the work surface as shown in *Figure 2-6*.
2c)   Tighten the two screws using a 9/64 inch Allen wrench.
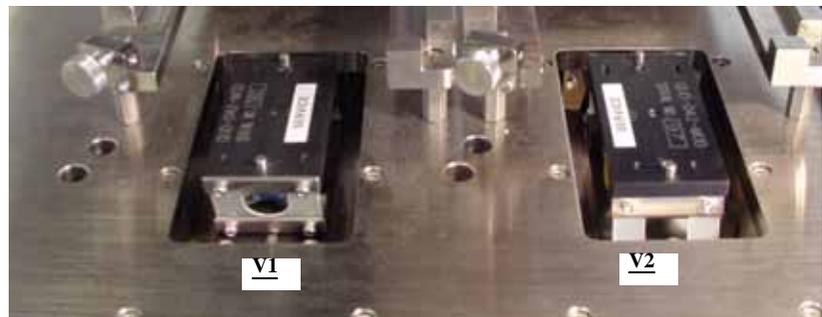
Figure 2-6—V1 and V2

3.   Install output tube unloader—
3a)   Install the output tube unloader to the output Vibrator Motor 2 (V2) on the right side of the work surface as shown in *Figure 2-6* above.
3b)   Tighten the two screws using a 9/64 inch Allen wrench.

4.   Insert tubes in input tube loader—
4a)   Insert empty tubes in the first and last lanes of the input tube loader. See *Figure 2-7*.
4b)   Adjust the rear tube guide and the front tube guide so the tubes are held on the input tube loader snugly but are not compressed out of shape. See *Figure 2-7*.
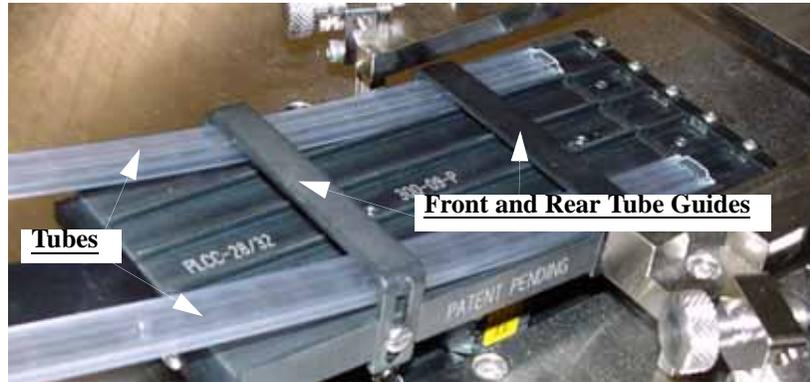
Figure 2-7—Adjust front and rear tube guides

4c) Remove the empty tubes from the first and last lanes of the input tube loader.

5.   Adjust output tube unloader—

5a) Identify the output tube unloader. See *Figure 2-8*.

Figure 2-8—Output tube unloader

5b) Adjust the output tube unloader front and rear tube guides as described in Step 4 above.

6.   Insert tubes—

6a) Insert **full** tubes into the input tube loader.

6b) Insert **empty** tubes into the output tube unloader.

6c) Close the safety shield.

> *NOTE: The pin 1 orientation for devices is set in the Package file. Devices should be loaded in tubes as defined in the package file.*

> *NOTE: If this is the first time you are installing tube feeders on your PS Series System, you may need to edit the AH400.ini file to reflect this additional option. Proceed with Step 7.*
>
> *If you have installed tube feeders on your PS Series System before, proceed with Step 8.*

7.   Configuring AH400 after first tube feeder installation—

7a) Using Windows Explorer, open C:\AH400_32\WinAH400.ini.with NOTEPAD editor.

7b) Locate the section

`;------- tube media settings -----`

7c) Ensure value for **Tube Feeder 1** (input tube feeder) is **STDIN**.

7d) Ensure value for **Tube Feeder 2** (output tube feeder) is **STDOUT**.

7e) Save the WinAH400.ini file and exit Windows Explorer.

8.   Configuring AH400 after repeat tube feeder installation—

8a) On the Options window, select "Tubes" for the input and output media.

8b) If the vision system will be used to check every device, set Vision System to ON.

8c) If the vision system will be used to check only the first and last devices in a tube, set Vision System to OFF and check "1st +last 2 /tube."

9.   Adjust vibration controls—

9a) If devices do not travel freely in the input tube loader or the output tube unloader, increase the vibration by turning the vibration controls in clockwise direction. The magnitude of vibration is set by adjusting V1 for the input tube feeder and V2 for the output tube unloader.

> *NOTE: Within AH400, Vibrator 1 is represented by the yellow position label **Vib1**. Vibrator 2 is represented by the yellow position label **Vib2**.*

This completes the procedure for setting up a tube input and tube output modules.

Before running a job for the first time, it is necessary to:
*   Teach locations to the PNP head. For information, see "Teach the Package File" on page 3-40.

(Option) Installing the Tape Input Feeder

The PS Series System can be configured with a tape input feeder.

Tape input feeders are available in 8, 12, 16, 24, 32, 44, and 56mm sizes to match device tape of those widths. The last two digits of the tape input feeder part number indicate the tape width. For example, a 32mm tape input feeder has a part number ending in 32. See *Figure 2-9.*

Figure 2-9—Part number for 32mm feeder

To install the tape input feeder:

1. **For first-time installation—**
   If the tape input feeder is being installed for the first time on your PS Series System, the AH400.ini file may need to be edited to reflect this additional option.

1a) Using Windows Explorer, open C:\AH400_32\WinAH400.ini.with NOTEPAD editor.

1b) Locate the section
```
;------- tape input/output -----
```

1c) Ensure value for Tape Advance Installed is **TRUE**, as shown.
```
TapeAdvanceInstalled=TRUE
```

1d) Save the WinAH400.ini file and exit Windows Explorer.

2. **Prepare the system—**

2a) From the Handler Computer interface, stop any job that is running and exit to the main window as shown in *Figure 2-10*.
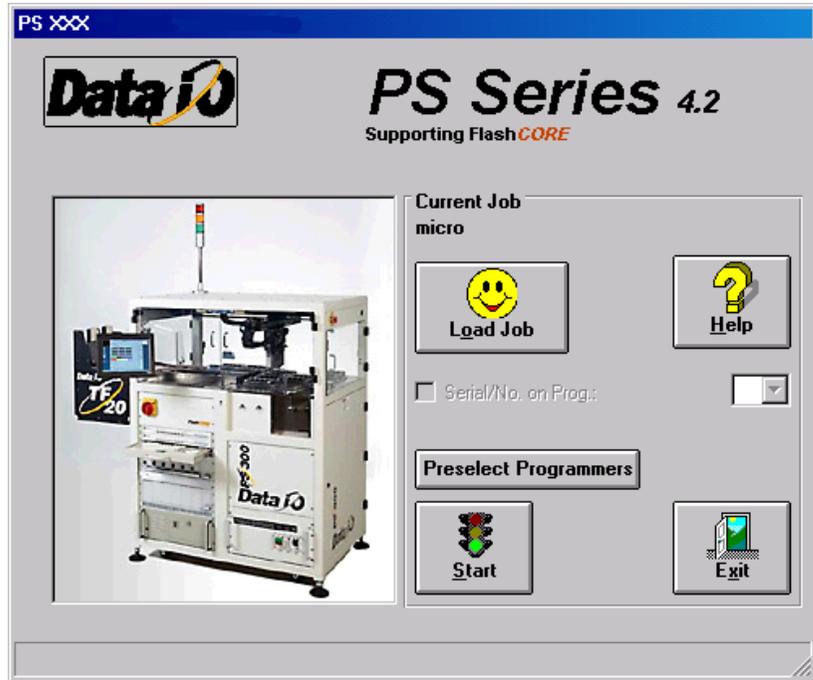
Figure 2-10—Main window

2b) Open the safety shield on the right side of the PS Series System.

3.   Mount the feeder unit—

3a) Loosen the knob on the lock bar and slide lock bar to the left as far as it goes. See *Figure 2-11*.

Figure 2-11—Slide lock bar to left

3b) Align the rail on the bottom of the feeder unit with the channel in the base plate.

3c)   Slide the feeder unit down the rail until the feeder unit reaches the front wedge. See *Figure 2-12*.

Figure 2-12— Slide feeder unit onto base plate

3d) Make sure the nose of the feeder unit slides under the front wedge on the base plate. See *Figure 2-13*.
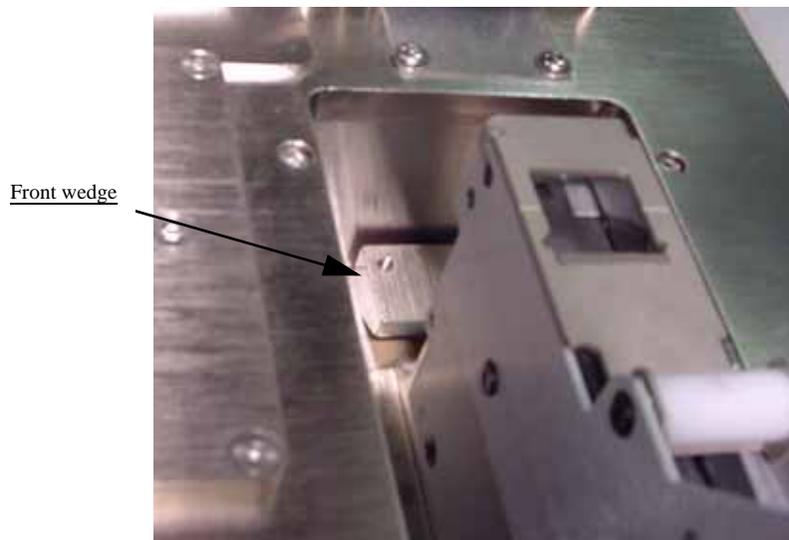
Front wedge

Figure 2-13—Feeder unit sliding under front wedge

3e) Slide lock bar to right and tighten knob.

3f) If the feeder unit is loose, tighten the front wedge on the base plate. To access the wedge, open the right side panel door of the PS Series System. Use a 1/8 inch Allen wrench to tighten the two nuts on underside of the wedge. See *Figure 2-14*.

Figure 2-14— Location of two nuts on underside of wedge

4.   Connect interface cable—

4a)   Insert interface cable into plug until cable snaps in. See *Figure 2-15*.

Figure 2-15—Connect interface cable

5.   Mount device reel—

5a)   Orient the reel so that devices are on the top of the carrier tape as the tape comes off the reel.

5b)   Slide the reel onto the reel pin shaft and lock on the locating ridge.

5c)   Rotate the reel pin cap to secure the reel to the shaft.

6.   Thread device carrier tape—

NOTE: For more information about threading device carrier tape, see the manual that came with your tape feeder system.

6a)   Insert device carrier tape under the input roller.

6b)   Thread device carrier tape down the input guide so that it sits under the guide and on top of the step.

6c)   Thread device carrier tape under cover tape roller.

6d)   Lift the spring-loaded tape window latch and lift the tape window.

6e)   Pull device carrier tape until it is visible at the end of the feeder unit.

6f)   Separate cover tape from the device carrier tape.

6g)   Pull device carrier tape forward to feed into carrier waste tape channel.

NOTE: The empty device carrier tape will eventually come out of the channel. Place a reject box on the floor to contain empty device carrier tape.

6h)   Align the guide holes in the device carrier tape with the teeth on the Drive Sprocket.

7.   Thread cover tape—

7a)   Thread the cover tape through the tape window, under the window roller, and over the cover tape roller.

7b)   Thread the cover tape under the cover tape wheel.

7c)   Attach the end of the cover tape to the cover tape wheel using a small piece of adhesive tape.

8.   Adjust pitch—

8a)   Count the number of guide holes in the carrier tape between the center of one pocket and the center of the next pocket.

8b)   On the feeder unit control panel, set the pitch index to the number of guide holes. For example, if there are 4 guide holes from center to center, enter 4 in the pitch index. Use the **–** and **+** buttons to lower or raise the pitch index. See *Figure 2-16.*
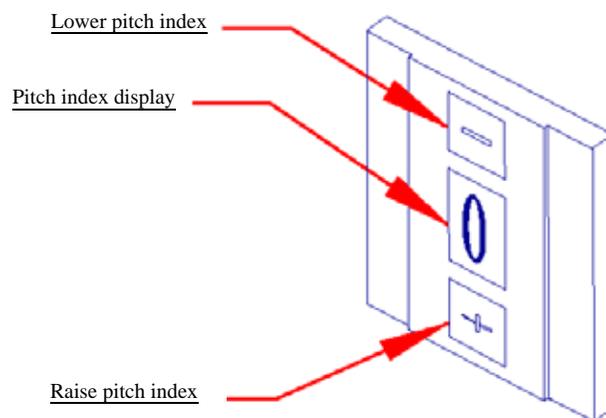
Figure 2-16—Setting pitch index

9.   Turn on the feeder unit—

9a)   Close all safety shields and release E-Stop buttons.

9b)   On the Gantry window, press **Home**.

NOTE: The circuit breaker K1 is now engaged and power is on for the feeder unit.

10. Align pick point—

10a) On the feeder unit control panel, press and hold the center button.

10b) While holding the center button, press the forward button. The carrier tape advances one guide hole. Advance the carrier tape in this manner until the pick point mark on the tape window aligns with the center of the pocket.

10c) Release the center button. Press the forward button once to index the device tape forward one pocket.

11. Replace full cover tape reel—

11a) Remove full cover tape reel from spindle.

11b) Pull off cover tape.

11c) Replace cover tape reel.

This completes the procedure for setting up the tape input feeder.

Before running a job with the tape input feeder in place, it is necessary to:

•   Teach locations to the PNP head. For information, see "Teach the Package File" on page 3-40.

•   Select tape input setting in the AH400 software. For information, see "Configure the Input/Output Settings in the AH400 Software" on page 3-6.

(Option) Setting Up the Tape Output Module

Tape output modules come in two types: heat seal or pressure seal units. See *Figure 2-17* and *Figure 2-18* below:

Figure 2-17—Heat seal unit
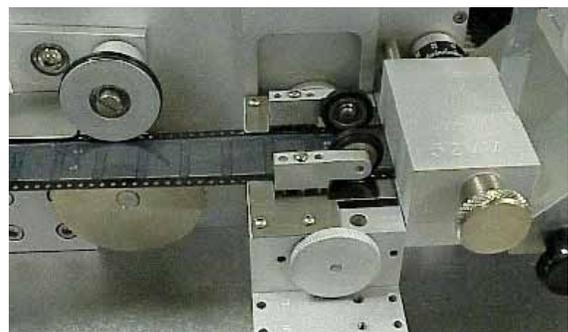
Figure 2-18—Pressure seal unit

*NOTE: Installation is the same for either unit, unless noted otherwise. Refer to the manual that came with your heat seal unit (**TM-330 Taping Machine Operator's Manual**) or pressure seal unit (**Universal PSA Sealer Operator's Manual**) for additional information.*

To set up the tape output module:

1. **For first-time installation—**
    If the tape output module is being installed for the first time on your PS Series System, the AH400.ini file may need to be edited to reflect this additional option.
1a) Using Windows Explorer, open C:\AH400_32\WinAH400.ini.with NOTEPAD editor.
1b) Locate the section
    `;------- tape input/output -----`
1c) Ensure value for Tape Output Installed is **TRUE**, as shown.
    `TapeOutputInstalled=TRUE`
1d) Save the WinAH400.ini file and exit Windows Explorer.

2. **Determine the width of the carrier tape—**
2a) Standard sizes are 8, 12, 16, 24, 32, 44, and 56mm.

3. **Install carrier tape supply reel—**
3a) Place the reel on the spindle so that the carrier tape comes off the top of the reel with the empty carrier pockets facing up.

4. **Insert tape into feeder—**
4a) Thread the end of the carrier tape under the Front Tape Guide.
4b) Thread the tape into the Adjustable Loading Track so that it sits under the guide and on top of the channel, as shown in *Figure 2-19*.

Figure 2-19—Carrier tape threaded into track

5. **Adjust width of Adjustable Loading Track—**
5a) The Adjustable Loading Track has detents at 8, 12, 16, 24, 32, 44, and 56mm widths. Adjust the width of the Adjustable Loading Track by gently pushing in or pulling out the near side to match the width of the carrier tape, as shown in *Figure 2-20*.

Figure 2-20—Adjustable Loading Track

6.   Advance carrier tape—
6a) Slide the carrier tape to the left until it passes the Out of Pocket sensor, as shown in *Figure 2-21*.

Figure 2-21—Out of Pocket sensor and tape location
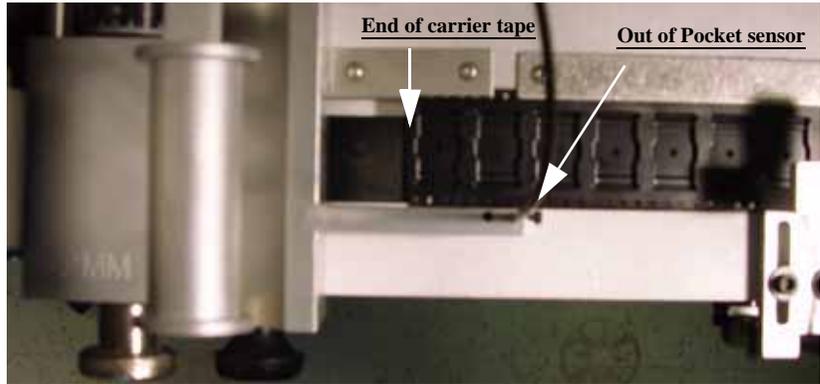
7.   Install seal unit—
       HEAT SEAL UNIT:
•   Install the heat seal unit that matches the width of the carrier tape. Heat seal units come in 8, 12, 16, 24, 32, 44, and 56mm sizes.
•   Use the long screw to attach the heat seal unit at the top and the short screw to attach it at the bottom. See *Figure 2-22*.

Figure 2-22—Installing heat seal unit

PRESSURE SEAL UNIT:
- Remove Allen head screw on top of pressure seal unit.
- Adjust width of pressure seal unit to match the width of tape.
- Tighten Allen head screw. See *Figure 2-23*.

Allen head screw
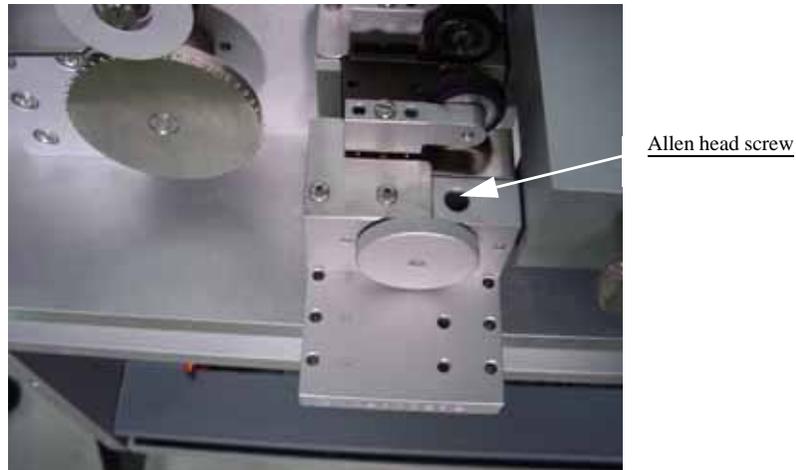
Figure 2-23—Adjusting width of pressure seal unit

- Use the short screw to attach the pressure seal unit at the top and the long screw to attach it at the bottom. See *Figure 2-24*.

Figure 2-24—Installing pressure seal unit

8. Plug seal unit into control box—
8a) Insert the power cord from the seal unit into the Tape Output controller as shown in *Figure 2-25*.

Figure 2-25—Power cord in Tape Output controller

9.   Turn on and adjust seal pressure—
9a)   Turn the Air Pressure ON/OFF Switch to ON.
9b)   Set the Seal Pressure Adjust Controls so that Inner and Outer air pressure are 40-50 PSI, as shown in *Figure 2-26*.

Figure 2-26—Seal pressure control settings

10.   Install cover tape—
10a) Select cover tape of the same width as the carrier tape.
10b) Install the cover tape reel on the spindle so that the smooth side of the cover tape faces the seal unit.
10c) Thread the cover tape around Cover Tape Guide #1 and Cover Tape Guide #2 as shown in *Figure 2-27*.
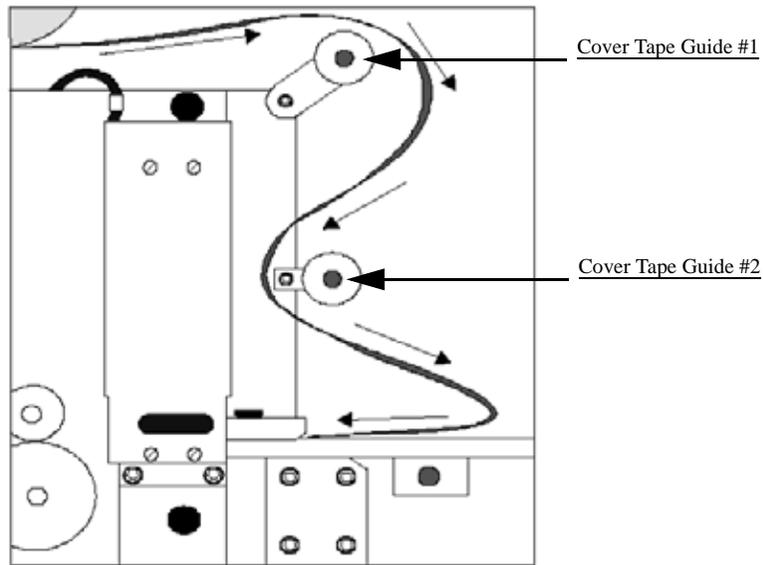
Figure 2-27—Path of cover tape

Cover Tape Guide #1

Cover Tape Guide #2

11. Turn power on to Tape Output controller—

11a) Set Seal Switch to ON position.

11b) Set Inside and Outside temperature to 150-160° C.

11c) Wait for temperature to reach target range. See *Figure 2-28*.

Figure 2-28—Power and heat settings

12. Remove Sensor Clamp Block—

12a) Remove and set aside the Sensor Clamp Block to facilitate advancing the carrier tape through the seal unit. See *Figure 2-29*.

Figure 2-29—Remove sensor clamp block

13.   Attach cover tape to carrier tape—

13a) Use a small piece of adhesive tape to attach the end of the cover tape to the carrier tape. See *Figure 2-30*.

Figure 2-30—Combine cover and carrier tape

14.   Advance combined tape—

14a) Advance the combined cover/carrier tape through the seal unit.

15. Install Cover Tape Guide #3—

15a) Cover Tape Guide #3 comes in 8, 12, 16, 24, 32, 44, and 56mm sizes. Pick the size that matches the carrier tape width.

15b) Slide Cover Tape Guide #3 onto shaft (as shown in *Figure 2-31*) and tighten the knurled knob.
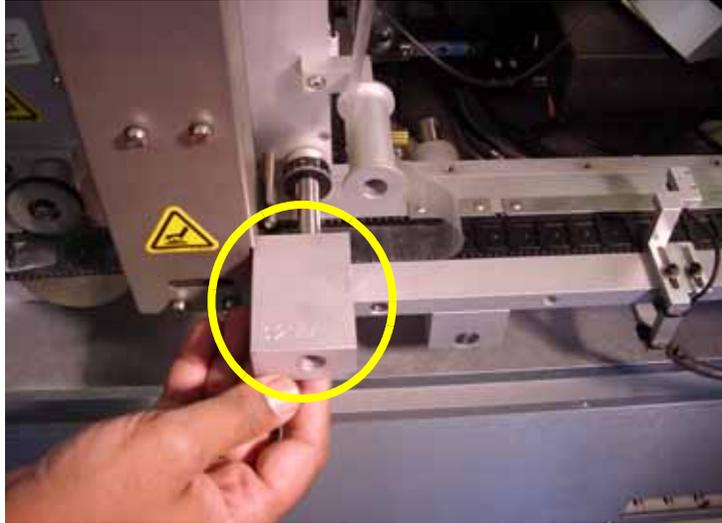
Figure 2-31—Cover Tape Guide #3

15c) Reinstall the Sensor Clamp Block.

16. Advance combined cover/carrier tape through seal unit—

16a) Slide the combined cover/carrier tape through the seal unit until it is visible on the left of the seal unit.

17. Drive sprocket—

17a) Lift the Idler Arm and insert the combined cover/carrier tape.

17b) Align the holes on the combined cover/carrier tape with the teeth on the Drive Sprocket. See *Figure 2-32*.

Figure 2-32—Idler Arm and Drive Sprocket

18. Set Tape Output controller values—

18a) On the Tape Output controller, press ESC to display the main menu.
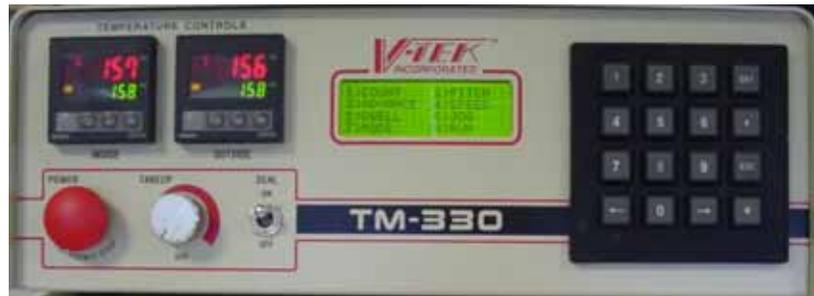

Figure 2-33—Tape Output controller main menu

*NOTE: Values used in this example are for illustration purposes only. For more specific information, refer to "Approximate Starting Points for Seal Controls" on page 16 of 36 in the **TM-330 Taping Machine Operator's Manual** that came with your system.*

18b) Select **2** for Pitch. Count the number of guide holes in the carrier tape between the center of one pocket and the center of the next pocket. Enter that number for the Pitch value.

18c) Select **4** for Speed. Enter 100 and press ENT.

18d) Select **7** for Mode. On the Mode window, select choice 2. An asterisk (*****) appears to the right of "Heat Seal w/32mm." Press ESC.

18e) Select **5** for Dwell. Verify the value is 350-400. Press ENT.

18f) Select **3** for Advance. On the Advance window, Select 1. Press ENT.

18g) Select **8** for Run. Verify values.

19. Advance the combined cover/carrier tape—

19a) Step on the foot pedal to advance the combined cover/carrier tape 4-5 inches to the left of the seal unit.

**20. Inspect position of cover tape over carrier tape—**

The cover tape should align over the carrier tape so that the cover tape touches the side rails of the carrier tape and but does not cover the guide holes on the carrier tape. See *Figure 2-34*.

Figure 2-34—Alignment of cover tape over carrier tape

If the cover tape does not align properly, adjust Cover Tape Guide #3 as follows (refer to *Figure 2-35*).

- If cover tape needs to move toward the **outside** of the carrier tape, loosen the knurled knob on Cover Tape Guide #3 and turn the adjustment dial **counterclockwise**. Tighten the knurled knob on Cover Tape Guide #3 and advance the tape 4-5" to the left of the seal unit. Recheck the alignment of cover tape over carrier tape. Repeat until cover tape centers on carrier tape.
- If cover tape needs to move toward the **inside** of the carrier tape, loosen the knurled knob on Cover Tape Guide #3 and turn the adjustment dial **clockwise**. Tighten the knurled knob on Cover Tape Guide #3 and advance the tape 4-5" to the left of the seal unit. Recheck the alignment of cover tape over carrier tape. Repeat until cover tape centers on carrier tape.

Adjustment dial

Knurled knob
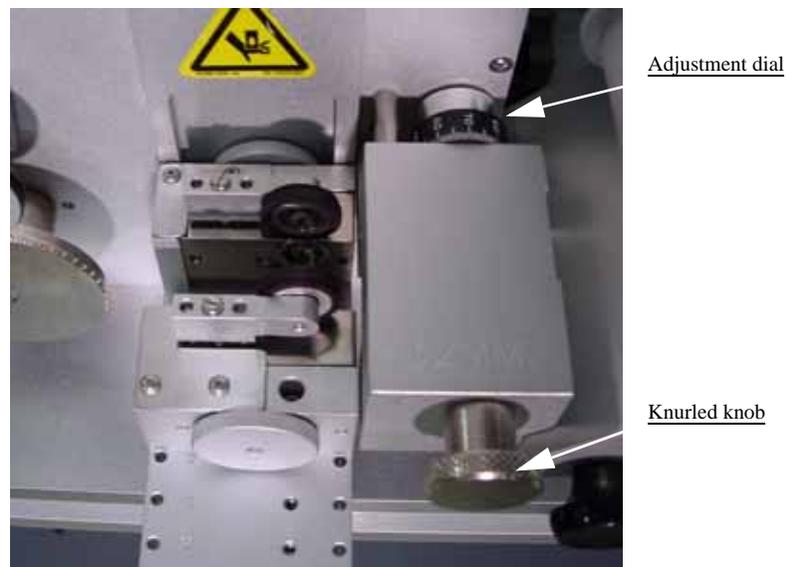
Figure 2-35—Adjusting Cover Tape Guide #3

21. Set Tape Output controller values—
21a) On the Tape Output controller, press ESC to exit run mode.
21b) Select **1** for Count. Select 1 to reset Count to 0 (zero).
21c) Verify the Stop number or enter a new Stop number.
21d) Select **8** to Run.

22. Install take up reel—
22a) Advance the combined carrier/cover tape to supply a few empty pockets. This number varies depending on your application requirements.
22b) Select a take up reel of the same size as the carrier tape. Reels come in 8, 12, 16, 24, 32, 44, and 56mm sizes.
22c) Insert the end of combined carrier/cover tape into slot on the inner reel and turn the take up reel to wind tape.

23. Adjust location of PNP head—
It is necessary to accurately position the Tape Out PNP head over the carrier tape so that devices are placed properly.

23a) On the PLC controller:
- Toggle DOWN the switch labeled "Transfer."
- Toggle DOWN the switch labeled "Long Stroke."
- Toggle DOWN the switch labeled "Short Stroke."

Figure 2-36—Toggle switches in DOWN position

23b) On the Tape Output controller:
- Select **6** for Jog. This advances the carrier tape in 0.04mm increments.
- Continue to press **6** for Jog until the center of the empty pocket is directly beneath the PNP head.

23c) On the PLC controller:
- Press the black reset button located on the left side of the PLC controller.
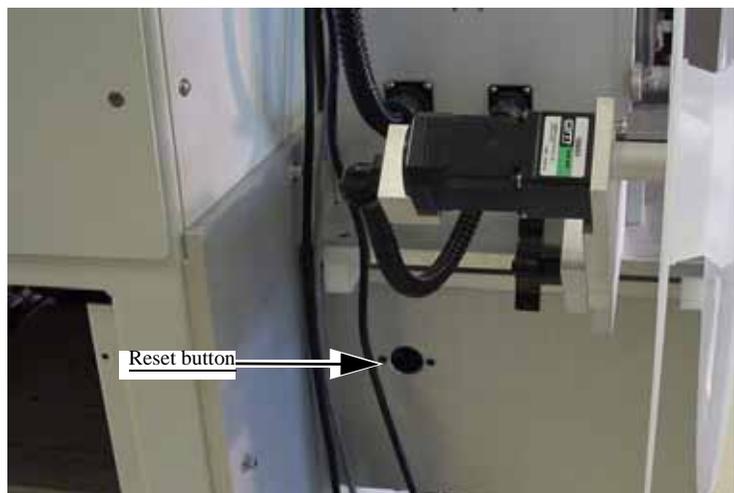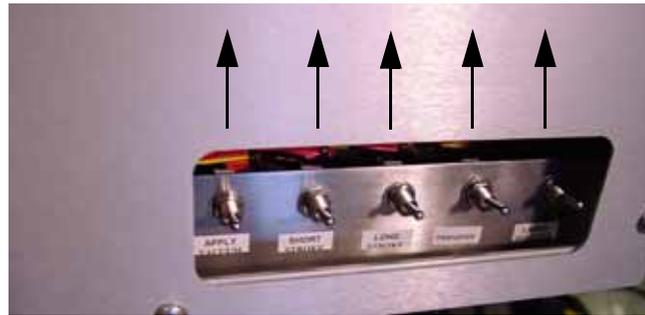

Figure 2-37—Reset button

23d) On the front of the controller, toggle UP all switches. This is the "normal" position. See *Figure 2-38*.

Figure 2-38—Toggle switches in UP ("normal") position

On the Tape Output controller:
•   Press ESC to enter run mode.

The Tape Output system is now ready for programmed devices.

24.   Replace full take up reel—
When the take up reel is full:
24a) Leave job-specified number of empty pockets on the carrier tape.
24b) Cut the carrier tape.
24c) Roll carrier tape onto take up reel and remove reel.
24d) Install empty take up reel.
24e) Continue job.

(Option) Setting Up the Laser Marking System

PS Series System that is ordered with the optional laser marking system requires no additional set up at a customer's site. All mechanical connections are complete, and the laser marking system is ready to use.

To use the laser marking system, a laser marking file must first be created and added to a job file. For more information, see "(Optional) Create a Laser Marking File" on page 3-58.

If the laser marking system is being installed for the first time on your PS Series System, the AH400.ini file may need to be edited.

1.   For first-time installation—
1a)   Using Windows Explorer, open C:\AH400_32\WinAH400.ini.with NOTEPAD editor.
1b)   Locate the section
      `;------- marking system settings -----`
1c)   Ensure the value for Marking System corresponds to the laser system installed on your PS Series System. For example, if your laser system is Synrad Digital, the value should look like this:
      `;MarkerSystem=NONE`
      `;MarkerSystem=LASERMARK`
      `;MarkerSystem=SYNRAD`
      `MarkerSystem=SYNRAD_DIGITAL`
      `;MarkerSystem=ROFIN_SINAR`
1d)   Save the WinAH400.ini file and exit Windows Explorer.

(Option) Setting up the Label Printing System

The PS Series System can be configured with the optional label printing system. To set up the label printing system, load the media (labels and transfer ribbon) and install the tamp applicator.

> NOTE: *For additional information about the label printing system, see the* **Apollo 1 Operator's Guide** *and the* **Apollo 1 Service Manual** *that came with your label printing system.*

If the label printing system is being installed for the first time on your PS Series System, the AH400.ini file may need to be edited.

1. **For first-time installation—**
1a) Using Windows Explorer, open C:\AH400_32\WinAH400.ini.with NOTEPAD editor.
1b) Locate the section
```
;------- marking system settings -----
```
1c) Ensure the value for Marking System corresponds to the label printing system installed on your PS Series System. For example, if your label printing system is Apollo, the value should look like this:
```
;MarkerSystem=M&R
;MarkerSystem=M&R+TAPE
MarkerSystem=BRADY_APOLLO
```
1d) Save the WinAH400.ini file and exit Windows Explorer.

2. **Loading labels—**
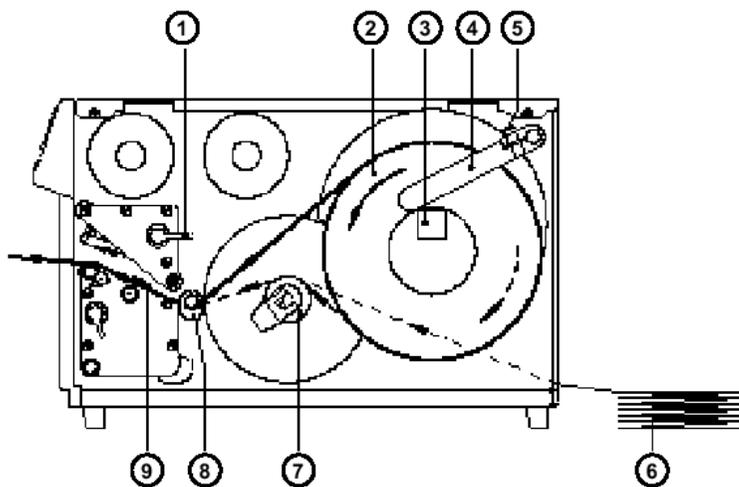To load labels in the label printing system, follow the steps below. Refer to *Figure 2-39*:

Figure 2-39—Loading labels

2a) Open the cover.
2b) Lift the printhead by rotating the lever (**1**) clockwise until it stops.

2c) Loosen the media retainer knurled screw (**5**), swing the media retainer (**4**) backwards, and place the label roll (**2**) onto the media hub (**3**).

2d) Slide the media guide (**8**) into its outermost position.

2e) Unroll a length of label stock from the media roll and feed it through as shown in *Figure 2-29*. The solid line represents the feed path of outside-rolled labels, and the broken line represents the path of inside-rolled labels. The broken-dotted line shows the media path of fanfold paper (**6**).

2f) Slide the media strip right through the space between the print roller and the printhead until it comes out of the label printer.

2g) Slide the media guide (**8**) back towards the edge of the media strip.

2h) Turn the level (**1**) counter-clockwise until it stops and thereby locks the printhead.

2i) Close the cover.

3.   Loading transfer ribbon—
To load transfer ribbon in the label printing system, follow the steps below. Refer to *Figure 2-40*:
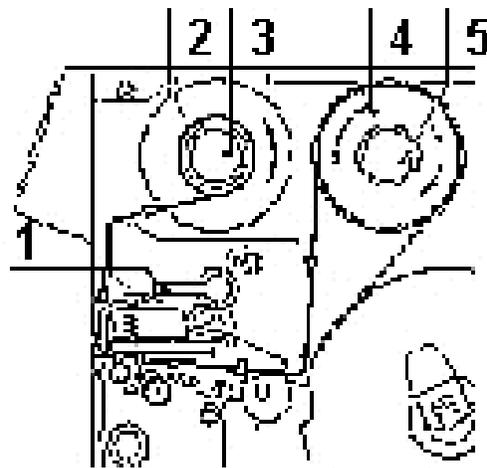
Figure 2-40—Loading transfer ribbon

3a) To lift the printhead, turn the printhead lever (**1**) clockwise until it stops.

3b) Slide the roll of transfer ribbon (**4**) onto the ribbon supply hub (**5**) as far as possible.

NOTE: Pay attention to the side of the ribbon material which is coated with ink. The inked side is generally the dull side. When the ribbon is inserted, the inked side must face the opposite side of the printhead. In Figure 2-40, the solid line shows the path of inside wound ribbon, and the broken line represents the path of outside wound ribbon.


3c) Slide an empty cardboard core (**2**) onto the ribbon take up hub (**3**).

3d) From the side, feed the transfer ribbon along the path as shown in *Figure 2-40*, then attach it to the core (**2**) using adhesive tape or a label.

3e) Turn the lever (**1**) to a central position between the locked and unlocked positions.

3f) Turn take up hub (**3**) in order to smooth and stretch the ribbon.

3g) Turn the lever (**1**) back counter-clockwise to lock the printhead.

4.   Installing the tamp applicator—

To install the tamp applicator in the label printing system, follow the steps below. Refer to *Figure 2-41*.

> *NOTE: For additional information about the tamp applicator, see the **Tamp Applicator with Lift Cylinder Operating Instructions/Service Manual** that came with your label printing system.*
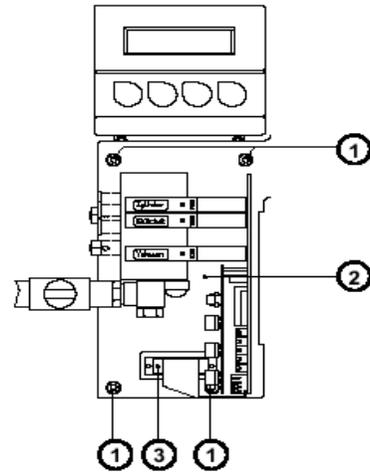
Figure 2-41—Installing the tamp applicator

4a) Remove the applicator's cover (**2**) by loosening the screws, two on the left and one on the right.

4b) Fasten the applicator to the front of the label printer using the four supplied screws (**1**) including the washers.

4c) Plug the connector (**3**) of the applicator's electronic system into the peripheral port of the label printer.

4d) Reinstall the applicator cover.

Chapter 3

Operation

The PS Series System provides a configurable set of instructions for the rapid programming of semiconductor devices. Two primary levels of setup and operation are:

- Operator functions
- Administrator functions

This chapter is divided into sections regarding each of these levels.

Operator Functions

This section describes operator functions for processing devices. Before these procedures are performed, the operator should be familiar with the information in *Chapter 1—Introduction*. It is assumed that the hardware modules are already installed and adjusted, and that the system is ready to process devices.

> *NOTE: This section includes procedures for options that your PS Series System may not have. The illustrations in this manual may appear different than your system, depending on the options installed.*

In this section, these operator functions are described:

- Prepare to Turn On System Power
- Turn On System Power
- Perform a Safety Check
- Process New Devices
- Troubleshoot Programmer Problems
- Stop the System
- Shut Down the System

Prepare to Turn On System Power

Before you turn on power, check to ensure that:

☞ The external air line is connected, the air pressure switch is in the **ON** position, and input air pressure is set to between 75 and 80 PSI (517 to 552 kilo Pascals).

☞ All E-Stop buttons are in the released (operating) position.

☞ All safety shields are closed.

☞ The PROGRAMMERS circuit breaker switch located on the back of the PS Series System is in the **OFF** position. The other three circuit breaker switches are in the **ON** position.

☞ The main circuit breaker switch on the front of the PS Series System is in the **ON** position.

☞ The power switch on the Handler Computer is in the **ON** position.

☞ The network cable is connected and the Server Computer is turned on.

☞ The adapters for the job you want to run are installed on all programmer sites.

Once the system is checked, you are ready to turn on power.

Turn On System Power

After preparing the PS Series System as described above:

1. Turn the main power switch clockwise to the **ON** position.
2. Press the AutoPak **START** button.
3. When the Handler Computer starts, log on to the Novel network by clicking **OK**. No password is required.
4. Turn the PROGRAMMERS circuit breaker switch located on the back of the PS Series System to the **ON** position.

Perform a Safety Check

Each time you turn on system power, perform this safety check:

1. Test each E-Stop button by depressing it while the AutoPak is **ON**.
2. Make sure that the AutoPak turns **OFF**.
3. Make sure the PNP head can be moved by hand.

If the safety check is successful, the system is ready to begin processing new devices.

Process New Devices

The PS Series System makes it simple to process devices quickly and easily. Each time you process new devices, you complete the following steps:

1. Start the AH400 Handler Software
2. Select a Job/Task
3. Preselect the Programmers (Optional)
4. Configure the Input/Output Settings in the AH400 Software
5. Verify Job Information
6. Prepare the Input/Output Modules
7. Start the Selected Job

Start the AH400 Handler Software
1. **Handler Computer—**
1a) Using either the keyboard or KVM switch box, select the Handler Computer.

Figure 3-1—KVM switch boxes

2. AH400—

2a) Double-click the AH400 icon on the desktop. This opens the main window. The AH400 Handler software is now running.

> *NOTE: Displayed on the main window is the version number (in this example, 4.2), the most recently run job (if one has been run; in this example, no job is listed under **Current Job**, so none has been run yet), and buttons to **Load Job**, get **Help**, **Preselect Programmers**, **Start** a job, or **Exit** the software.*
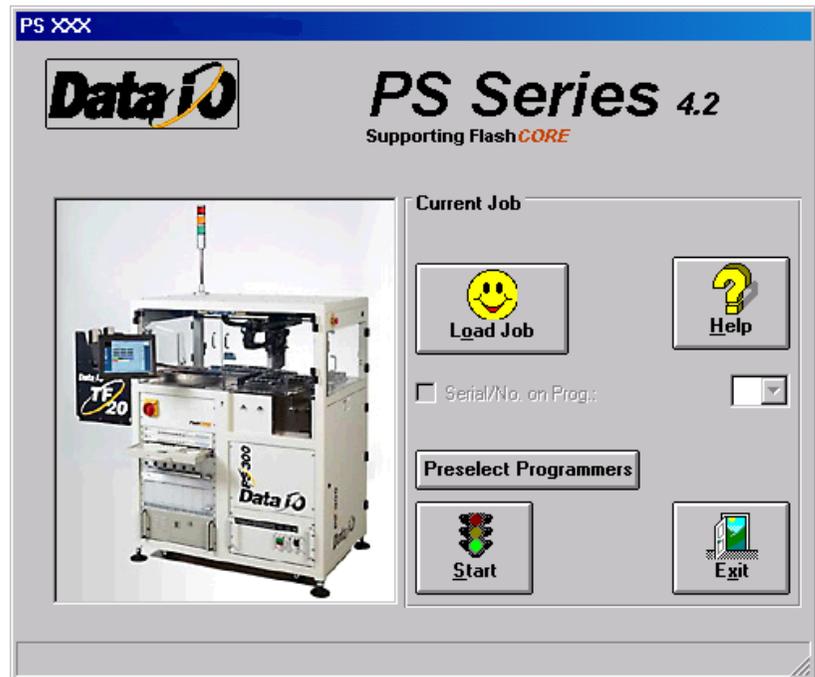

Figure 3-2—AH400 main window

Select a Job/Task

1. Load job—

> *NOTE: If a job was previously run, that job name is listed under **Current Job**. To run this job again, skip the remaining steps; otherwise continue.*

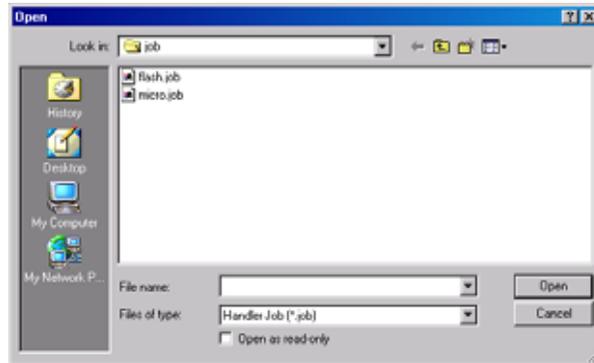1a) Click **Load Job** to open the standard Windows Open dialog box:

Figure 3-3—Selecting a job file to open

1b) Select the job file (for example, micro.job) and click **Open**. This job name now appears at the top of the main window.
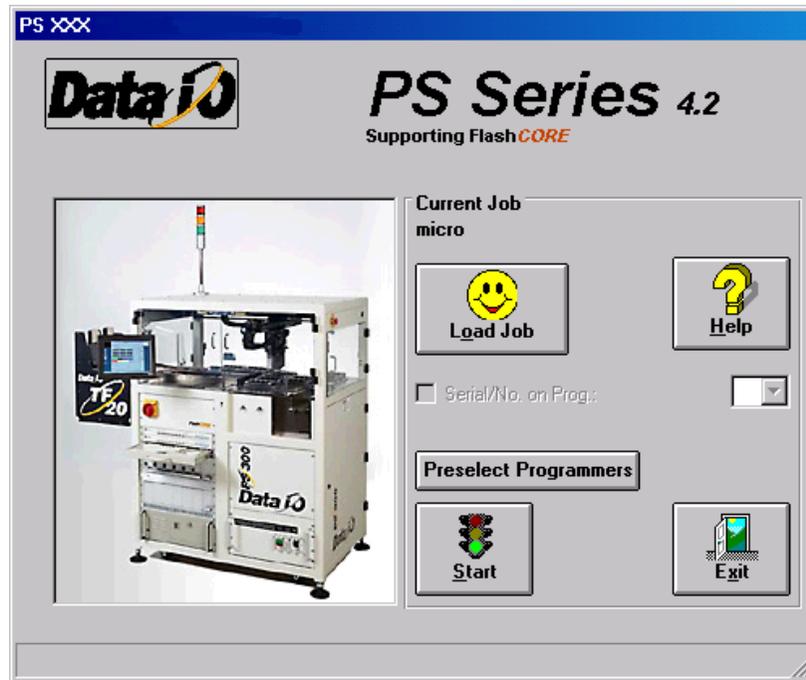
Figure 3-4—Job file loaded and ready for use

<u>Preselect the Programmers (Optional)</u>

Your PS Series System may contain up to 12 programmer sites with a mix of Optima (Universal and FlashTOP), and FlashCORE programmers. You may wish to shut off programmer sites that are not used in a particular job.

Complete this process to preselect which programmers are used:

1. **Preselect programmers —**
1a) On the main window, click **Preselect Programmers.**
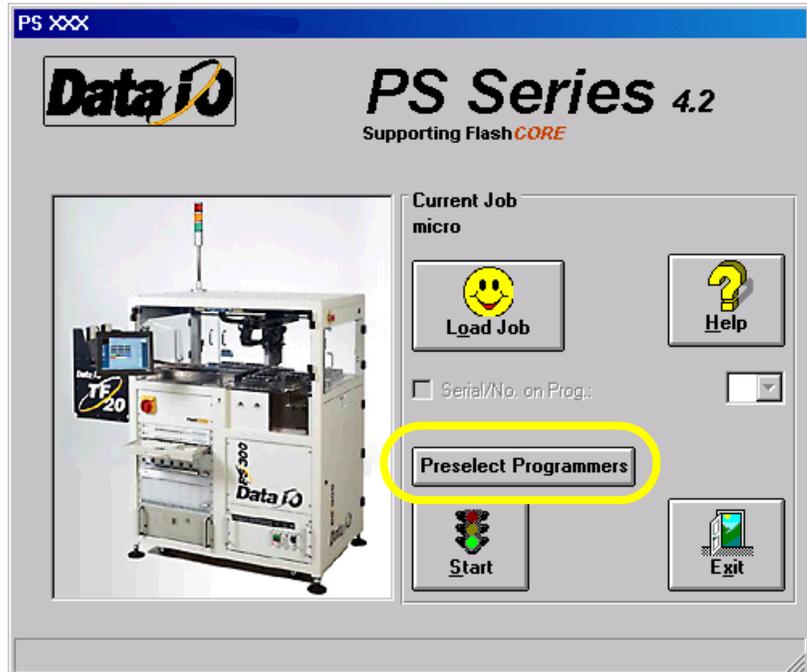
Figure 3-5—Preselect programmers

1b) Unlock the configuration by clicking the **I** (green) side to toggle to the **Unlock Cnf** position.

1c) Click the **I** (green) side of the toggle switch to enable a programmer. Click the **O** (red) side of the toggle switch to disable a programmer. In *Figure 3-6*, programmers 1, 2, 3, and 4 are disabled, and programmers 5, 6, 7, 8, 9, 10, 11, and 12 are enabled.
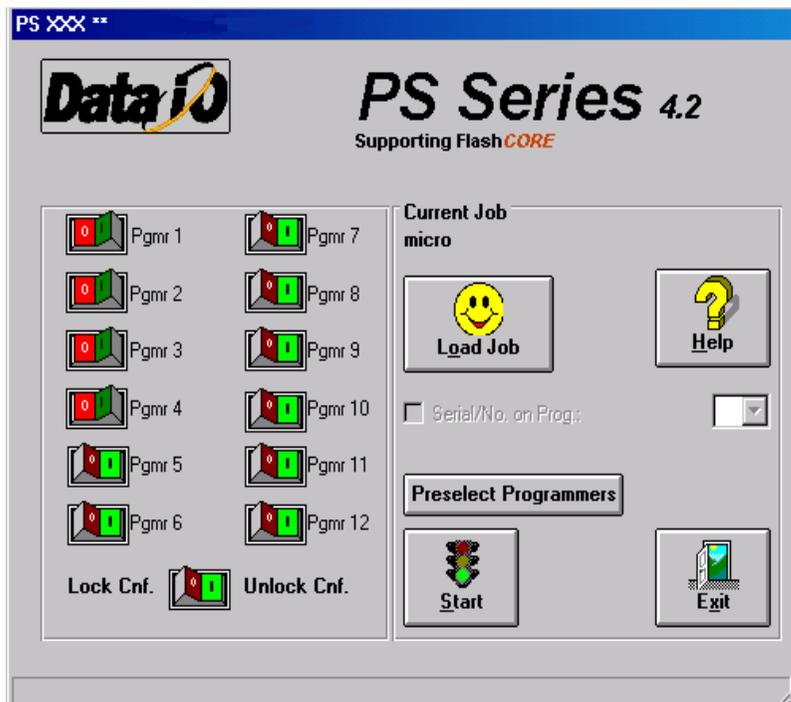

Figure 3-6—Programmers selected

2. Lock configuration and start—

2a) To lock configuration (so that next time the system is turned on the same programmers are selected), click the **O** (red) side of the **Lock Cnf.** toggle switch.

2b) On the main window, click **Start**. This opens the Setup window.

Configure the Input/Output Settings in the AH400 Software

1. Prepare the system—

1a) From the Setup window, select the **Options** tab.

1b) With the cycle buttons, select the main **Input** and **Output** media. The selections are **Tube**, **Tape**, and **Tray**.
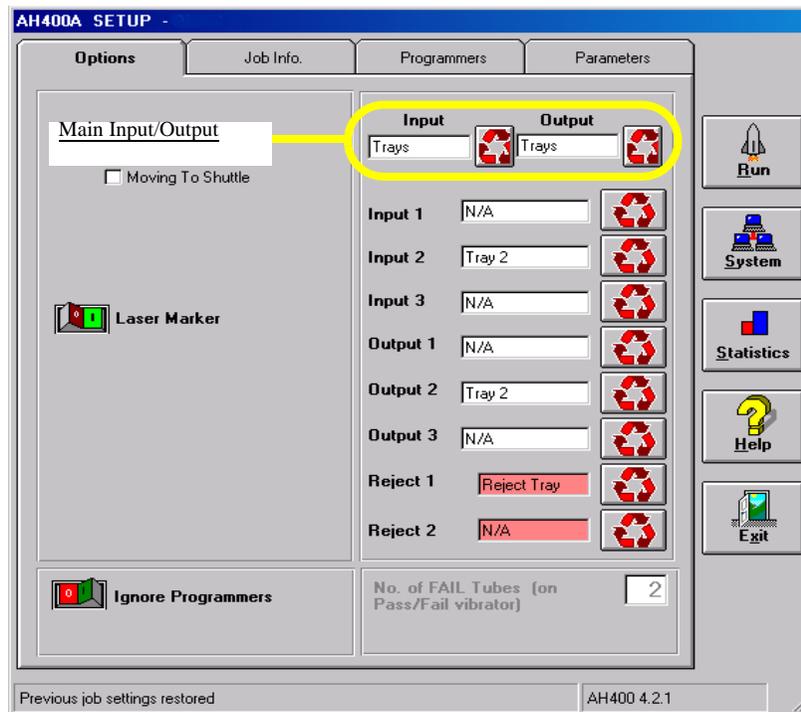
Figure 3-7—Main Input/Output selections on Options tab

2. Input 1, 2, 3 and Output 1, 2, 3 media—

2a) Select media for Input 1, 2, 3 and Output 1, 2, 3 with the cycle buttons to the right of each field. Options vary depending on the selections made for the main **Input** and **Output** media.

3. Reject media—

3a) Select media for Reject 1 and Reject 2. These fields are highlighted in red.

NOTE: When settings are changed for the main Input/Output media or the Input 1, 2, 3 and Output 1, 2, 3 media, reject media are set to N/A. When Reject Media 1 is changed, Reject Media 2 is set to N/A.

NOTE: Only applicable media are shown depending upon the mode selected.

Verify Job Information

1.   Select Job Info tab—

1a)   On the Setup window, click the Job Info tab.

1b)   Verify that all the information displayed matches the information for this job. See *Figure 3-8*.

Figure 3-8—Job info

NOTE: Only the Pass Limit information displayed on the Job Info tab is editable. To change the Pass Limit, complete Step 2 below.

2.   Change Pass Limit (optional)—

2a)   On the Job Info tab, click on the Pass Limit field. This opens the Keyboard window.
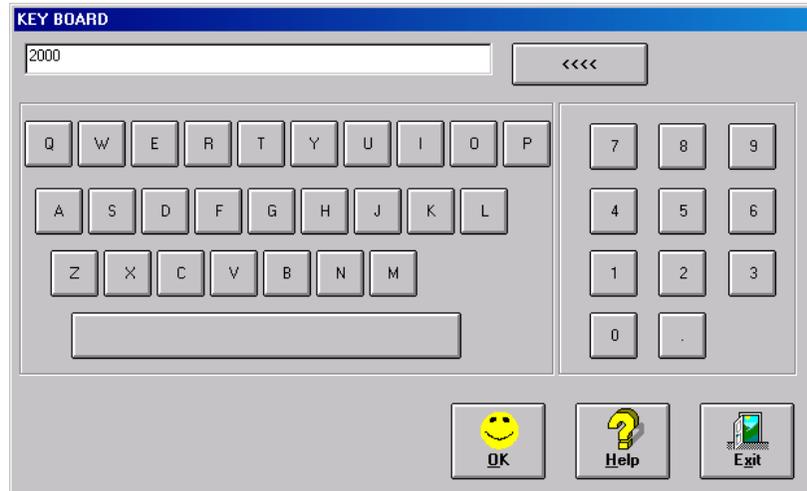
Figure 3-9—Keyboard window

2b)   Enter the new Pass Limit value (for example, 5000) and click **OK**. The new Pass Limit is then displayed on the Job Info tab. See *Figure 3-10*.
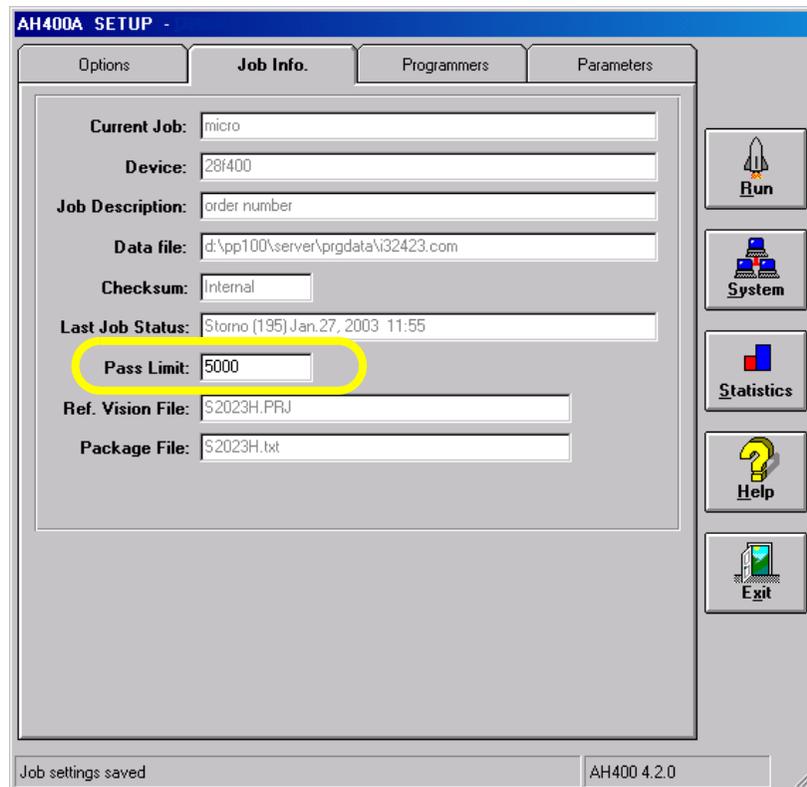

Figure 3-10—New Pass Limit

<u>Prepare the Input/Output Modules</u>

CAUTION: Devices programmed on the PS Series System may be highly sensitive to internal damage from electrostatic discharge (ESD). To prevent damage from ESD always wear an antistatic

wrist strap. The wrist strap should be connected to the grounding plug and should contain a 1M-ohm (minimum value) to 10M-ohm (maximum value) current limiting resistor.

Regardless of input module used, all devices should be installed right-side-up ("live bug" orientation), with the device leads pointing toward the floor so that identifying marks are visible on the top of the device.

The system must be reconfigured if a different device type is programmed or if the input module (tube, tape, or tray) changes.

When a device is in the pick position waiting for the PNP head, pin 1 on the device must match the *pin 1 orientation* predefined in the job. If it does not, when the PNP head picks the device and rotates it based on the information in the job, the device might be inserted incorrectly in the socket, possibly damaging device leads and socket contacts.

NOTE: Ask your system administrator for pin 1 orientation for trays and tape input as defined by your facility.

CAUTION: Devices and the sockets can be damaged if the devices at the pick position do not match the pin 1 orientation defined in the job. Make certain that they are the same. If they are not, do not start the job until you reinstall the devices in the input module or modify the job.

If the devices require a different size suction tip, make sure that you install the appropriate tip onto the PNP head as shown below:

If processing this device type	Use this size tip
FBGA **μBGA**	Small (2mm)
300 mil DIP **20 PLCC** **32 TSOP**	Medium (4mm)
28 PLCC or greater **40 TSOP or greater** **QFP** **600 mil DIP**	Large (6mm)

Figure 3-11—Selecting Tip Size

For detailed instructions on how to set up the tray input/output modules, see "Applying Power for the First Time" on page 2-3.

For detailed instructions on how to set up the tube input/output modules, see "(Option) Setting up the Tube Input and Tube Output Modules" on page 2-6.

For detailed instructions on how to set up the tape input/output modules, see "(Option) Installing the Tape Input Feeder" on page 2-9.

Start the Selected Job

1. Setup window—

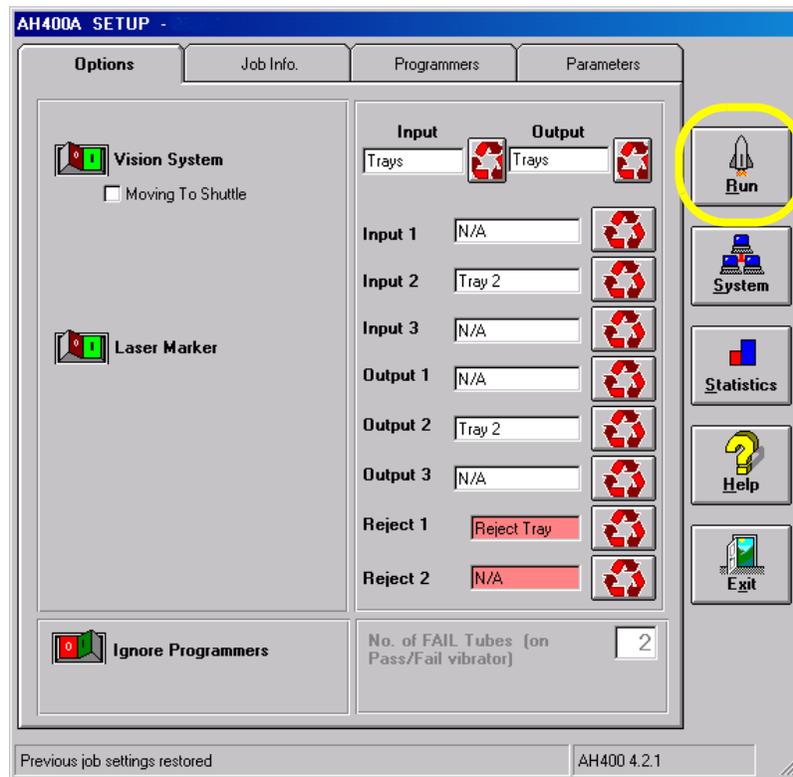1a) From the Setup window, click **Run**.

Figure 3-12—Setup window
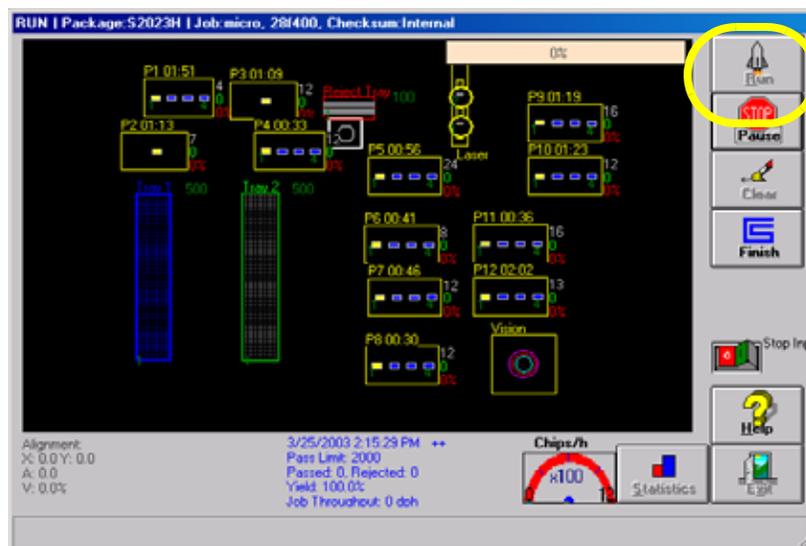
1b) On the Run window, click **Run**.

Figure 3-13—Run window

WARNING: *Do not continue until making sure that all safety shields are closed, or personal injury may result.*

NOTE: To pause a moving PNP head, open a safety shield or click **Stop** *on the Run window. For more details on methods of stopping the system, see "Stop the System" on page 3-14.*

NOTE: Do not press the red E-Stop button except in the case of a physical emergency. You may lose data and have to restart the job.

1c) Click **Run** again and follow the directions on the window. The PNP head will move to the home position and then start the job. Status indicators will appear inside the programmer outlines, and the PNP head's location will be tracked on the window.

NOTE: If a job was run previously but the specified number of devices was not completed, you will be prompted to either reset the job to zero or continue at the number of devices already programmed.

NOTE: If the input media is tube, adjust the tube vibration using the vibration controls on the front right of the PS Series System.

1d) To end the job after a "pass" module is full, click the **Tray/Tube Stop** switch to the **ON** position.

NOTE: The **Tray/Tube Stop** *switch can be selected while the job is running. If there are more devices in sockets than empty spaces in the "pass" module, the system will load an additional tray or tube before stopping. You can continue a job stopped in this way by clicking* **Run** *again.*

Troubleshoot Programmer Problems

Clearing Programmer Disabled Status

If the status indicator disappears from any of the programmer outlines, or the PNP head skips a programmer, you might be able to correct the problem by simply clearing the programmer disabled status using the following procedure.

1. On the Run window, click **Pause.**
2. Place the cursor over the disabled programmer.
2a) To re-enable all sockets, right-click the mouse and select
    All => EMPTY
    Programmer outlines turn grey and all sockets are re-enabled.

2b) To re-enable a single socket, right-click the socket and select
     => EMPTY
    The programmer outline turns grey and the socket is re-enabled.

See *Figure 3-14.*
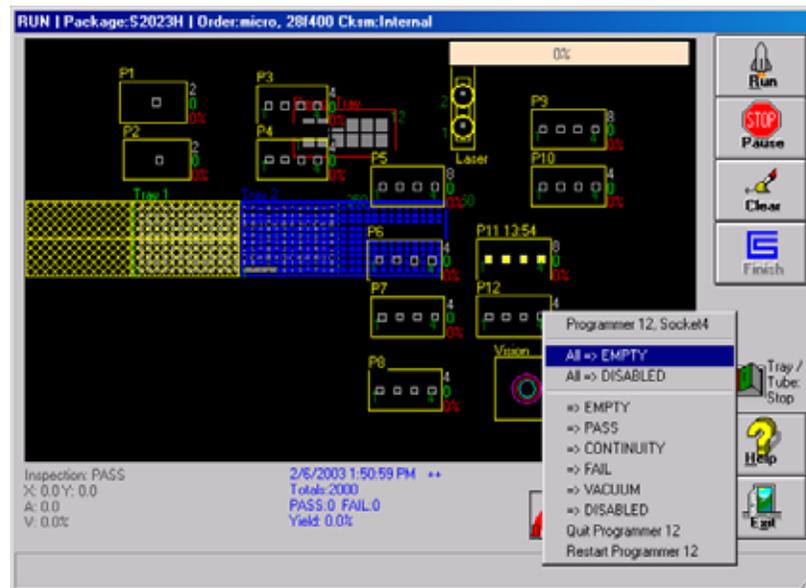
Figure 3-14—Re-enabling programmer

☞ If the programmer outline does **not** turn grey, note whether the LED on the programmer site in question is illuminated (red, yellow, or green) to determine whether the programmer is operational. If the LED is on and the programmer outline does not change states as described above, re-initialize the programmer as outlined in "Re-initializing Programmers" on page 3-12.

☞ If the LED is **not** on, check the power connections to the programmer module inside the PS Series System. If they are intact and the programmer power supply is operational, contact Data I/O Customer Support for further diagnosis or programmer module replacement.

3. Resume job—
3a) Remove any devices in the programmer's sockets.
3b) Click **Run**, and then click **Run** again to resume the job.

Re-initializing Programmers

If programmer error messages appear, the programmers in question may need to be re-initialized. To re-initialize programmers, perform the following:

1. Prepare the system—
1a) Make sure that the correct adapter is securely installed on the programmer site.
1b) Turn the PROGRAMMERS circuit breaker switch on the rear of the PS Series System to **OFF** and wait for approximately 20 seconds.
1c) Turn the PROGRAMMERS circuit breaker switch back **ON** again.

2. Programmer Computer—

2a) Select the Programmer Computer associated with the programmer in question.

2b) If the large status indicator in the center of the window is grey, the programmer is in the handler-ready mode and has been successfully re-initialized. It may take several minutes for the programmers to reach this state after power is reset.

2c) If the status indicator is not grey, exit and restart the software again.

> *NOTE: After exiting the software, you cannot continue a job that was in progress. The job must be restarted.*

2d) If the indicator still does not turn grey, note whether the LED on the programmer site in question is illuminated (Red, Yellow, or Green) to determine whether the programmer is operational.

2e) If the LED is on and the programmer does not change states as described above, re-initialize the programmers again as outlined above. If the programmer still does not initialize after a second reset, contact Data I/O Customer Support for further diagnosis or programmer module replacement.

2f) If the LED is not on, check the power connections to the programmer module inside the PS Series System. If they are intact and the programmer power supply is operational, contact Data I/O Customer Support for further diagnosis or programmer module replacement.

Disabling a Programmer

If a programmer is not performing and the error cannot be cleared, disable that programmer and continue to use the other sites to process devices.

Perform the following to disable a programmer:

1. Setup window—

1a) From the Setup window, click the **Programmers** tab.

1b) Click the button for the failed programmer.

1c) Click the black **DISABLED** button. The programmer button changes to black.
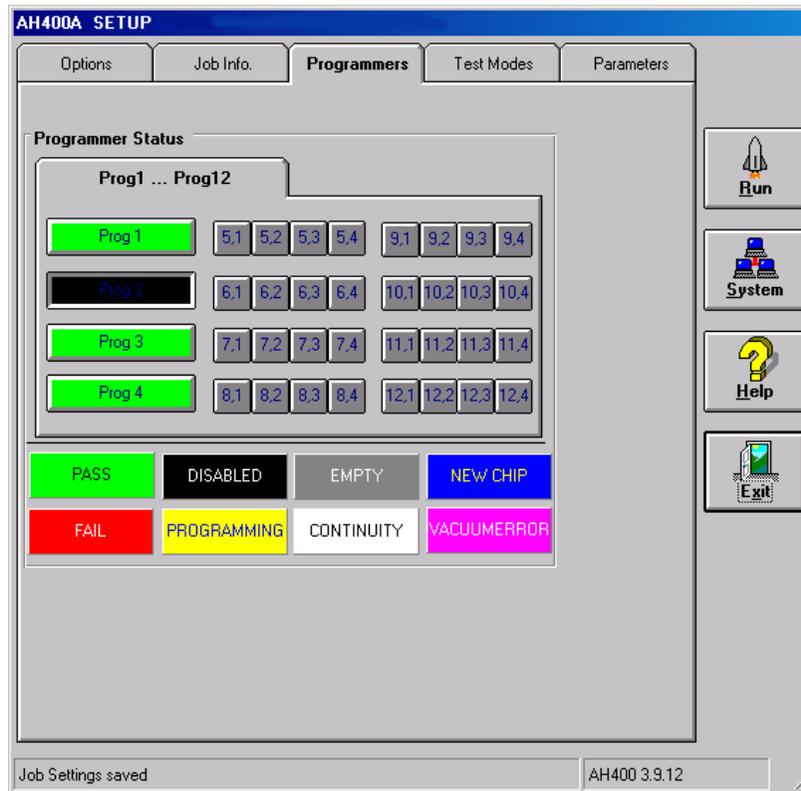
Figure 3-15—Programmer 2 disabled

2.   Resume job—

2a)   Click **Run** to resume the job.

Stop the System

There are three methods for stopping the PS Series System:

- **Emergency Stop and Restart** — Stop the movement of the PNP head in an emergency.
- **Pause a Programming Session —** Pause a programming session to perform routine tasks and then resume the programming session.
- **End a Job —** Complete the current programming cycle, remove devices from the sockets, and place them into the output module or reject bin.

Emergency Stop and Restart

To prevent bodily injury or damage to equipment in an emergency, press the red **Emergency Stop** (E-Stop) button located on either side of the system. This stops all movement on the PS Series System immediately. The robot and Handler Computer shut down. Power to the programmers stays on.

> **WARNING:** *Do not use the E-Stop button to turn off power to the PS Series System. The E-Stop button does not completely remove power from the machine. Only the Handler Computer, AutoPak, and associated components lose power. Power is still applied to the programmer assemblies.*

NOTE: Do not press the red E-Stop button except in the case of a physical emergency. You may lose data and have to restart the job.

*WARNING: The **STOP** button on the operator interface window is not an E-Stop button. It allows the PNP head to continue moving at full speed until the current operation is complete.*

Figure 3-16—Emergency stop (E-Stop) button

To restart the system, turn the E-Stop button counterclockwise until it springs back to its full height, manually remove devices from the programming sockets, and then press the AutoPak **START** button.

NOTE: The PNP head shuts down automatically if the input air pressure drops below a factory-set threshold level. If the system stops for no apparent reason, check the input air pressure and air line connections.

Pause a Programming Session

To pause a moving PNP head at the end of the current programming cycle, click **Pause** on the Run window. This is the preferred method of stopping the system in a non-emergency situation. To recover, click **Run**. See *Figure 3-17.*

Opening a safety shield will also pause the system. To recover, press **OK** on the "Safety Shield Open" message.
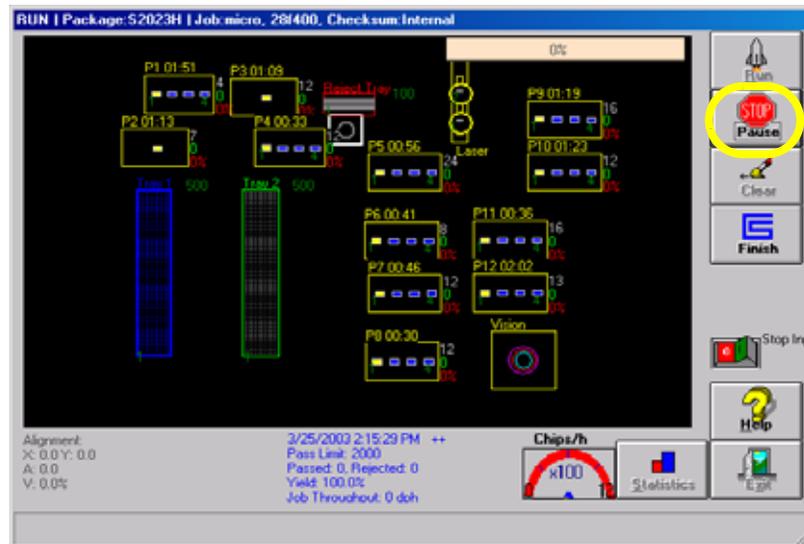
Figure 3-17—Click ***Pause***

WARNING: *During tests or normal operation, opening a safety shield only halts the motion of the PNP head. It does not remove power to the PNP head. When the safety shield is closed, the PNP head will resume its motion. In case of an emergency, do not rely on the safety interlocks to create a safe environment in the operating envelope. Always use the E-Stop button to remove power to the PNP head before entering the machine if there is an emergency.*

NOTE: *If you are using tape output, you also must press the red reset button on the taping machine to continue running a job after pausing.*

To remove all devices that are currently in programmers, click **CLEAR** on the Run window. All devices will be removed from the programming sockets and placed in the fail tube, tray, or tape.

End a Job

To end a job, click **FINISH** on the Run window. This completes the current programming cycle. No more blank devices are picked from the input media, and all devices in the sockets are removed and placed in the appropriate output or reject modules.

Another method to end a job is to click the **Tray/Tube Stop** switch to the **ON** position. The job then ends after a "pass" tray or tube is full.

Shut Down the System

To remove power to all PS Series System components, for instance when the system is not to be run overnight or before performing major service procedures, follow these steps:

1.   Complete or exit any job that is running.

2. Remove all devices from the system.
3. Turn the PROGRAMMERS circuit breaker switch to the **OFF** position.
4. Exit the laser software (if this option is installed), and shut down the Laser Computer from the Windows **Start** button.
5. Exit the AH400 handler software, and shut down the Handler Computer from the Windows **Start** button.
6. Turn the main power switch to the **OFF** (vertical) position.
7. (Optional) Padlock the main power switch so that it cannot be turned back on while the lock is in place.

Administrator Functions

Administrators are responsible for several functions not performed by operators. In addition to general service and preventive maintenance, administrators would likely perform these functions:

- Create a Job
- Create the Reference Vision File and the Package File
- Teach the Reference Vision File
- Teach the Package File
- (Optional) Create a Data File from a Master Device
- (Optional) Create a Serialization File
- (Optional) Create a Laser Marking File
- (Optional) Create a Label Printer File
- Monitor Programming Yield Statistics
- Maximize Programming Yields

Each of these functions will be discussed in this section.

Create a Job

A job is a complete set of instructions for processing devices. The administrator creates a job using the Programmer Computer interface and saves the job to the Server Computer. Using the Handler Computer interface, the operator selects and loads a job and is quickly processing devices.

A job contains all necessary device-specific settings to process devices. Job parameters specify operations performed on devices, including whether devices are serialized and whether devices are marked by the optional laser marker or the optional label printer.

- For more information on serializing, see "(Optional) Create a Serialization File" on page 3-53.
- For more information on laser marking, see "(Optional) Create a Laser Marking File" on page 3-58.
- For more information on label printing, see "(Optional) Create a Label Printer File" on page 3-66.

In addition to containing all device-specific settings, a job references three files:

- *package file (package.txt)* The package file is a text file containing calibration information that the PNP head uses to properly pick and place devices. A package file template (PackageTemplate.txt) is included with the AH400 software.

- *reference vision file (vision.prj)* The reference vision file contains camera data required to compensate for minor inaccuracies. A reference vision file with the same file name as the package file (but with a *.prj* extension) is automatically 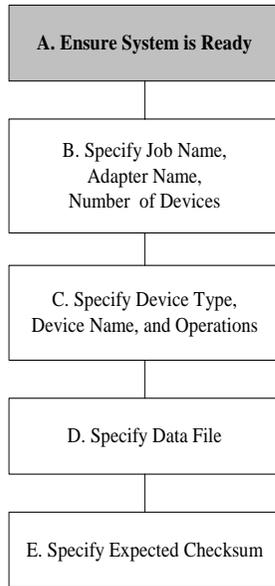generated when the package file is created. For instructions on how to fill the values for the reference vision file, see "Create the Reference Vision File and the Package File" on page 3-27.

- *data file (*.hex or *.bin, for example)* The data file contains all the data that will be programmed into the devices.

The job creation process moves through these stages:

```
┌─────────────────────────────┐
│   A. Ensure System is Ready  │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│     B. Specify Job Name,     │
│        Adapter Name,         │
│      Number of Devices       │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│   C. Specify Device Type,    │
│  Device Name, and Operations │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│     D. Specify Data File     │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│  E. Specify Expected Checksum │
└─────────────────────────────┘
```
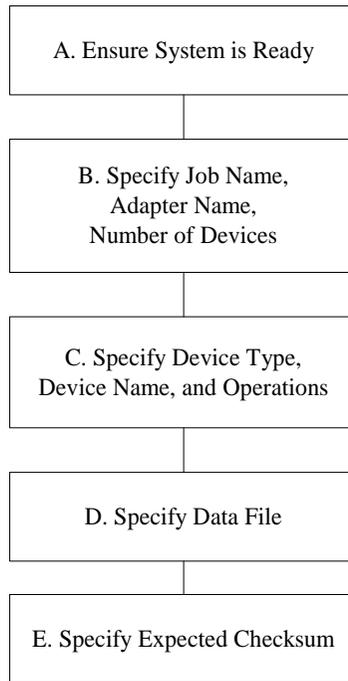
Figure 3-18—Job creation process

A. Ensure System is Ready

A. Ensure System is Ready

B. Specify Job Name, Adapter Name, Number of Devices

C. Specify Device Type, Device Name, and Operations

D. Specify Data File

E. Specify Expected Checksum

1.   Verify adapter—

1a)   Verify that the adapter required to program the device is installed on a programmer site. If the adapter is not installed, the device may not be selectable when creating the job.

NOTE: The completed job is uploaded to the Server Computer for use by all programmers when the system is restarted.

2.   Check for package file—

2a)   Check for a package file with the name of the installed adapter. The package file contains all the robot calibration information specific to the device. Package files are found in:

        C:\AH400_32\Package

with the extension, **.txt*.

NOTE: If a package file for your adapter does not yet exist, one must be created. See "Teach the Package File" on page 3-40.

3.   Set default number—

3a)   Decide on a default number of devices to be processed. The operator can change this before each programming run, but the default should be set to a generally acceptable value to reduce operator interaction and increase productivity.
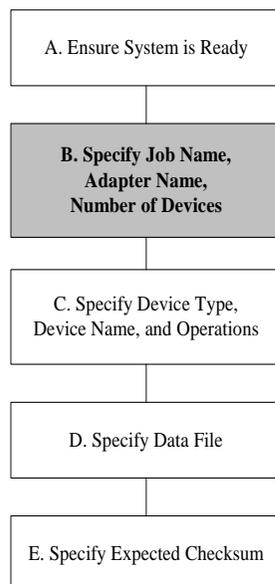
4.   Data file—

4a)   Know the data file name, file path, extension, format (hex or binary, for example) and checksum. Data files are commonly located in the directory:

            Data on 'Sms1'(I:)\Prgdata

*NOTE: Existing job files **cannot** be edited, but they are small and easy to create. If you wish to start over, simply press <Enter> twice or press <Esc>.*

A. Ensure System is Ready

B. Specify Job Name, Adapter Name, Number of Devices

C. Specify Device Type, Device Name, and Operations

D. Specify Data File

E. Specify Expected Checksum

B. Specify Job Name, Adapter Name, Number of Devices

1.   Select Programmer Computer—

1a)   Select the Programmer Computer for the programming site with the correct adapter installed.

NOTE: When the job is finished, the job file is uploaded to the Server Computer for use by all programmers when the system is restarted.
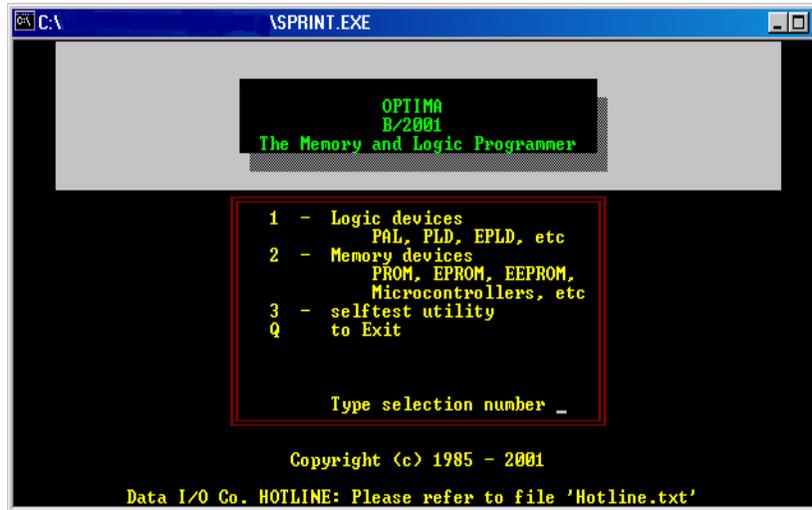
1b)   The Optima main window is displayed.

Figure 3-19—Optima main window

1c) Press <Esc> to exit the Optima window.
1d) At the prompt:

    D DOS, **N** New Job, **M** Master Read, **C** Continue

    press <**N>** for new job.

NOTE: The main menu will reappear after a few seconds if you do not answer the first prompt.

1e) Press any key to continue.

Figure 3-20—Job information

2.   Enter Job/Task name—
2a) Type a name up to 8 characters in length. For example: **BIGJOB**. Do not add a file extension.
2b) Press <Enter>.

Figure 3-21—Enter Job name

---

*NOTE: If a job by that name already exists, the prompt "**Job/Task already exists. Overwrite old File (Y /N)?**" is shown. Type Y or N and press <Enter>.*

---

3.   Enter short description of the Job—
3a) Type a short description of the job if desired. A description can help operators distinguish similar jobs.
3b) Press <Enter>.

Figure 3-22—Short description of job

4.   Enter device name to be displayed—

4a)   Enter the device name to be displayed when this job is run. For example: **intel te28f**

4b)   Press <Enter>.

> *NOTE: The device name entered here is displayed during the job run and can help operators distinguish between similar jobs. Entering the device name here does <u>not</u> select the device for the job.*

Figure 3-23—Enter the device name

5.   Enter adapter name—

5a)   Type the adapter name as it is shown on the top of the adapter installed on the programming site. For example: **S271h**. Do not add a file extension.

> *NOTE: The adapter name entered here is used to derive the names of the package file and the reference vision file.*

5b)   Press <Enter>.

Figure 3-24—Enter adapter name

6.   Enter quantity of devices to program—

6a)   Type a number of devices to program. For example: **1000**.

6b)   Press <Enter>. See *Figure 3-25*.

> *NOTE: At this point, the reference vision file and package file are only specified or "pointed to." They will need to be created and then taught. For information about creating these files, see "Create the Reference Vision File and the Package File" on page 3-27. For information about teaching the reference vision file, see "Teach the Reference Vision File" on page 3-28. For information about teaching the package file, see "Teach the Package File" on page 3-40.*

Figure 3-25—Enter quantity of devices to program

NOTE: The operator can easily adjust this before a run. For information about adjusting the number of devices to program, see "Verify Job Information" on page 3-7.

7.   Set serialization options—

7a)   At the serialization prompt type **N** and press <Enter> if you do <u>not</u> want to use serialization.

7b)   To use serialization, type **Y** and press <Enter>.

NOTE: For more information on serialization, see "(Optional) Create a Serialization File" on page 3-53.

Figure 3-26—Serialization

8.   Set marking options—

8a)   When prompted to use the marking system, select **N** and press <Enter> if this job does <u>not</u> use the marking system.

Select **Y** and press <Enter> if this job does use the marking system.

Figure 3-27—Marking system

NOTE: If this job does <u>not</u> use the marking system, skip to Step 9. If this job <u>does</u> use the marking system, continue with Step 8b.

8b)   If you wish to use the *label printer*, at the prompt "Do you have an APOLLO or an MR Labeler?" select **Y** and press <Enter>.

At the prompt asking which label type you will be using, enter Label Type 1-6 as appropriate. Type the text for Lines 1-4. Press <Enter>.

NOTE: For detailed information on creating a label printer file, see "(Optional) Create a Label Printer File" on page 3-66.

8c)   If you wish to use the *laser printer*, at the prompt "Do you have 'Serial Marking Interface' Software on LASER PC?" select **Y** and press <Enter>.

Type the filename of the drawing that will be used, e.g. **BIOS7**. See *Figure 3-28.*

Figure 3-28—Typing drawing filename **Ver7**

9. Set verify options—
9a) At the prompt "Is this a verify only job" type **N** for normal jobs. Or type **Y** for "verify only."
9b) Press <Enter>.

```
. If you want a Verify Only job, you still need to set
. the options in the 'C' Menu of PROM/PAL.
.. Is this a Verify Only job (y/n) ?: _
```
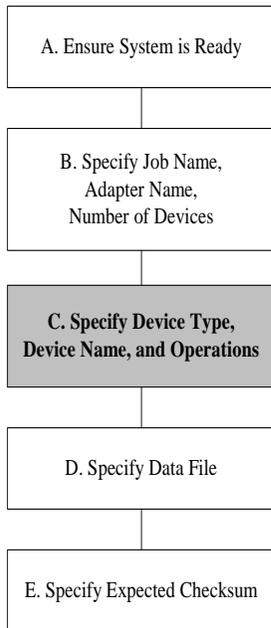
Figure 3-29—Verify only options

10. Select the device type—
10a) Type **M** if the devices to be programmed are memory devices. Type **L** if they are logic devices.
10b) Press <Enter>.

NOTE: Make sure that the adapter for your device is installed on the programmer site.

A. Ensure System is Ready

B. Specify Job Name,
Adapter Name,
Number of Devices

**C. Specify Device Type,
Device Name, and Operations**

D. Specify Data File

E. Specify Expected Checksum

11. Display device manufacturers—
11a) Press any key to initialize the programmer and display a list of device manufacturers.

C. Specify Device Type, Device Name, and Operations

NOTE: Specifying a logic device or a memory device follows the same steps. Depending upon the device type selected (memory or logic), either a PROM vendor selection menu or a PLD vendor selection menu appears.

The selection menu first detects which devices the currently installed adapter supports and then displays a color-coded list of manufacturers and devices. Devices listed in **YELLOW** can be programmed on the installed adapter, while devices listed in **GREEN** are not compatible with the installed adapter. If the device to be programmed is **GREEN**, press <Enter> twice, change to the proper adapter, and then re-create the job using the previously outlined steps.

NOTE: At this point in the job creation process, the job file name has been created and cannot be used twice. If you wish to use the same job file name again, that job file must first be deleted before the name can be re-used.

Figure 3-30—Memory device vendor selection window

1. Select manufacturer, family code and device name—

1a) From the vendor selection window, type the letter for the manufacturer for your device. For example: **L**

1b) Press <Enter> to display a list of device families.

NOTE: You can also use the arrow keys to select the item.

1c) Type the letter for the device family. Press <Enter> to display a list of devices names.

NOTE: If the device name you are looking for does not appear on the list, but you know it is supported on the PS Series System, press the <Esc> key to return to the family menu. Check the family listing carefully, as the device you need may reside in a different family listing than the one originally selected.


1d) Type the letter of the device. Press <Enter> to display the command menu.

2. Set device operations on the command menu—

2a) From the command menu, select the operations to be performed on devices during processing. See *Figure 3-31* for a sample command menu. The command menu varies based on device type (memory or logic).

Figure 3-31—Command menu

2b) Set any special options—such as optional address ranges, test vectors (for logic devices), and device security features—from this menu. **These special options must be set here or they will not be performed in the programming operation.**
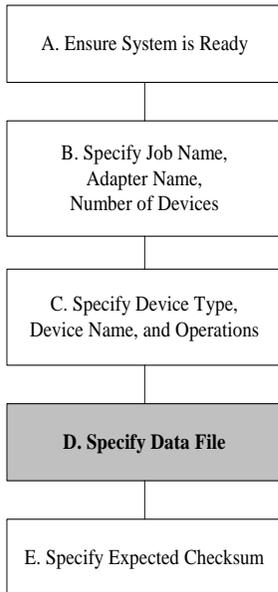
*NOTE: For information regarding the commands found on this window, see the **Sprint Operation Manual**, Chapter 9.*

D. Specify Data File
1.   Search for file—
1a) Type **I** to display the file input window.

Figure 3-32—File input window

1b) Use the <Tab> key on the computer keyboard to move to the File type field and type ***.***.

NOTE: Use the arrow keys or Tab key to select fields and items.

1c) Type the Drive and Directory path to the location of the data file.

A. Ensure System is Ready

B. Specify Job Name, Adapter Name, Number of Devices

C. Specify Device Type, Device Name, and Operations

D. Specify Data File

E. Specify Expected Checksum

*NOTE: The full directory path may be used in the **Enter filename** field if desired.*

2.   Select a file—
2a)   From the list of displayed files, select the data file.
2b)   Press <Enter>.

*NOTE: Files that are displayed in **GREEN** are not compatible with the selected device.*

3.   Select file mode—
3a)   When prompted for an input file mode, type <**B>** when using a binary data file type, or <**H>** for a hex file type in the Select binary/other file format field.
3b)   Leave the remaining fields as they are.

4.   Load file—
4a)   Press <Enter> to load the file into memory.
4b)   Press any key to return to the command menu.

5.   Extended checksum options—
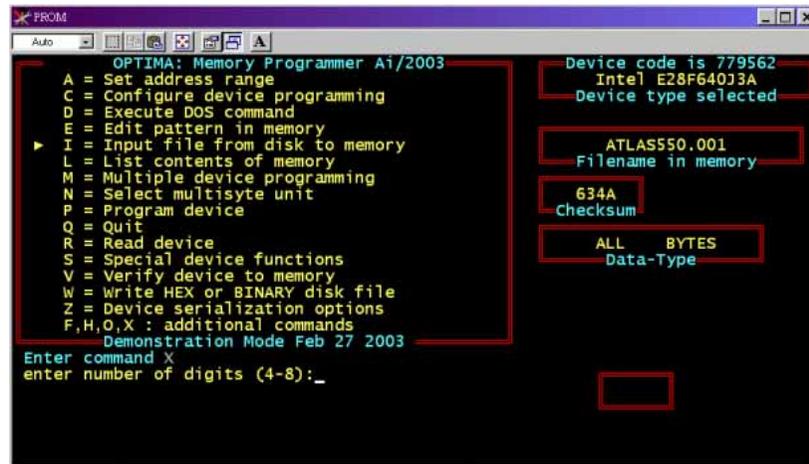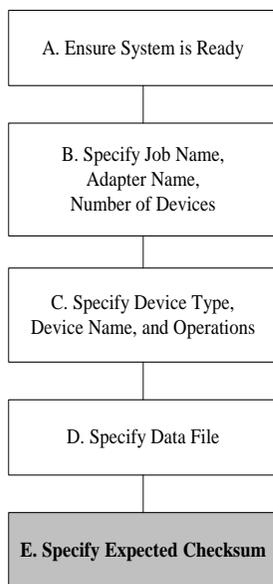5a)   Type **X** to select extended checksum options.

Figure 3-33—Extended checksum options

5b)   Enter the required number of digits for the checksum, e.g., 8.
5c)   Select the checksum method:
       To use 8-bit method, enter **B** (for Byte), which is the default.
       To use 16-bit method, enter **W** (for Word size)
       To use 32-bit method, enter **D** (for Double Word size)

Figure 3-34—Checksum method

A. Ensure System is Ready

B. Specify Job Name, Adapter Name, Number of Devices

C. Specify Device Type, Device Name, and Operations

D. Specify Data File

E. Specify Expected Checksum

5d) If the device has special features selectable by setting special bits, these bits may either be included or excluded while calculating the checksum.
To include special bytes, enter **Y**
To exclude special bytes, enter **N**

`Calculation of checksum with special bytes (Y/n):`

Figure 3-35—Special bytes

E. Specify Expected Checksum

1.   Copy checksum—

1a) Write down the checksum that appears in the upper-right corner of the command menu.

1b) Type <**Q**> to quit the DOS program.

2.   Enter checksum

2a) When prompted, type the *exact* checksum that you wrote down.

2b) Press <Enter>.

> **NOTE:** *Job files are saved in the directory:*
> `Data on 'Sms1' (I:)\Machine1\Job`
> *with the extensions* ****job*** *and* ****ini*** *(for example, AMD0301.job and AMD0301.ini). You may want to test the job using the procedures in "Process New Devices" on page 3-2.*

Job creation is now complete.

Create the Reference Vision File and the Package File

While creating a job, a reference vision file (**.prj*) and a package file (**.txt*) are "pointed to" or specified. At the time of job creation, these files do not yet contain the data required to run a job. Before a job using the reference vision file and package file is run for the first time, it is necessary to create the raw files and then "teach" them.

The reference vision file contains all the Vision system data required by the PNP head to compensate for minor inaccuracies caused by mechanical variations in devices, minor errors in the placement of devices on the PNP head, and other small inaccuracies. The package file contains information about the location of all programmers, all available input media, and the shuttle transfer (if installed).

To create a reference vision file and package file:

1.   Copy and rename reference vision template file—

1a) Select the Handler Computer.

1b) Using Windows Explorer, locate the reference vision template file, e.g., C:\acuWIN95\TEST*VisionTemplate.prj*.

1c) Copy and paste *VisionTemplate.prj* to create *Copy of VisionTemplate.prj*.

1d) Rename *Copy of VisionTemplate.prj* to the name of the required reference vision file.

> *NOTE: The name of the required reference vision file was given during job creation and is the name of the adapter used in the job. See Step 5 on page 3-21.*

For example, if the required reference vision file is S2023H.prj, use Windows Explorer to copy *VisionTemplate.prj* and rename it S2023H.prj.

> *NOTE: This "raw" reference vision file contains the values from the vision template file. It is necessary to "teach" this particular reference vision file. See "Teach the Reference Vision File" on page 3-28.*

2.   Copy and rename package template file—
2a)   Select the Handler Computer.
2b)   Using Windows Explorer, locate the package template file, e.g., C:\AH400_32\package*PackageTemplate.txt.*
2c)   Copy and paste *PackageTemplate.txt* to create *Copy of PackageTemplate.txt.*
2d)   Rename *Copy of PackageTemplate.txt* to the name of the required package file.

> *NOTE: The name of the required package file was given during job creation and is the name of the adapter used in the job. See Step 5 on page 3-21.*

For example, if the required package file is S2023H.txt, use Windows Explorer to copy *PackageTemplate.txt* and rename it S2023H.txt.

This is now the "raw" package file. It is necessary to teach the package file. See "Teach the Package File" on page 3-40.

Teach the Reference Vision File

The "raw" reference vision file contains the vision template values. Now it is necessary to teach this reference vision file for the particular device being programmed.

To teach the reference vision file:

1.   Prepare the system—
1a)   Load the job containing the reference vision file you want to teach.
1b)   On the main window, click **Start**.
1c)   On the Setup window, click **System**.
1d)   On the System window, click **Gantry**.
1e)   Click the **P1** yellow position label representative of Programmer 1. The gantry will move the PNP head to the location specified.
1f)   Adjust the location of the probe tip so that it is centered on the socket. Use the up/down arrows for Y-axis adjustments and the left/right

arrows for X-axis adjustments. From the inside working outward, the arrow buttons adjust the positional value ±0.001, 0.010, and 0.100 inches respectively.

1g) Click **Save**.

1h) Click the **Park** yellow position label to move the PNP head to the Park location.

2. Teach Z drop and Z pick—

2a) Place a device in the socket in Programmer 1.

2b) Click the **P1** yellow position label representative to move the PNP head back to the socket.

NOTE: Adjust the socket actuator ribs if required. See Step 4 on page 3-42.

2c) Click **Z-Axis autom**. See *Figure 3-36*. Ensure that the device is picked up in the center.
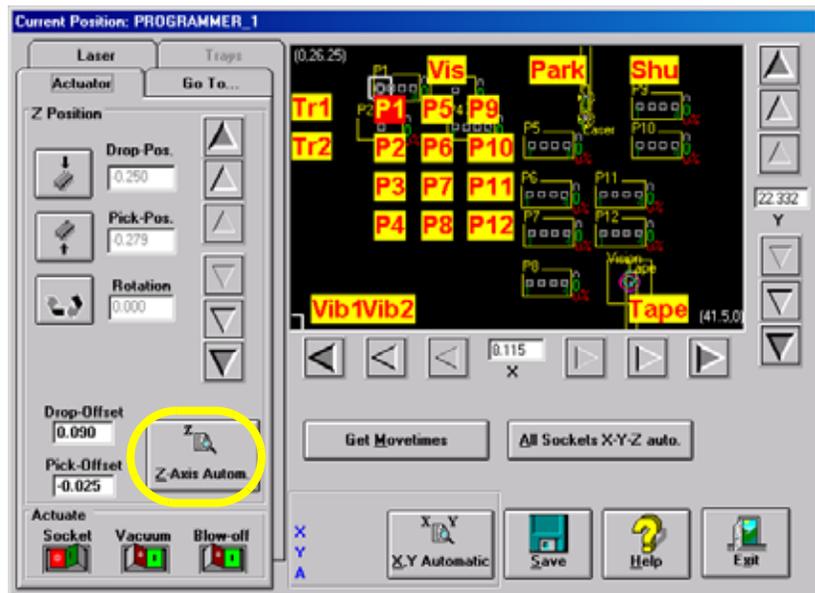
Figure 3-36—Z-Axis autom.

3. Set R-axis rotation values

When a device is inserted into a socket, pin 1 of the device must match pin 1 of the socket. For example, if pin 1 of the socket is the upper left corner and pin 1 of the device in the input medium is also the upper left corner, no rotation is required. However, if the pin 1 location of devices in the input medium is **not** the same as the pin 1 location of the socket, the PNP head must rotate the device.

The R-axis value determines how the PNP head rotates the device as it moves the device from the input medium to the socket or the Vision camera.

To rotate a device in the CLOCKWISE direction as it moves from the input medium to the socket or Vision camera, set the R-axis values as shown:
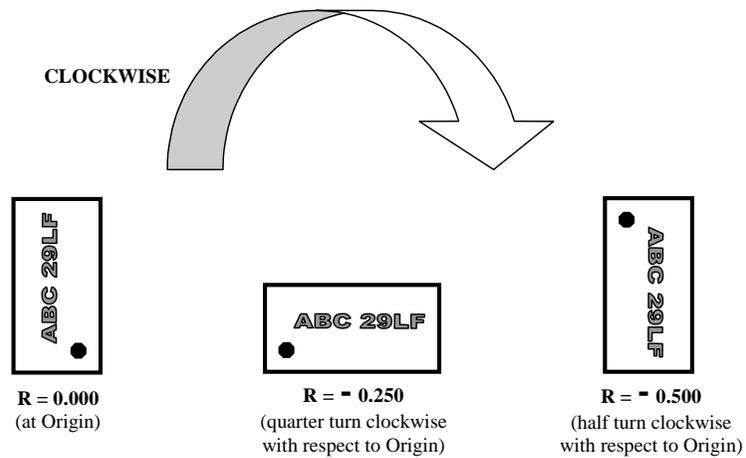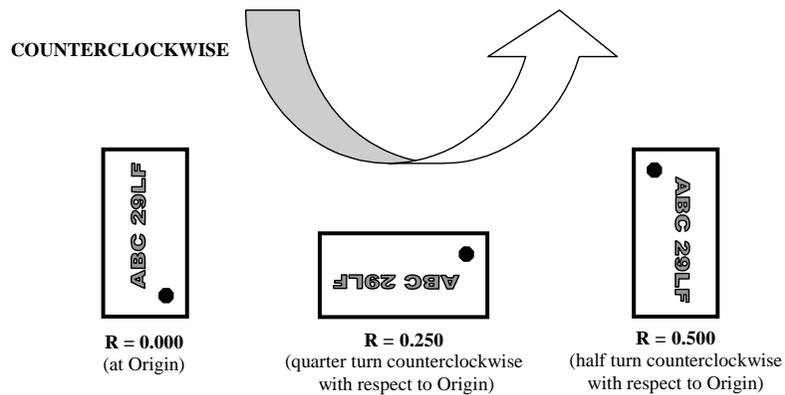

Figure 3-37—R-axis values for CLOCKWISE rotation

To rotate a device in the COUNTERCLOCKWISE direction as it moves from the input medium to the socket or Vision camera, set the R-axis values as shown:

Figure 3-38—R-axis values for COUNTERCLOCKWISE rotation

For example, if a device needs to be rotated a quarter turn in the clockwise direction as it goes from the input medium to the socket, set the R-axis at the socket to -0.250.

To set R-axis rotation:

3a) Click the **Tr1** yellow position label representative of Tray 1 to move the PNP head to the Tray 1 location.
3b) Click the Rotation icon.
3c) Enter the rotation value **0.000**. See *Figure 3-39*.
3d) Press <Enter>.
3e) Click **Save**.
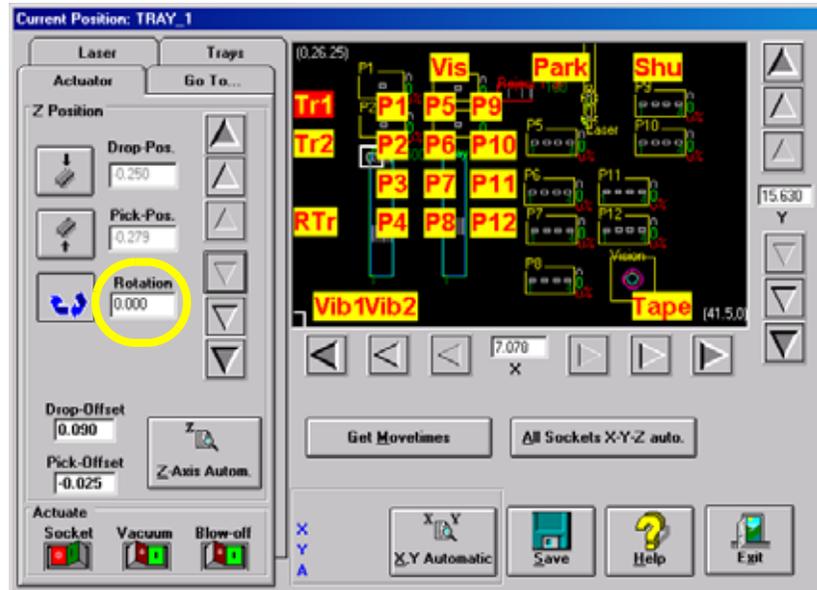3f) Click **Yes** to overwrite previous values.

Figure 3-39—Rotation set at 0.000 at Tr1

3g) Repeat Step 3a through Step 3f for **all** input locations (tray, tape, and tube).

---

*NOTE: The R-axis rotation value at **all** input media must be 0.000.*

3h) Click the **Vis** yellow position label representative of the Vision system to move the PNP head to the vision location.
3i) Click the Rotation icon.
3j) Enter the R-axis rotation value needed to rotate the device so that pin 1 on the device matches pin 1 on the socket. The rotation value will be 0.000, ±0.250, or ±0.500. In this example, 0.250 is entered. See *Figure 3-40*.

NOTE: Figure 3-37 shows clockwise rotation values. Figure 3-38 shows counterclockwise rotation values.

3k) Press <Enter>.
3l) Click **Save**.
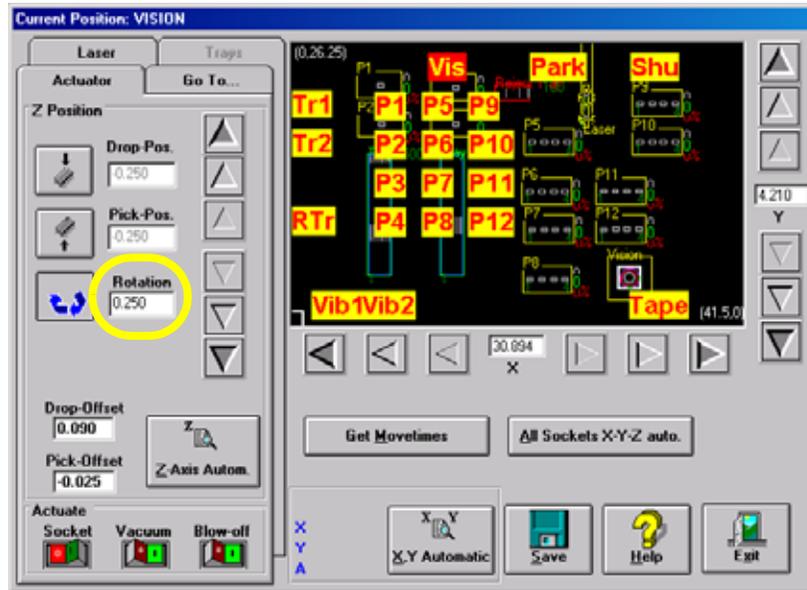3m) Click **Yes** to overwrite previous values.

Figure 3-40—Rotation value at Vision

3n) Click the **P1** yellow position label representative of Programmer 1. The gantry will move the PNP head to Programmer 1 location.

3o) Click the Rotation icon.

3p) Enter the same R-axis rotation value you entered at the Vision location.

3q) Press <Enter>.

3r) Click **Save**.
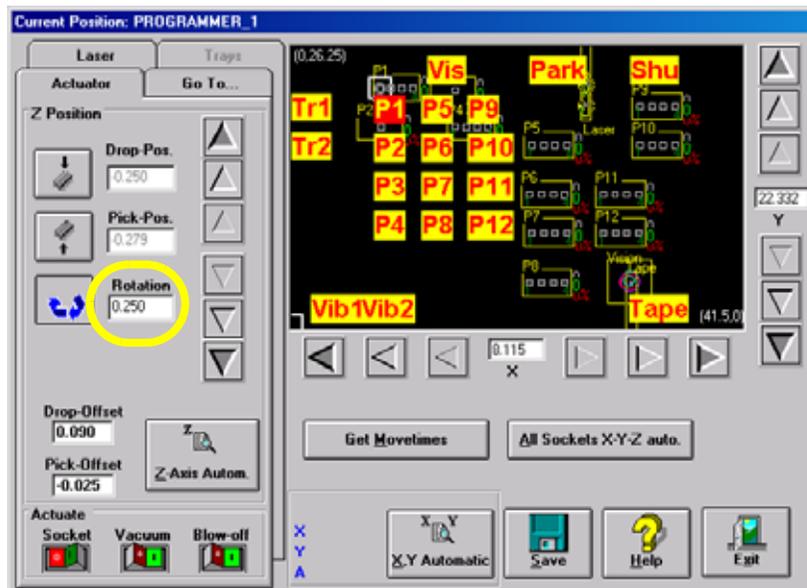
3s) Click **Yes** to overwrite previous values.

Figure 3-41—Rotation value at P1

> **NOTE:** *The R-axis value at all programmers and at the Vision location must be the same.*

3t) Repeat for **all** programmer locations.

4. Move device to the Vision system—

4a) Pick up the device by bringing the cursor over the programming site and right-clicking the mouse.

4b) On the Gantry window, select the **Go To...** tab.

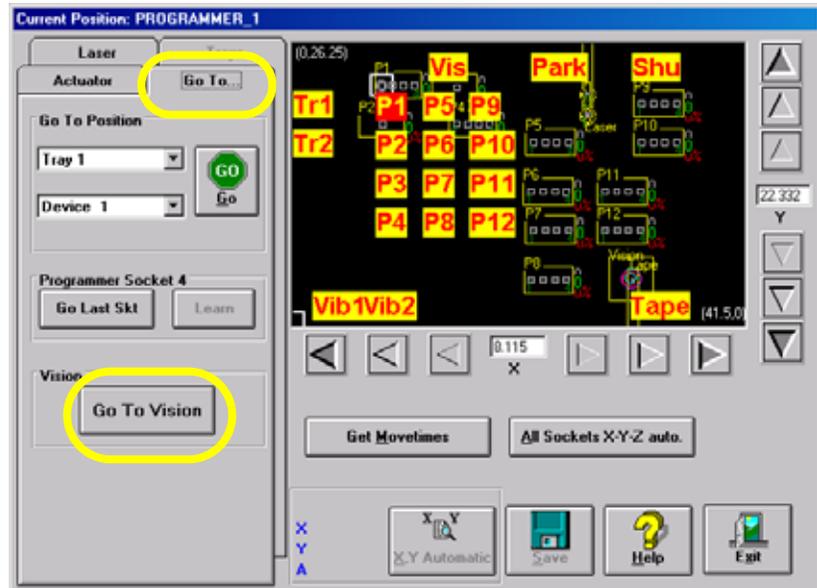4c) Click **Go To Vision**. The device is then moved to the Vision system.

Figure 3-42—Go to Vision

5. Verify correct file—

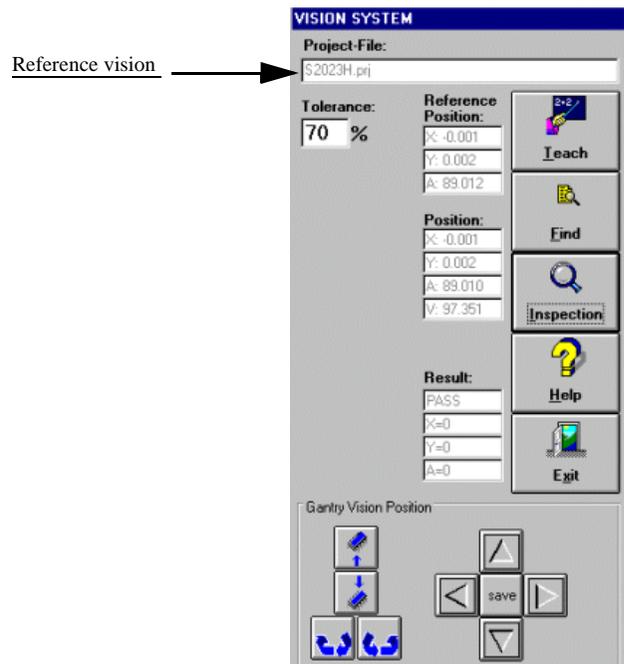5a) On the Vision System window, note that the name of the reference vision file is displayed.

Figure 3-43—Reference vision file name

6. Adjust device search area (if necessary) —

NOTE: It may be necessary to adjust the device search area for this device. If so, proceed with Step 6. If not, skip to Step 7.

6a) On the acuWin32 window, click the box icon, which opens the Object Manager window of acuWin32.

Figure 3-44—Box icon opens Object Manager

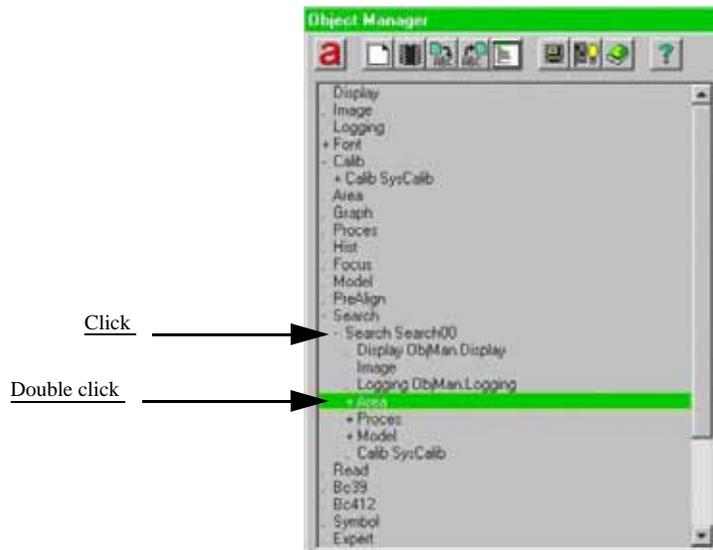6b) On the Object Manager window, click the plus sign (+) before **SearchSearch00**. Double click (+) before **Area**.

Figure 3-45—Object manager window

6c) Set the device search area (red rectangle) around the device so that it is 30-50% larger than the device. See *Figure 3-46*. To adjust the device search area, place the arrow on any red line, hold down the left mouse button, and use the trackball to drag the line.
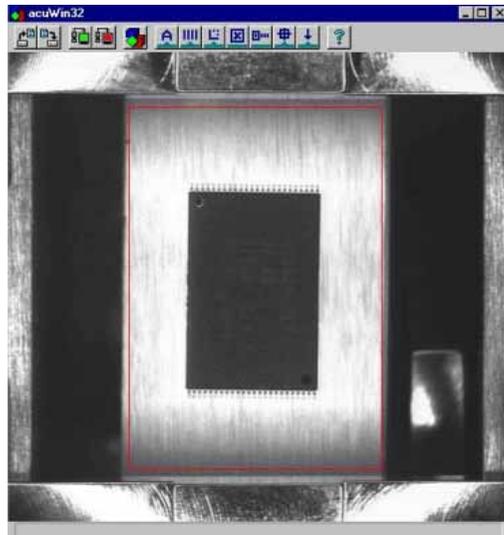
Figure 3-46—Set device search area (red rectangle) around device

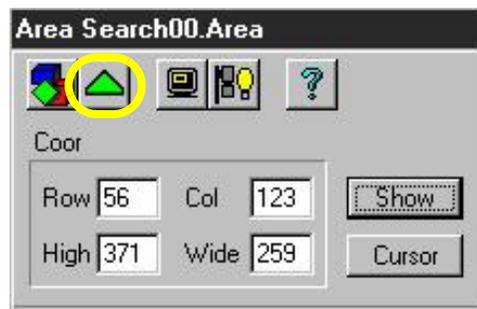6d) When the device search area is adjusted, click the green triangle to exit. See *Figure 3-47*.

Figure 3-47—Click green triangle to exit Search Area window

6e) On the Object Manager window, click **a** to close. See *Figure 3-48*.
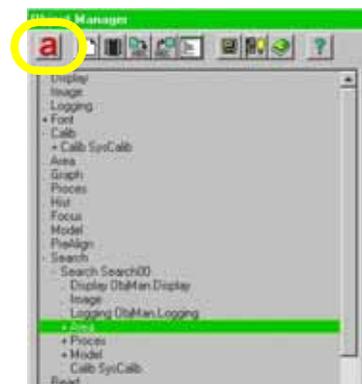

*Figure 3-48—Click **a** to close the Object Manager*

7. Teach—
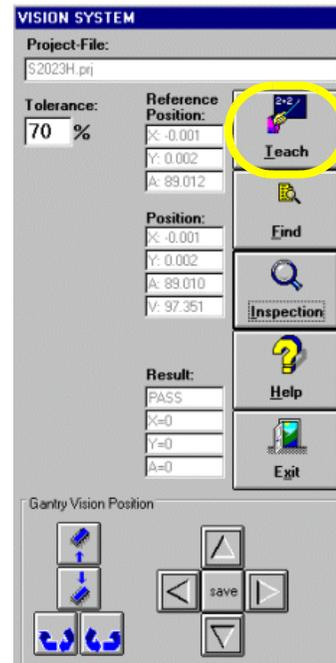7a) On the Vision System window, click **Teach**.

*Figure 3-49—Click **Teach***

7b) In the acuWin32 window, size the device image area so that it covers all of the device. In *Figure 3-50*, the device image area is offset slightly from the device for clarity. In actuality, the device image area needs to cover the device exactly.
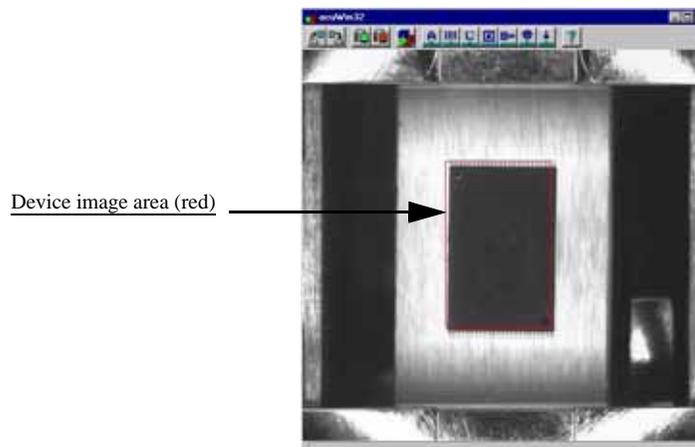

Device image area (red)

Figure 3-50—Device image area and device

7c) When the device image area exactly matches the device, click **OK**.

7d) If the Attention message box appears, click **Yes** to save the changed value. See *Figure 3-51*.

Figure 3-51—Save changed value

8. Check new values—

8a) On the Vision System window, note the new **Reference Position** values for X and Y. Values are in millimeters (0.001 inch). Ideally, these values are 0 (zero). Values of ±0.005 are within tolerance. In the example shown here, X = - 0.001 and Y = 0.002.

8b) Note the **Verification** value. This value must be greater than 95. In the example shown here, the value is 97.351.

NOTE: If values are <u>not</u> within tolerance, proceed with Step 9. If the values <u>are</u> within tolerance, skip to Step 10.
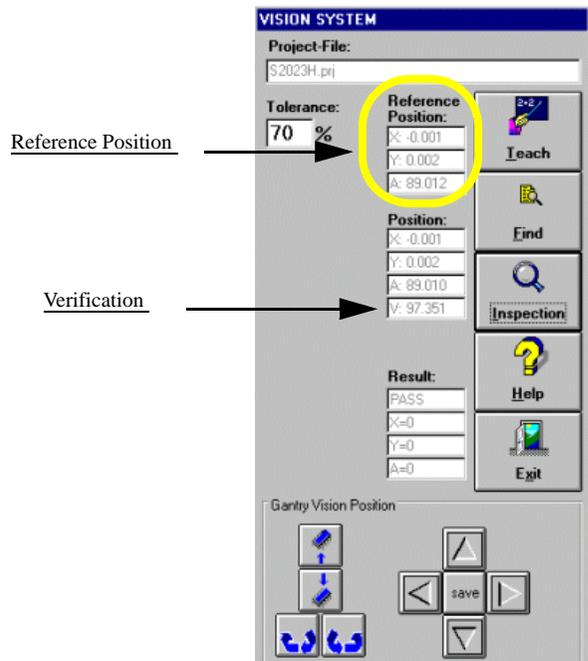

Figure 3-52—New values

9. Adjust device image area again—

9a) Adjust the device image area and move it in the X-axis and/or Y-axis direction as required.

9b) On the Vision System window, click **Teach** again.

9c) On the Attention message box, click **Yes** to accept changed values.

9d) Check new **Reference Position** and **Verification** values.

10. Inspect—

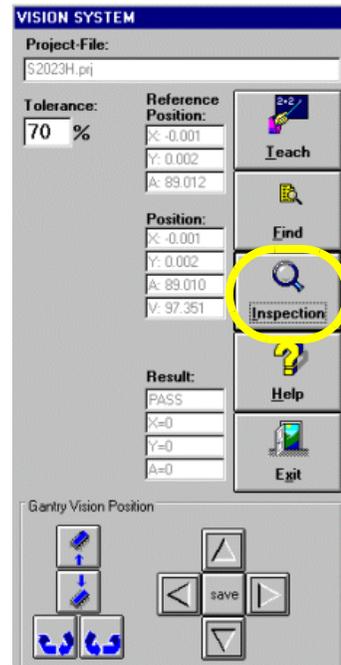10a) Click **Inspection** on the Vision System window.

Figure 3-53— Click ***Inspection***

10b) Verify that the **Result** now reads as shown in *Figure 3-54*.

PASS
X = 0
Y = 0
A = 0

Figure 3-54—Result: PASS

PS Series System Owner's Manual
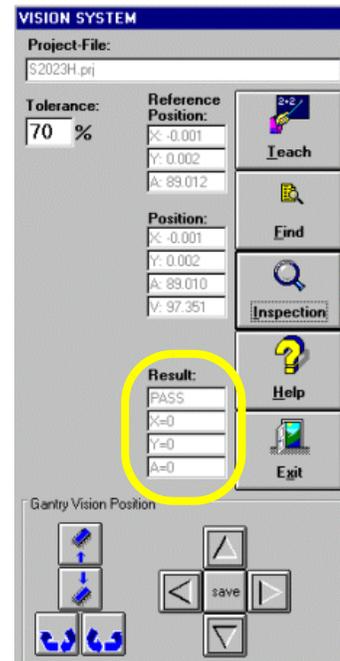
11. Verify reference vision file (optional)—

11a) Move the X-axis and Y-axis two steps (20 mils) by clicking twice on the forward arrow corresponding to each axis. See *Figure 3-55*.
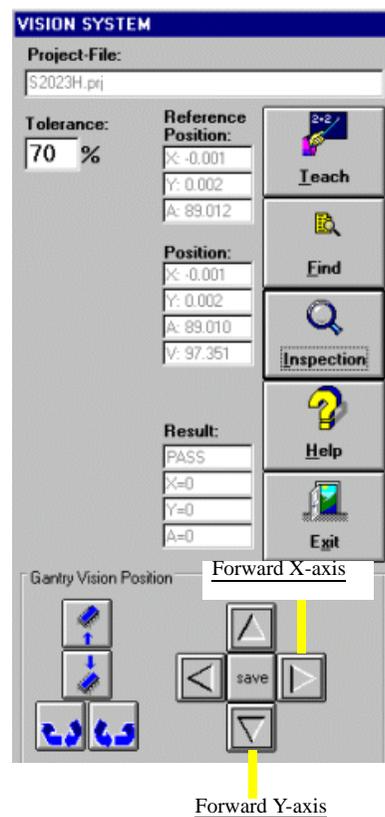
Figure 3-55—Forward arrows for X-axis and Y-axis

11b) Click **Inspection**.

11c) Verify that X = 20, Y = 20 and A = 0.

11d) Move the X-axis and Y-axis two steps back by clicking twice on the back arrow corresponding to each axis.

11e) Click **Inspection**.

11f) Verify that X = 0, Y = 0 and A = 0.

11g) Click the Theta rotation button twice. See *Figure 3-56*.

Theta rotation

Figure 3-56—Theta rotation

11h) Click **Inspection**.

11i) Verify that X = 0, Y = 0 and A = 20.

> *NOTE: If X or Y is more than ±5, then the vacuum cup nozzle is not correctly positioned. Repeat Step 2 on page 3-29 to reposition the vacuum cup nozzle.*

11j) On the Vision System window, click **Exit**.
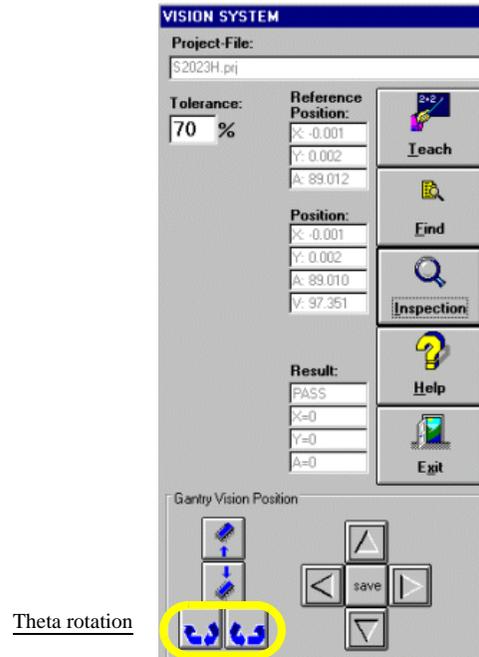
This completes the process of teaching a reference vision file.

Teach the Package File

The package file contains information about the location of all programmers, trays, and tubes, as well as the location of the Tape Input and the shuttle transfer.

The "raw" package file contains the Package Template values. Now it is necessary to teach this package file for the particular device being programmed.

To teach the package file:

Teach Programmer Locations

1.   Prepare the system—

1a)   From the AH400 Setup window, select the **Options** tab.

1b)   For main Input and Output media, select **Trays**.

1c)   For Reject 1, select **Reject Tray**.

1d)   By hand, open the socket on Programmer 1 and insert a device.

NOTE: If Programmer 1 contains more than one socket, insert devices in socket 1 and socket 4.

1e)   On the AH400 Setup window, click **System**.

1f)   On the System window, click **Gantry** to open the Teach Positions window. The Teach Positions window displays a graphic representation of the work surface, including yellow position labels for all locations in the work envelope. The Teach Positions window also includes Y-axis and X-axis adjustment arrows. See *Figure 3-57*.
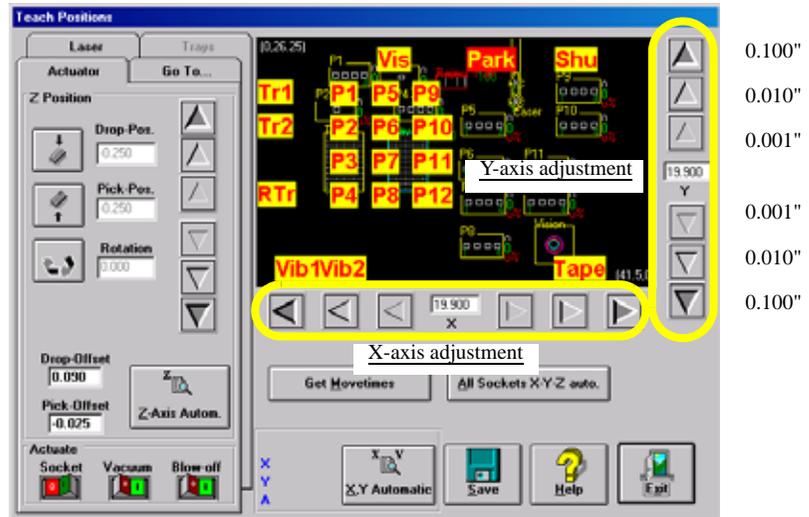

Figure 3-57—Teach Positions window

WARNING: *Stay clear of the operating envelope while teaching PNP head locations. The PNP head can move without notice when operating in this mode.*

1g)   Click the **P1** yellow position label representative of Programmer 1. The gantry will move the PNP head to the location specified, and a white box will appear on the graphic relative to the PNP head's physical location. The position label will flash RED then YELLOW indicating the position of the PNP head.

2.   Adjust location of the probe tip—

2a)   Adjust the location of the probe tip so that it is centered on the device. Use the up/down arrows for Y-axis adjustments and the left/right arrows for X-axis adjustments. From the inside working outward, the arrow buttons adjust the positional value ±0.001, 0.010, and 0.100 inches respectively. See *Figure 3-57* above.

2b)   Click **Save**.

NOTE: When saved, these settings are kept in the appropriate package file (.txt) in the directory C:\AH400_32\Package on the Handler Computer.

3.   Z-Axis autom.—

3a)   Click **Z-Axis autom**. The PNP head lowers and the probe tip touches the device.

3b)   The Z-axis reference position is now set. From the Z-axis reference, the drop and pick offsets are added. For example:

If Z-axis reference = -1.000, then Zdrop = -0.910 and Zpick = -1.025. See *Figure 3-58*.
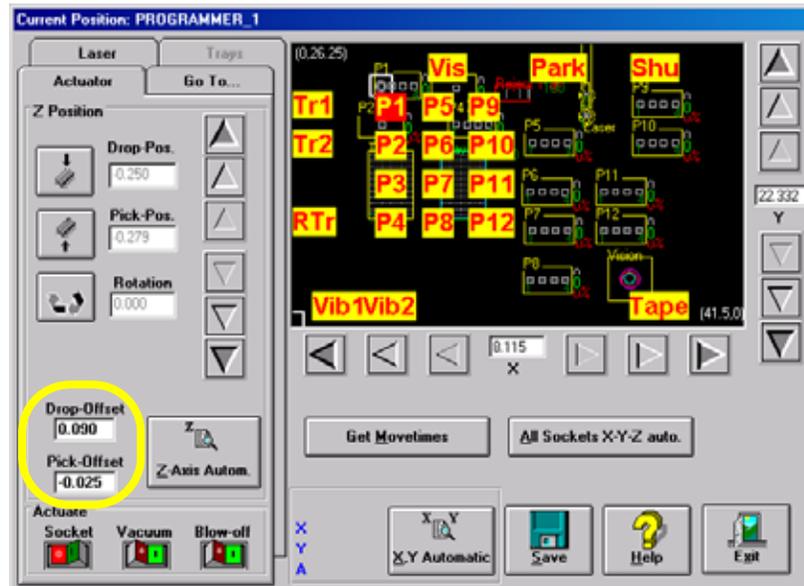
Figure 3-58—Drop and Pick offsets

4.   Adjust socket actuator (if required)—

NOTE: Adjust the socket actuator only if the socket fails to open or if devices are dropped. It is necessary to adjust the socket actuator only once while creating a package file.

4a)   Click **Socket** ON. This lowers the socket actuator and opens the socket.
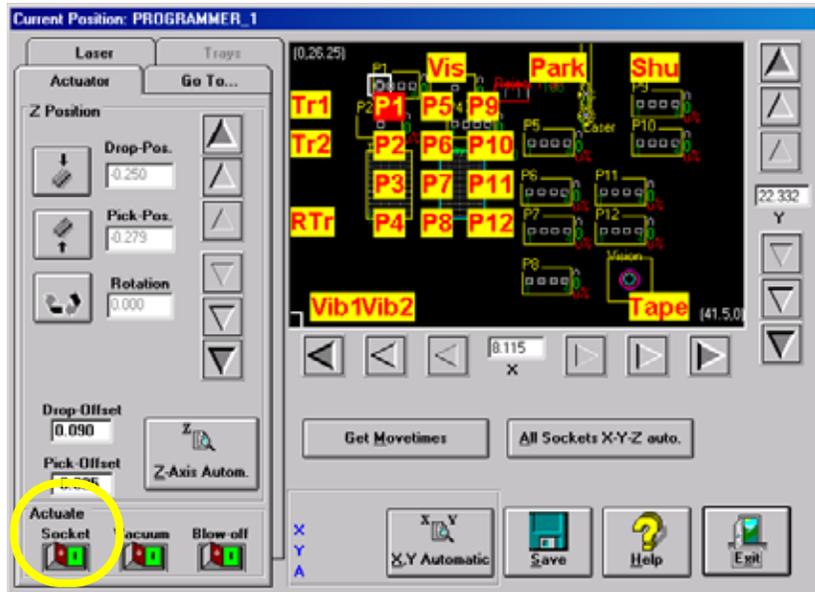
*Figure 3-59—Socket **ON***

4b) On the back of the PS Series System, turn the Main air pressure **OFF**.

4c) By hand, adjust the socket actuator so that the ribs open the socket as the probe tip descends and so the actuator does not interfere with the probe tip as it picks up the device.

4d) On the back of the PS Series System, turn the Main air pressure **ON**.

4e) Click **Socket** OFF to raise the socket actuator.

5. Set R-axis value—
See "Set R-axis rotation values" on page 3-29 for instructions.

6. Pick the device—

6a) Click the **P1** yellow position label representative of Programmer 1 to return the PNP head to Programmer 1.

6b) Press **X,Y Automatic**. The PNP head picks the device, takes it to the vision location and compares the orientation of the device to the orientation in the reference vision file.

6c) When the Attention message box pops up, check the **Results** field.

*Figure 3-60—**Results** field*

6d) If the new values for X and Y are >±5, press **Yes** and repeat Step 6b. If the new values for X and Y are <±5, press **No**.
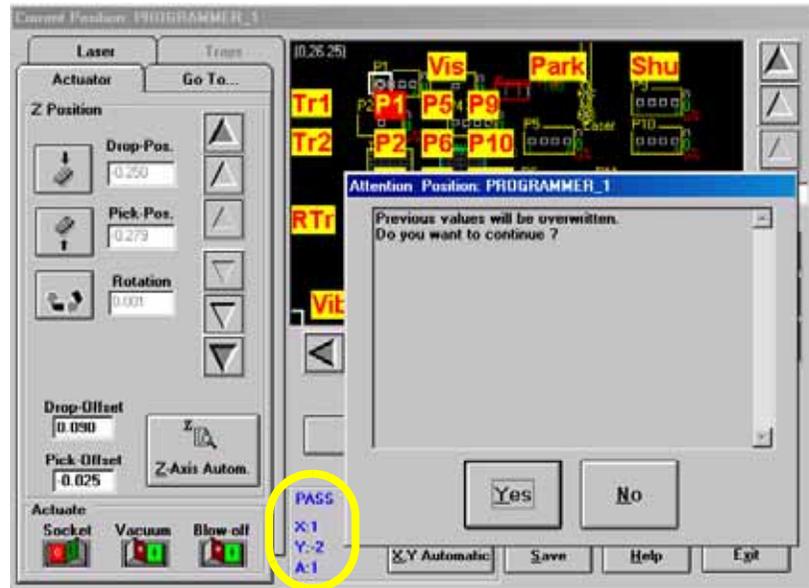
NOTE: If the programmer has multiple sockets, complete Step 7.

7.   Multiple socket programmers—

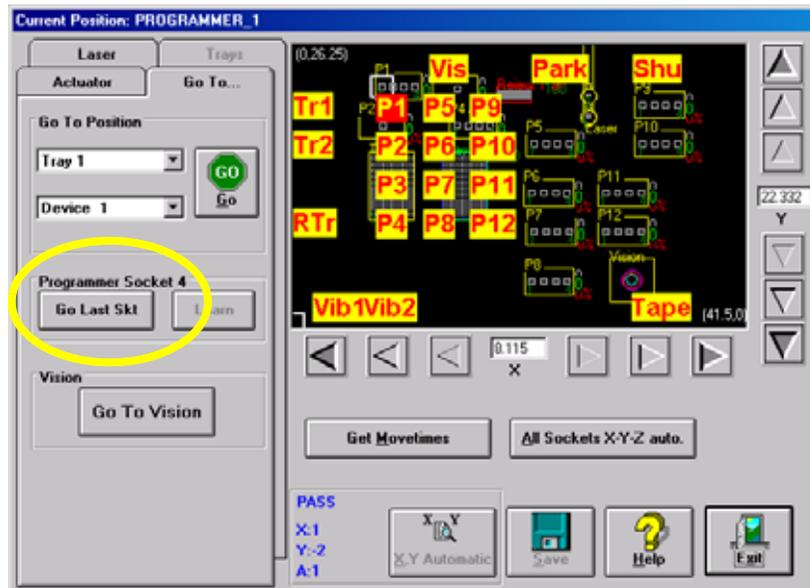7a)   On the **Go to** tab, click **Go Last Skt**. See *Figure 3-61*.

Figure 3-61—Go to Socket 4
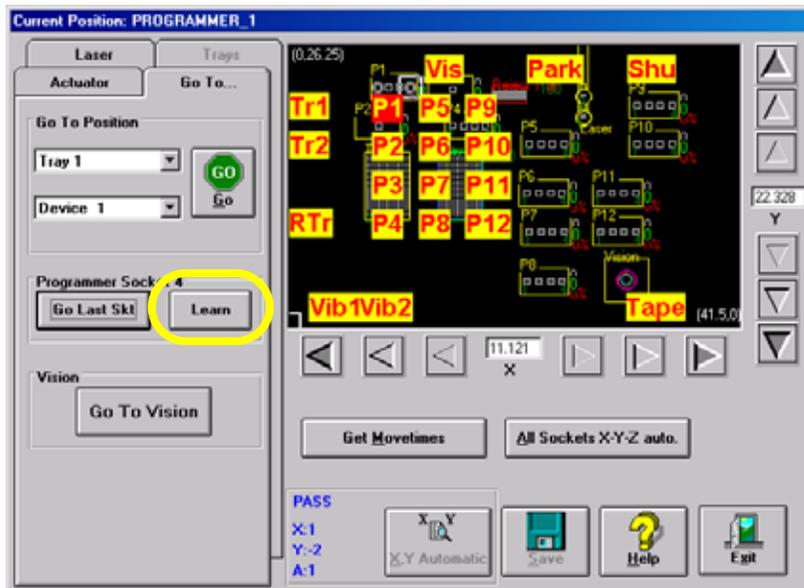
7b)   Click **Learn**.

Figure 3-62—Learn

7c) When the Attention message box pops up, check the **Results** field.

7d) If the new values for X and Y are >±5, press **Yes** and repeat Step 7b. If the new values for X and Y are <±5, press **No**.

This completes the process of teaching Programmer 1 locations. Repeat for **all** programmers.

Teach Tray Locations

1. Prepare the system—

1a) In Tray 1, insert devices in the upper left corner and lower right corner.

1b) In Tray 2, insert a device in the upper left corner only.

2. Teach upper left corner of Tray 1—

2a) Click the **Tr1** yellow position label representative of Tray 1.

2b) Adjust the location of the probe tip so that it is centered on the device in the upper left corner of Tray 1. Use the up/down arrows for Y-axis adjustments and the left/right arrows for X-axis adjustments. From the inside working outward, the arrow buttons adjust the positional value ±0.001, 0.010, and 0.100 inches respectively.

2c) Click **Save**.

> *NOTE: When saved, these settings are kept in the appropriate package file (.txt) in the directory* `C:\AH400_32\Package` *on the Handler Computer.*

2d) Click **Z-Axis autom**. The PNP head lowers and the probe tip touches the device. Click **Save**. The Z-axis reference position is now set.

2e) Press **X,Y Automatic**. The PNP head picks the device, takes it to Vision and compares the orientation of the device to the orientation in the reference vision file.

2f)   If the new values for X and Y are >±5, press **Yes** and repeat Step 2e.
      If the new values for X and Y are <±5, press **No**.

3.   Teach lower right corner of Tray 1—
3a)   Select the Trays tab.
3b)   Enter the number of columns and rows for this tray. See *Figure 3-63*.
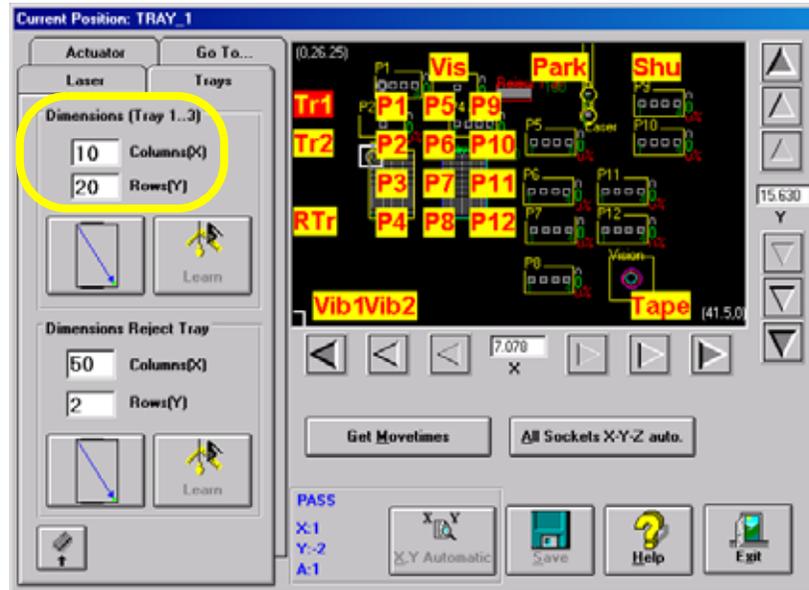
Figure 3-63—Specify dimensions of Tray 1

3c)   Click the diagonal arrow. See *Figure 3-64*. This moves the PNP head to
      the lower right corner of Tray 1.
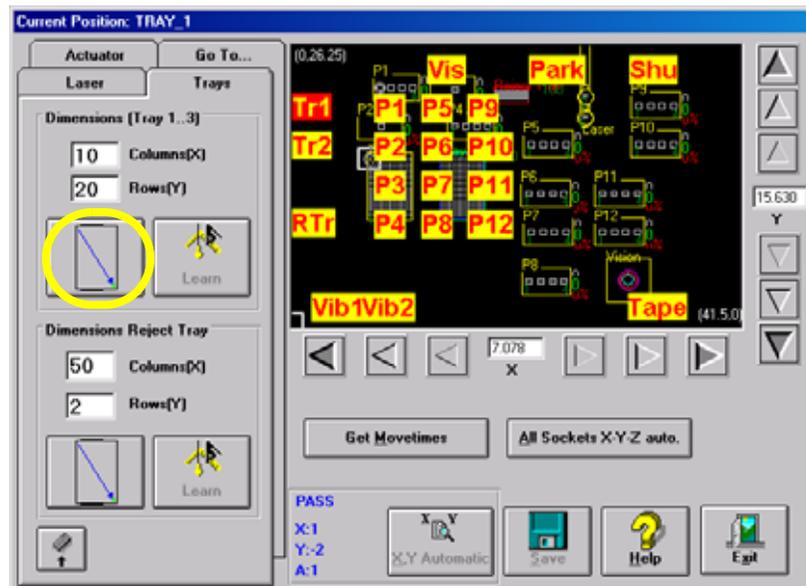
Figure 3-64—Click diagonal arrow

3d)   Adjust the location of the probe tip so that it is centered on the device
      in the lower right corner of Tray 1. Use the up/down arrows for Y-axis
      adjustments and the left/right arrows for X-axis adjustments.

3e) Click **Learn**.
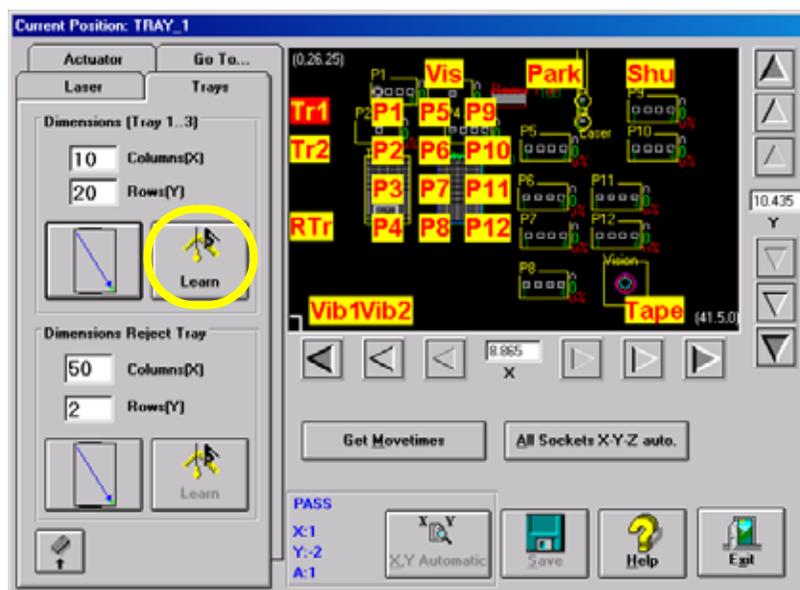
*Figure 3-65—Click **Learn***

3f) If the new values for X and Y are >±5, press **Yes** and repeat Step 3e. If the new values for X and Y are <±5, press **No**.

4. **Teach Tray 2 location—**

4a) Click the **Tr2** yellow position label representative of Tray 2.

4b) Adjust the location of the probe tip so that it is centered on the device in the upper left corner of Tray 2. Use the up/down arrows for Y-axis adjustments and the left/right arrows for X-axis adjustments.

4c) Click **Save**.

4d) Click **Z-Axis autom**. The PNP head lowers and the probe tip touches the device. Click **Save**. The Z-axis reference position is now set.

4e) Click **X,Y Automatic.** The PNP head picks the device, takes it to Vision system and compares the orientation of the device to the orientation in the reference vision file.

4f) If the new values for X and Y are >±5, press **Yes** and repeat Step 4e. If the new values for X and Y are <±5, press **No**.

5. **Teach reject location—**

> **NOTE:** *See Figure 2-4 for possible physical location of reject box/bin.*

5a) Click the **RTr** yellow position label representative of the reject box/bin.

5b) Adjust the location of the probe tip so that it is centered at the upper left corner of the reject box/bin. Use the up/down arrows for Y-axis adjustments and the left/right arrows for X-axis adjustments.

5c) Click **Save**.

5d) Select the Trays tab.

5e) In the Dimensions Reject Tray field, enter a value for Columns (X) and Rows (Y) for the reject box/bin. These values set the number of reject devices sent to the reject box/bin before the **Reject is Full** message is

displayed. In the example shown in *Figure 3-66*, the **Reject is Full** message is displayed after 50 (5 x 10 = 50) devices are placed in the reject box/bin.
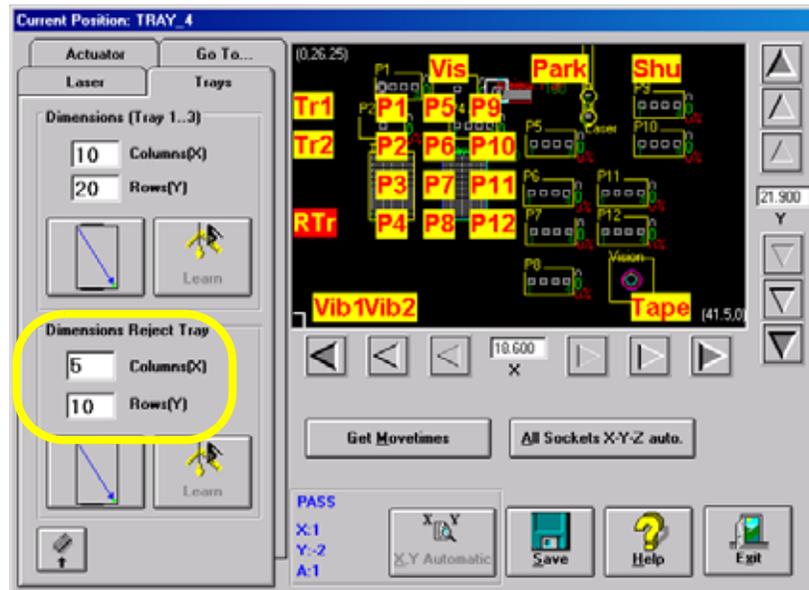
Figure 3-66—Setting number of devices sent to reject box/bin

5f) Click the diagonal arrow. This moves the PNP head to the lower right corner of the reject box/bin.

5g) Adjust the location of the probe tip so that it is centered at the lower right corner of the reject box/bin. Use the up/down arrows for Y-axis adjustments and the left/right arrows for X-axis adjustments.

5h) Click **Save**.

5i) When prompted, click **Yes** to overwrite values.

Teach Tube Locations

1. Prepare the system—

1a) From the AH400 Setup window, select the Options tab.

1b) For main Input and Output media, select **Tubes**.

1c) For Reject 1, select **Vibrator 2**.

1d) In the **Count of Fail Tubes** field, enter the number of tubes in Vibrator 2 (output feeder) that will receive failed (reject) devices.

1e) Insert tubes in Vibrator 1 (input feeder) and Vibrator 2 (output feeder).

2. Teach Vibrator 1 locations—

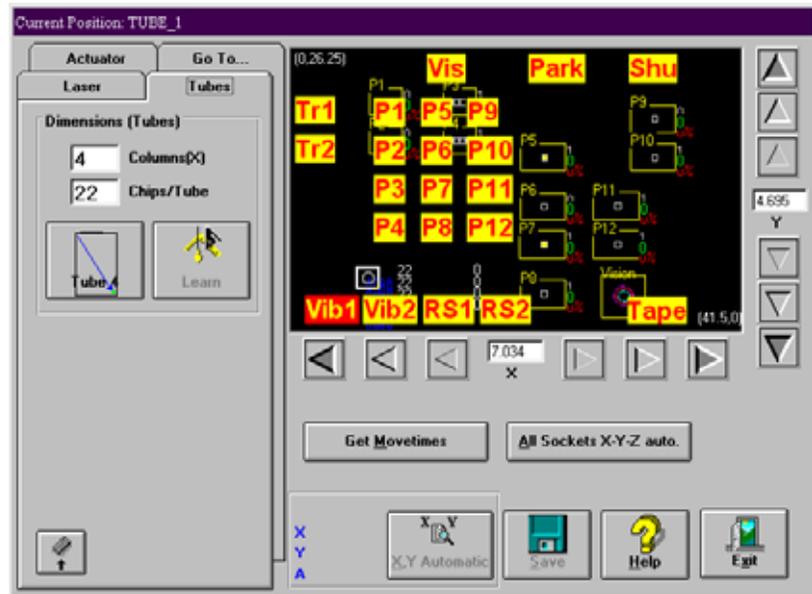2a) On the Gantry window, click the **Vib1** yellow position label representative of Vibrator 1 (input feeder).

Figure 3-67—Vib1 location

2b) Adjust the location of the probe tip so that it is centered on the device in the staging area of the left-most tube of Vibrator 1. Use the up/down arrows for Y-axis adjustments and the left/right arrows for X-axis adjustments.

2c) Click **Save**.

2d) Click the Tubes tab.

2e) In the **Columns (X)** field, enter the number of tubes in Vibrator 1.

2f) In the **Chips/Tube** field, enter the number of devices per tube.

2g) Click the diagonal arrow. The PNP head moves to the right-most tube in Vibrator 1.

2h) Adjust the location of the probe tip so that it is centered on the device in the staging area of the right-most tube. Use the up/down arrows for Y-axis adjustments and the left/right arrows for X-axis adjustments.

2i) Click **Learn**.

2j) If the new values for X and Y are $>\pm5$, press **Yes** and repeat Step 2h to Step 2i.

   If the new values for X and Y are $<\pm5$, press **No**.

3. Teach Vibrator 2 locations—

3a) On the Gantry window, click the **Vib2** yellow position label representative of Vibrator 2 (output feeder).

3b) Adjust the location of the probe tip so that it is centered on the device in the staging area of the left-most tube of Vibrator 2. Use the up/down arrows for Y-axis adjustments and the left/right arrows for X-axis adjustments.

3c) Click **Save**.

3d) Click the Tubes tab.

3e) In the **Columns (X)** field, enter the number of tubes in Vibrator 2.

3f) In the **Chips/Tube** field, enter the number of devices per tube.

3g) Click the diagonal arrow. The PNP head moves to the right-most tube in Vibrator 2.

3h)   Adjust the location of the probe tip so that it is centered on the device in the staging area of the right-most tube of Vibrator 2. Use the up/down arrows for Y-axis adjustments and the left/right arrows for X-axis adjustments.

3i)   Click **Learn**.

3j)   If the new values for X and Y are >±5, press **Yes** and repeat Step 3h to Step 3i.
      If the new values for X and Y are <±5, press **No**.

Teach Shuttle Transfer Locations

1.   Teach locations—

1a)   On the Gantry window, click the **Shu** yellow position label representative of the marking shuttle. The PNP head moves to the marking shuttle.

1b)   Adjust the location of the probe tip so that it is centered on Shuttle Ped 2 in the marking pedestal. Use the up/down arrows for Y-axis adjustments and the left/right arrows for X-axis adjustments.

1c)   Click **Save**.

1d)   Click the **Park** yellow position label representative of the park location. The PNP head moves to the Park location.

1e)   Select the Laser tab. Click the Vacuum switch to **ON**. See *Figure 3-68*.
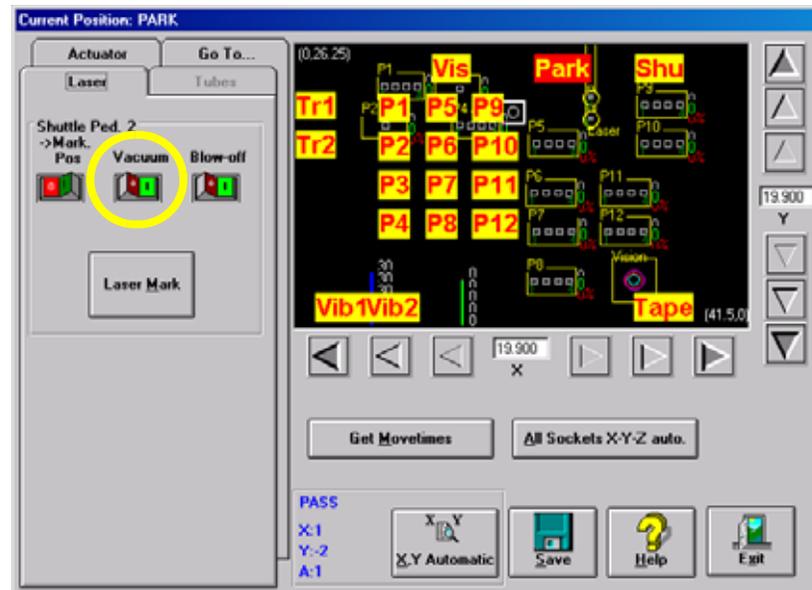
*Figure 3-68—Vacuum switch **ON***

1f)   Insert a device in Programmer 1.

1g)   Click **P1**. The PNP head moves to Programmer 1.

1h)   Right-click the mouse to pick up the device.

1i)   Click the **Shu** yellow position label representative of the marking shuttle. The PNP head moves to the marking shuttle.

1j)   Right click to place the device on Shuttle Ped 2.

1k)   Click **Z-Axis autom**. The PNP head lowers and the probe tip touches the device.

1l)   Click **Save**. The Z-axis reference position is now set.

1m) Click **X,Y Automatic.** The PNP head picks the device, takes it to Vision system and compares the orientation of the device to the orientation in the reference vision file.

1n) If the new values for X and Y are >±5, press **Yes** and repeat Step 1m. If the new values for X and Y are <±5, press **No**.

Teach Tape-Input Location
1. Prepare the system—

1a) On the feeder unit control panel, press and hold the center button. While holding the center button, press the forward button. The carrier tape advances one guide hole. Advance the carrier tape in this manner until the pick point mark on the tape window aligns with the center of the device. A device is now in the pick location.

2. Teach locations—

2a) On the Gantry window, click the **Tape** yellow position label representative of the tape input location. The PNP head moves to the tape input pick location.

2b) Adjust the location of the probe tip so that it is centered on the device in the pick location of the feeder unit. Use the up/down arrows for Y-axis adjustments and the left/right arrows for X-axis adjustments.

2c) Click **Save**.

2d) Click **Z-Axis autom**. The PNP head lowers and the probe tip touches the device.

2e) Click **Save**. The Z-axis reference position is now set.

2f) Click **X,Y Automatic.** The PNP head picks the device, takes it to Vision system and compares the orientation of the device to the orientation in the reference vision file.

2g) If the new values for X and Y are >±5, press **Yes** and repeat Step 2f. If the new values for X and Y are <±5, press **No**.

Get Movetimes
When the package file is taught, you can optimize the movement of the PNP head in the work envelope by getting movetimes.

To get movetimes:
1. Gantry—

1a) Click **Get Movetimes**.
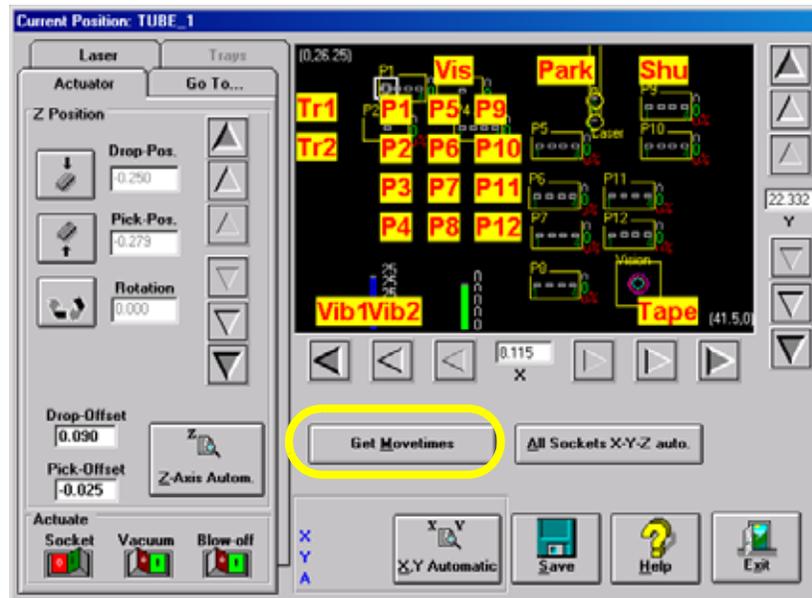
Figure 3-69—Get Movetimes

1b)   Click **Yes** when prompted to save positions.
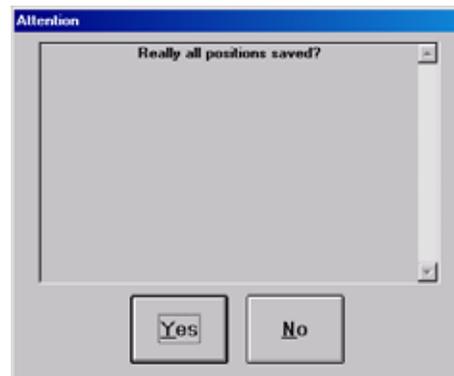
Figure 3-70—Save positions

This completes the process of teaching the package file.

(Optional) Create a Data File from a Master Device

The PS Series System can read data from a master device and create a data file that can then be used in programming jobs.

To create a data file from a master device:

1.   **Prepare the system—**
1a)   Select the Programmer Computer where the device is located.
1b)   Install the correct adapter for the device to the programmer that you are connected to.
1c)   Press <Esc> to exit the Optima window.
1d)   Type <D> to enter the DOS program.
1e)   Type C:

1f)   Press <Enter>.

2.   Select device type—

2a)   At the C:\ prompt, enter PROM or PAL depending on which type of device you have.

2b)   From the device list, select the device that you have.
For example: STM 27C801

3.   Insert device—

3a)   Manually insert the device in the programming site.

NOTE: If you have a PROM that was from another programmer, you may need to change the RAM fill to FF to get the correct check-sum. To change the RAM fill, complete Step 4.

4.   Change RAM fill (optional)—

4a)   Press **O** for Options.
Near the bottom the window you will see a line that says
`Default Buffer contents      FF Hex`
or
`Default Buffer contents      00 Hex`

4b)   Use the space bar to toggle to the desired fill option.

5.   Read device—

5a)   From the Command menu, select **R** = Read device. This will load the data into the RAM.

6.   Write file—

6a)   Select **W** = Write HEX or BINARY disk file.

6b)   You will be prompted for file type INTEL-HEX [H], SPACE-HEX [S] or BINARY [B].

NOTE: Do not use file type S.

6c)   When prompted for the file name and location, type **`I:\PRGDATA.`**

6d)   To test this file select **I** = Input file from disk to memory. Select this file and see if it loads correctly. If it loads and you get the correct check-sum, you are done.

(Optional) Create a Serialization File

Create a serialization file so that unique serial numbers can be written to the devices along with the actual data being programmed. The serial number is saved in a "Serial Number Master" file with a .SNM extension; for example ACMESR.SNM.

After writing a serial number on one device, the next serial number to be written is saved. This enables you to continue using the same serial number sequence on other devices. For example, if you want a serial number sequence starting with 00 00 0D 9C to be programmed on 150 32TSOP devices, the serial numbers stored will be 00 00 0D 9C to 00 00 0E 32. When new devices (perhaps in 44QFP package) are programmed, the first device in

this new lot or job will be written with the serial number 00 00 0E 33, thus continuing the same sequence of serial numbers.

In brief, the sequence of steps involved in serializing devices is as follows:

1.   Select a programmer for serialization.
2.   Create new job for serialization.
3.   Create a Master Serial Number file or select an already-existing Master Serial Number file.
4.   Select the device to be serialized.
5.   Set the address range where the serial number is to be written.
6.   Select other serialization options.
7.   Select the same device for programming with the data file.
8.   Read the data file and note its checksum.
9.   Start the AH400 software and load the newly created job.

You will need:

•   Data file loaded on the server, for example:
         `I:\PRGDATA\DATA01.BIN`
•   Package file, for example:
         `C:\AH400_32\PACKAGE\S273H.TXT`
•   Reference vision file, for example:
         `C:\acuWIN95\TEST\S273H.PRJ`
•   Dedicated serialization programmer, for example:
         `Programmer Number 8`

NOTE: Select one Universal programming station which will be used to store the serial number on the devices. This is also called the "serialization programmer." The selected programmer should be physically closest to Tray 2, for example Programmer 8, depending on how many programmers are there on the PS Series System.

•   Programmer for job creation, for example:
         `Programmer Number 6`

NOTE: The programmer/Programmer Computer combination used during job creation must be different than the one selected for serialization. The adapter required to support the device must be installed on the programmer.

•   Address for Serial Number Storage, for example:
         `1FFC ~ 1FFF`

NOTE: During job creation, you must specify the start and end addresses where the serial number will be stored on the device. For example, if the serial number is to be stored on the topmost four locations of the device, then these addresses, in hexadecimal format, could be 1FFC, 1FFD, 1FFE and 1FFF.

Consecutive Serialization Details (Step-by-Step)

1.   Select a programmer for job creation—
1a)   Select a programming site for job creation. This programming site must have the required adapter for the devices to be programmed and it must NOT be designated as the serialization programmer.
1b)   Select the Programmer Computer for this programming site.
1c)   Press <Esc> to exit the Optima menu.
1d)   Press **N** to start a new job.

2.   Create a new job for serialization—
2a)   Type the job name (maximum 8 characters): **NEWJOB**
2b)   Type the device name: **PHILIPS**
2c)   Enter the job description: **Test Job**
2d)   Type the device adapter name, which will be the package file: **S273H**
2e)   Enter a number of devices to be processed: **500**
2f)   Press <Enter>.

> *NOTE: The operator can easily adjust this number before a run. For information about adjusting the number of devices to program, see"Verify Job Information" on page 3-7.*

3.   Create or select a Master Serial Number file—
3a)   Select the Master Serial Number file. For example: **ACMESR**
3b)   Select the programming site to be used for Serialization: **8**
3c)   Press <Enter>.

4.   Select the device to be serialized—
4a)   From the device selection menu (see *Figure 3-71*), select the device to be serialized.

```
                PROM vendor selection:  Page 1 with any top
 # = my own list
 A = Auto EPROM ID        P = LG Semicon          F5  = SST
 B = ALI                  Q = Macronix            F6  = SyncMos
 C = Alliance             R = Microchip           F7  = Texas Inst
 D = AMD                  S = Micron              F8  = Toshiba
 E = Atmel                T = Mitsubishi          F9  = Waferscale
 F = Atmel W&M/Temi       U = Motorola            F10 = Winbond
 G = Catalyst             V = National            O   = Xicor
 H = Cypress              W = NEC                 1   = Xilinix
 I = Dallas               X = NexFlash            2   =  Zilog
 J = EON                  Y = OKI
 K = Fujitsu              Z = Philips/Signet      PgUp: Other vendors
 L = Hitachi              F1 = Samsung
 M = Infeneon/Sieme       F2 = Simtek
 N = Intel                F3 = Sharp
 O = ISSI                 F4 = STMicroelec

      Enter vendor code      SPACE: select last used, ESC: exit
                  OPTIMA Copyright © 1991 – 2000
       Data I/O Co. HOTLINE: Please refer to file 'Hotline.txt'
    Press + to generate device list for Memories + Micros Cb/2000
```

Figure 3-71—Device menu

4b)   Press <Enter>.

5.   Set the address range where the serial number is written—
5a)   From the command menu, select **A** to set Address range

```
-  OPTIMA: Memory Programmer Cb/2000 -          - Device code is 606231 -
A = Set address range                             Atmel AT17C65
C = Configure device programming               -- Device type selected --
D = Executive DOS command
E = Edit pattern in memory
I = Input file from disk to memory
L = List contents of memory                        ┌──────────────────┐
M = Multiple device programming                    │       E001       │
N = Select multibyte unit                          │   -- Checksum --  │
P = Program device                                 └──────────────────┘
Q = Quit
R = Read device
S = Special device functions
V = Verify device to memory                        ┌──────────────────┐
W = Write HEX or BINARY disk file                  │     ALL  BYTES   │
Z = Device serialization options                   │   -- Data-Type --│
H,H,O,X: additional commands                       └──────────────────┘

Enter command _
```

Figure 3-72—Command menu

5b) Specify the new start location. At the prompt:

```
Device data extends to 1FFF HEX plus 1 control bytes
Start location is now 0  Enter new start location ___
```

Enter the start address where the serial number is to be stored. For example, if the four topmost address locations are specified for the serial number to be stored, enter:
```
Start location is now 0  Enter new start location
1FFC
```

5c) Press <Enter>.

5d) At the prompt:

```
End location is now 0  Enter new start location ___
```
Enter the end address where the serial number is to be stored. For example:
```
End location is now 1FFD Enter new location 1FFF
```

5e) Press <Enter>.

NOTE: The above options will be set for the Universal programmer dedicated as the serialization programmer, in this example Programmer 8.

5f) Verify the address range displayed in the next window is correct. See *Figure 3-73*.

```
- OPTIMA: Memory Programmer Cb/2000 -        - Device code is 606231 -
A = Set address range                            Atmel AT17C65
C = Configure device programming              -- Device type selected --
D = Executive DOS command
E = Edit pattern in memory
I = Input file from disk to memory
L = List contents of memory                   Range = 1FFC - 1FFF
M = Multiple device programming
N = Select multisyte unit
P = Program device
Q = Quit
R = Read device                                       E001
S = Special device functions                      -- Checksum --
V = Verify device to memory
W = Write HEX or BINARY disk file
Z = Device serialization options
H,H,O,X: additional commands
                                                  ALL   BYTES
Enter command _                                -- Data-Type --
```

Figure 3-73—Command menu showing address range

6. Select other serialization options—

6a) Type <**Z**> to open device serialization options.

6b) When prompted, enter the Serialization file name, complete with drive, path, name and extension. This file name is SERFILE.SN

Type filename: **S:\SERFILE.SN**

6c) Press <Enter>.

6d) Set available options on the Device Serialization Options window. See *Figure 3-74*.

```
            ======= Device Serialization Options =======
Serialization:            Enabled
S/N Options file:         S:\SERFILE.SN
Next S/N:                 3484 dec.
S/N stored in:            HEX / ASCII / BCD
S/N digits:               8 / 4 / 2
Serial Number Start Addr. 7FFC HEX
Byte Order:               Big Endian / Little Endian
Word Mode:                OFF / On
Store S/N Bytes:          ALL / Even / Odd / 0 ~ 3 of four
```

Figure 3-74—Device serialization options

- **S/N Options file** cannot be changed. This name was selected when you completed Step 6 above.
- **Next S/N** cannot be changed. It is written here in decimal format.
- **S/N stored in** can be changed. Toggle between HEX, ASCII and BCD.
- **S/N digits** can be changed. Choose 8, 4 or 2 digits.
- **Serial Number Start Addr** can be entered here in HEX format.
- **Byte Order** can be changed. Toggle between Big Endian (to start with most significant byte) or Little Endian (to start with least significant byte).
- **Word Mode** should be set to <u>OFF</u>.
- **Store S/N Bytes** should be set to <u>ALL</u>.

6e) Press <Enter> to save changes and exit the Device Serialization Options window.

6f) On the OPTIMA main window, press <**Q**> to quit the settings for the Serialization Programmer 8.

6g) Set other options. Press **Yes** or **No** to questions about Marker, Label Printer and Verify options as appropriate to the particular job being created.

7. Select the same device for programming with the data file—

7a) Type by pressing <M> if PROM devices are to be programmed, or <L> if PAL devices are to be programmed.

7b) From the Device Selection options window, select the same device as was selected in Step 4 above.

8. Read data file and note its checksum—

8a) From the Command Menu, press <**I**> to Read-IN the data file. The data file should already exist in I:\PRGDATA, for example I:\PRGDATA\DATA01.BIN

8b) Note the checksum displayed after the data file is loaded.

8c) Press <**Q**> to quit.

8d) On the next window, type the checksum as noted.

8e) Press <Esc> to return to the Optima menu.

9. Start the Handler Computer and load the newly created job—

9a) Switch to the Handler Computer.

9b) Re-start the AH400 software and load the newly created job:
NEWJOB.JOB

> *NOTE: At the end of this job, the Serial Number Master file, ACMESR.SNM, will have the next serial number to be programmed.*

When this **NEWJOB** is finished and another batch of new devices is to be programmed using the *next* number in this Serial Number sequence, do the following:

1. Exit AH400 software.

2. Start again at Step 1 on page 3-55.

3. At Step 2, type a *different* job name.

4. At Step 3, type the *same* Serial Number Master file name, in this example ACMESR.

5. At Step 5, set the address range for recording the serial number as appropriate for that device or as required.

If another batch of devices is to be programmed using *different* serial numbers, do the following:

1. At Step 3, type a *different* (or new) Serial Number Master file name, for example FRESHSR.

2. Complete all other steps as described above.

(Optional) Create a Laser Marking File

Laser graphics used to mark devices are generated using the WinMark Pro software on the Laser Computer. Any style of marking (whether text-based,

graphic-based, or both) can be generated and used for marking devices. The only limitation is the size of the device to be marked.

Creating an Image File for the Laser System

To create an image file for the laser system to use in laser marking devices:

1.   Prepare the system—

1a)   Select the Laser Computer.

1b)   Copy and paste *Template.mkh* to create *Copy of Template.mkh*.

1c)   Rename *Copy of Template.mkh* to the name you gave the laser marking (drawing) file in the job creation process, e.g. Ver7.mkh. See Step 8c on page 3-22.

1d)   Start WinMark Pro by double-clicking the WinMark icon on the desktop.

2.   Load the file—

2a)   From the menu at the top of the window, select **File > Load**.

2b)   Select your laser marking file from the list that appears, or navigate to the location and select the file.

2c)   Click **Open** to load the file.

Figure 3-75—Selecting the laser marking file

3.   Format—

3a)   Click **Drawing** in the right-hand side of the Properties window.
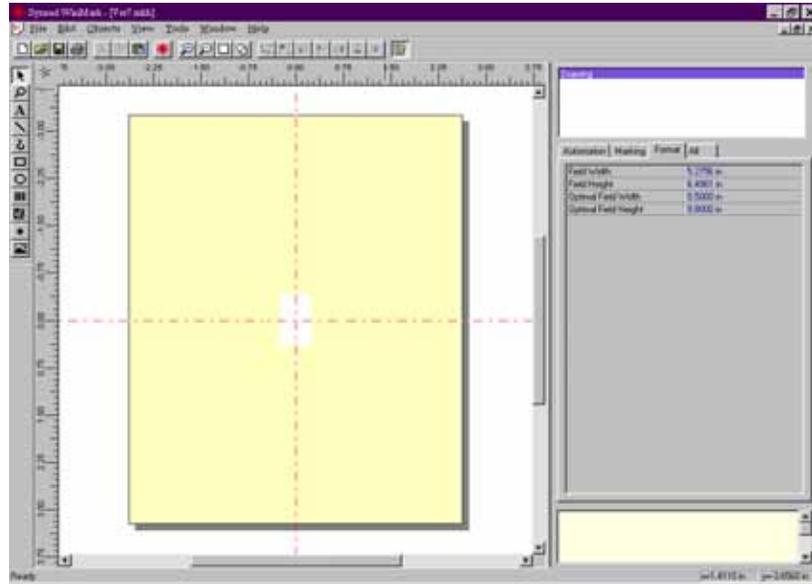
3b)   Click the **Format** tab.

Figure 3-76— Format tab

3c) On the Format tab, set the Optimal Field Width and Optimal Field Height to the approximate height and width of the device to be marked.

CAUTION: Do NOT change values in the **Automation** *tab. These values are set in Template.mkh.*

4. Create text—

4a) On the vertical tool bar on the left side of the window, select the Text tool (the button with the letter **A** on it).

4b) Click the mouse anywhere in the drawing area.

4c) Type the desired text.

NOTE: The center of the drawing area is the center of the device to be marked and is indicated by the red cross hairs. Ensure that the graphics and text fit onto the surface of the device to be marked. Use the rulers above and to the left of the drawing area as guides to marking placement.

4d) Save the file by selecting **File > Save** from the menu at the top of the page.

4e) Exit WinMark Pro by selecting **File > Exit**.

Default Settings in Template.mkh

When creating or editing text, use Stroke fonts. These fonts are drawn and marked on the devices very quickly using point-to-point vectors. If you choose True Type fonts instead of Stroke fonts, marking time increases.

Setting	Default Value	Range
Velocity	30 ips (in./sec)	Range 0.01 to 240 ips (0.25 to 6,096 mm/sec)
Power	60%	Range 0 to 100%
Resolution	600 dpi	200 to 1000 dpi
Pline Start Delay	100 secs	0 to 80,000 secs
Pline End Delay	450 secs	0 to 80,000 secs
Interseg Delay	350 secs	0 to 80,000 secs
Off Vector Delay	300 secs	0 to 80,000 secs
Off Vector Velocity	75 ips (1,905 mm/sec)	0 to 600 ips
Off Vector Resolution	300 dpi	0 to 600 dpi

Figure 3-77—Template.mkh settings

The three most important settings are Velocity, Power and Resolution. These three settings, plus object delays on the Marking tab, are the primary factors that determine the speed and quality of the laser mark on devices.

NOTE: For more information, refer to the manual that came with your marking system.

Edit Text in an Image File

If an image file already exists and you wish to edit the text:

1.   Prepare the system—

1a)   Double-click the WinMark icon on the desktop.

1b)   From the menu at the top of the window, select **File > Load**.

1c)   Select your laser marking file from the list that appears, or navigate to the location and select the file.

1d)   Click **Open** to load the file.

2.   Edit text—

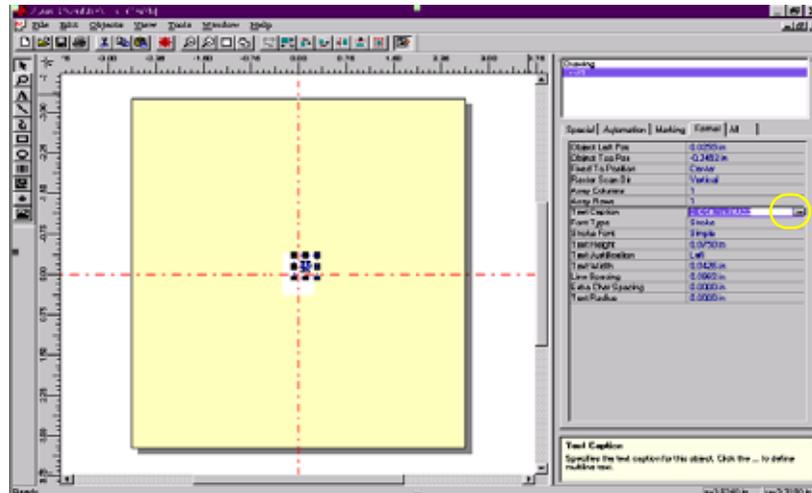2a)   On the Format tab, click the ellipses to the right of the Text Caption field. See *Figure 3-78*.

Figure 3-78—Click ellipses

2b) On the Text Caption Editor window, edit the text as desired. Press OK when finished. See *Figure 3-79*.
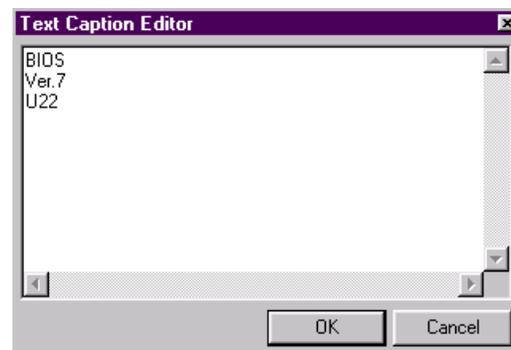

Figure 3-79—Edit text

Loading the Image File
To load the image file and use it to mark devices:

1.   Prepare the system—
1a)   Select the Laser Computer.
1b)   Start Serial Marking Interface (SMI) by double-clicking the icon on the desktop.

NOTE: This completes the process of loading the image file if your system has SMI.If your system does not have SMI, continue with Step 2.

2.   Open WinMark Pro—
2a)   Start WinMark Pro by double-clicking the WinMark icon on the desktop.

3. Load the file—

3a) From the menu at the top of the window, select **File > Load**.

3b) Select your laser marking file from the list that appears, or navigate to the location and select the file.

3c) Click **Open** to load the file.

Figure 3-80—Selecting the laser marking file

4. The Mark icon—

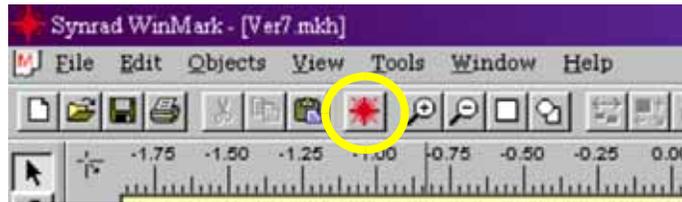4a) From the tool bar at the top of the WinMark window, click the **Mark** icon.

*Figure 3-81—The **Mark** icon on the tool bar*

4b) The Synrad WinMark control window opens and displays the marking graphic that was created.
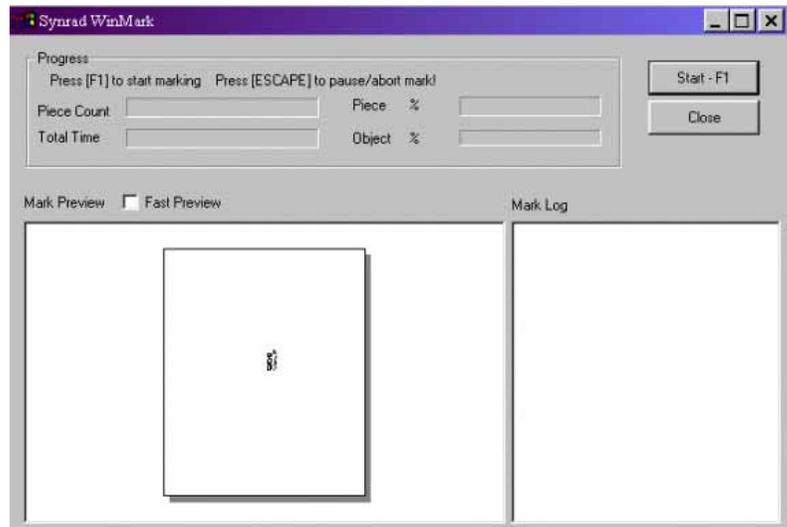
Figure 3-82—Synrad WinMark control window

4c)   Click **Start–F1**.

The WinMark software is now waiting for commands from the Handler Computer to begin marking devices.

Verifying Proper Laser Operation

WARNING: *Blindness hazard! Always wear eye protection when the laser safety shields are open, such as during service. Direct or diffuse laser radiation can damage eyes. Goggles must block 10.6 μm laser radiation. Goggles protect against scattered energy but not against direct viewing of the laser beam or reflections from metallic surfaces.*

WARNING: *Serious burn hazard! Enclose the laser beam path during service by closing the cover. Direct or diffuse laser radiation can cause serious burns.*

WARNING: *Toxic fume hazard! Laser marking generates vapors, fumes, and particles that may be noxious, toxic, or even fatal. Follow maintenance procedures on the fume extractor. Use proper ventilation.*

WARNING: *The following procedures must **NEVER** be performed with the laser safety shield removed from the laser marking assembly. The laser system is aligned at the factory for optimal performance. If there are gross inaccuracies with the laser marking system, a factory service person should be called to service the machine.*

These tests will verify the proper operation of the laser marking system:

1.   Prepare the system—
1a)   Start the AH400 software.
1b)   From the AH400 Setup window, click **System**.
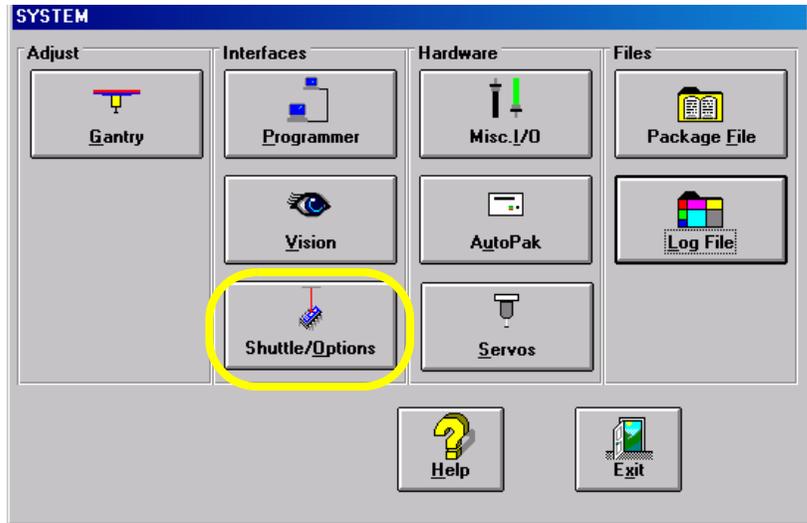1c)   From the System window, select **Shuttle/Options**.

*Figure 3-83—Select **Shuttle/Options***

2.   Shuttle/Options window—
2a)   From the Shuttle/Options window, click **Home**.
2b)   Click **Go** next to **Ped**.**2 Load Pos**. to move the laser marking shuttle to
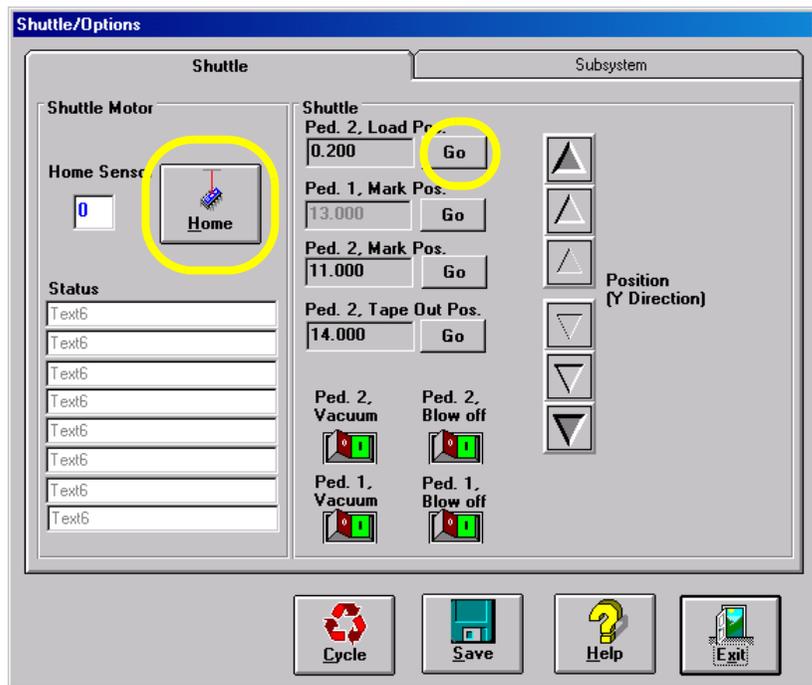   the front of the marking assembly.

*Figure 3-84—Click **Home***

2c)   Click the **Ped**. **2 Vacuum** switch to the **ON** position.

*WARNING: Do not perform any of the following steps if the laser
safety shields have been removed. Extreme burns can occur to any-
one in the area of the laser if proper safety equipment is not in*

place. If these procedures fail, contact Data I/O Customer Support to place a service call.

2d) Place a device to be marked on marking Pedestal 2, ensuring that it is centered.

2e) Click **Go** next to **Ped**. **2 Mark Pos**. to move the laser marking shuttle to the marking position.

CAUTION: Never fire the laser without a device on the transport pedestal. Damage to the pedestal O-rings can result.

2f) Select the Subsystem tab.

2g) Click **Laser Marker** to fire the laser.

2h) When the **Done Marking** message appears, click the Shuttle tab.

2i) On the Shuttle tab, click **Go** next to **Ped**. **2 Load Pos**. to move the laser shuttle to the front of the marking assembly.

3. Verify marking graphic—

3a) Verify that the marking graphic is centered on the device.

3b) If the graphic is not centered, adjust the value in the **Ped**. **2 Mark Pos**. field until properly centered.

NOTE: Manually placing the device on the transport pedestal will not be as accurate as allowing the PNP head to place the device. Manual placement should only be used as a rough alignment when necessary. Check the laser marking on the devices after the PNP head has had the opportunity to place them. Make fine adjustments to the marking position measurements at this time.

4. Troubleshooting—

If the device is not marked, perform the following:

4a) Lay a sheet of paper in the laser bay over the pedestals and fire the laser.

4b) If the image appears, move the pedestal to center the marking on the device.

4c) If no image appears, verify power is applied to the laser marking assembly and that it is turned on.

4d) If all appears correct, contact Data I/O Customer Support for further assistance.

(Optional) Create a Label Printer File

If devices are to be labeled using the optional label printing system, a label printer file must be created. Follow these steps to create a label printer file.

1. Prepare the system—

1a) Select the Handler Computer.

1b) On the Handler Computer, navigate to and open MRPRT.exe to display the label printing parameters window. See *Figure 3-85*.
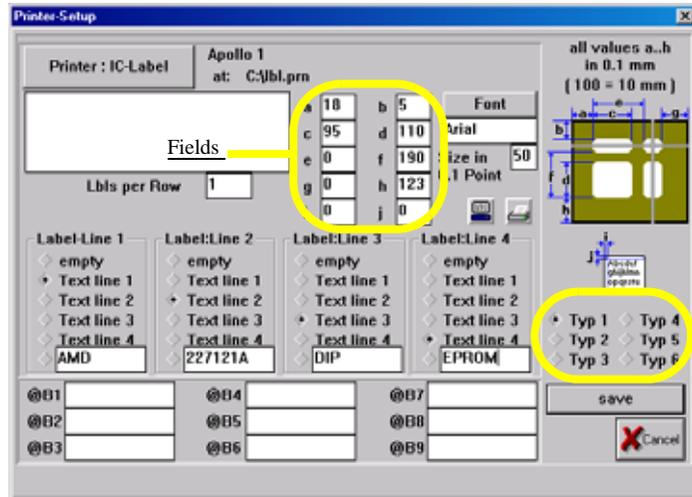
Figure 3-85—Label printing parameters window

2. Select label type—

2a) Select the label type used when this job is run. The MRPRT software allows up to six sizes of labels called "types."

---

*NOTE: Each label type has different values in **a** to **j**. All values are in millimeters.*

---

3. Set a to j values—

3a) Enter the values for fields **a** to **j**. See *Figure 3-86* for an explanation of what each value represents.

a	The offset in X (left to right) of the print from the edge of the label
b	The offset in Y (top to bottom) of the print from the edge of the label
c	The label size in the X
d	The label size in the Y (must be less than value for **f**)
e	This is not used on the PS Series System and should be set to 0
f	The distance from the front of the label to front edge of the next label
g	Rotation (not yet implemented)
h	Label advance. This is the distance to advance the label toward the tamp applicator after printing. This only makes some small changes. The Tamp head should be in the correct position first.
i	Text centering in X direction. 0= Auto and 1= All the way to the left of the label. Normally set to 0.
j	Text centering in Y direction. 0= Auto and 1= All the way to the top of the label. Normally set to 0.

Figure 3-86—Values for a to j

4. Set text lines—

4a) Select the correct box for each line of text for up to four lines.

4b) In the box, type text to be printed on label.

5. Set labels per roll—
5a) Set "Labels per Roll" to 1.

6. Save printer file—
6a) Click **Save** to save and exit the MRPRT software.

For information on selecting label printing during job creation, see "Set marking options—" on page 3-22.

Monitor Programming Yield Statistics

Occasionally, the system administrator may require pass/fail statistics for a group of devices for a given job. This is easily accomplished through the use of the statistics tool available from the Job-Information tab of the Setup window.

To view programming statistics:

1. Prepare the system—
1a) From the Setup window, select the **Job Info** tab. Click **Statistics**.
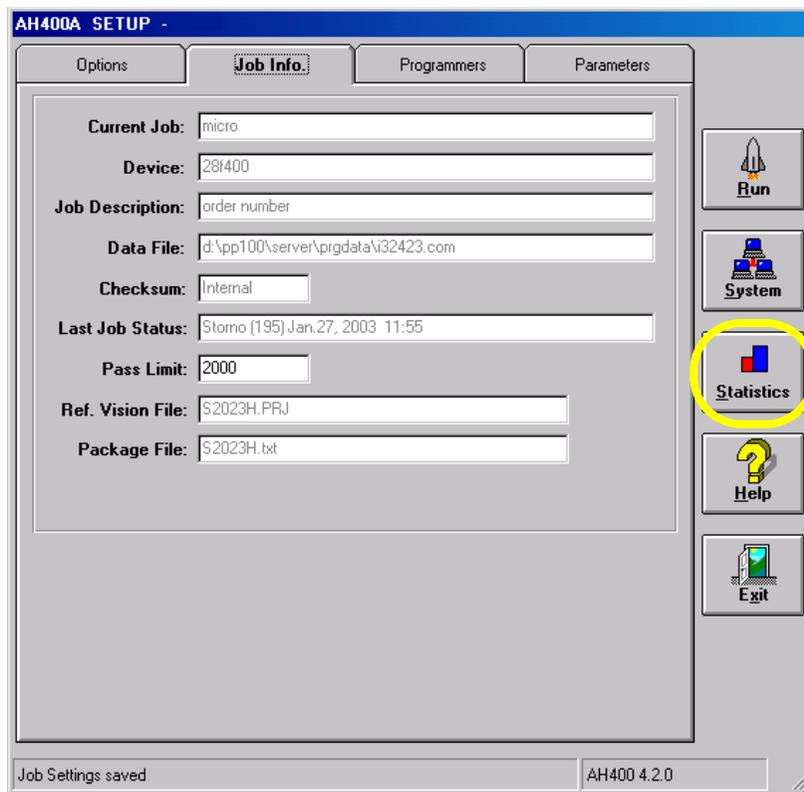
Figure 3-87—Job Info tab

2.   Review statistics information—

2a)   The statistics include such items as successful programs, continuity failures, verify failures, etc.
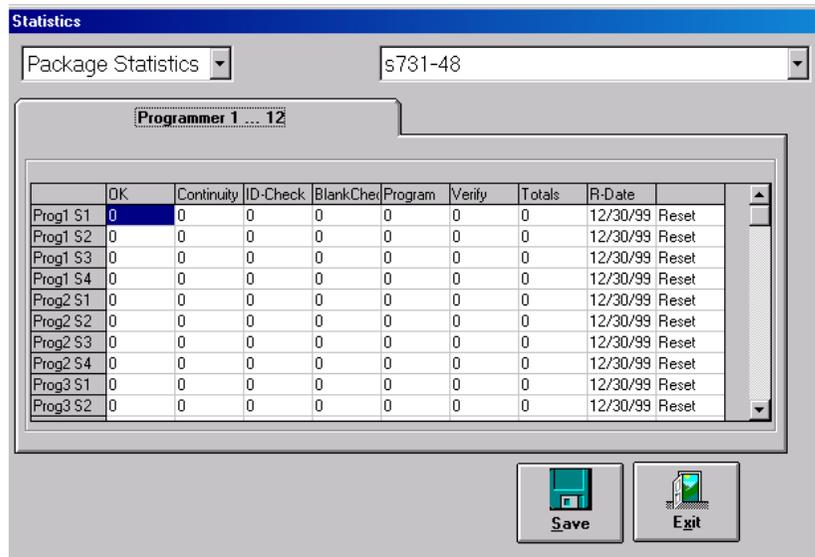

Figure 3-88—Package statistics

2b)   Pass/fail criteria are logged for each individual programmer. This is useful when attempting to identify a potential hardware problem with a programmer.

3.   Reset statistics—

The statistics displayed correspond to the package file and therefore to the adapter being used. When an adapter (or a socket in an adapter) is replaced on a particular programmer, statistics for that adapter/socket must be reset. To reset statistics:

3a)   Click **Reset** in the right-most column corresponding to the programmer on which the adapter or socket was replaced (Prog2 in the example shown in *Figure 3-89*).
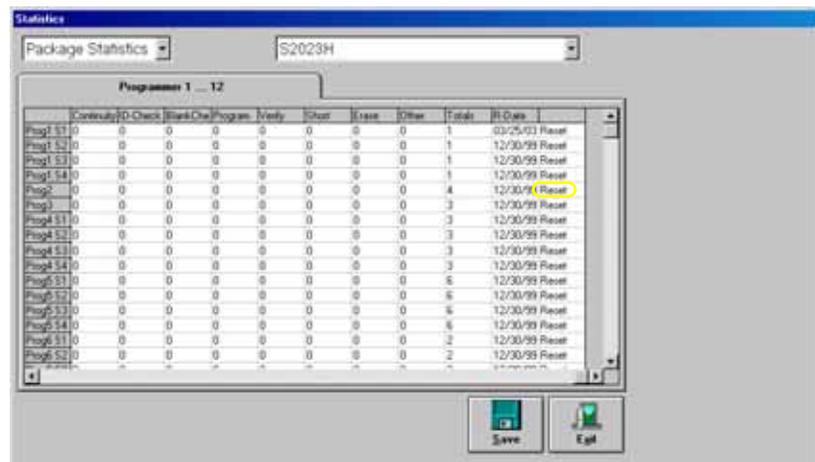
Figure 3-89—Resetting statistics for Prog2

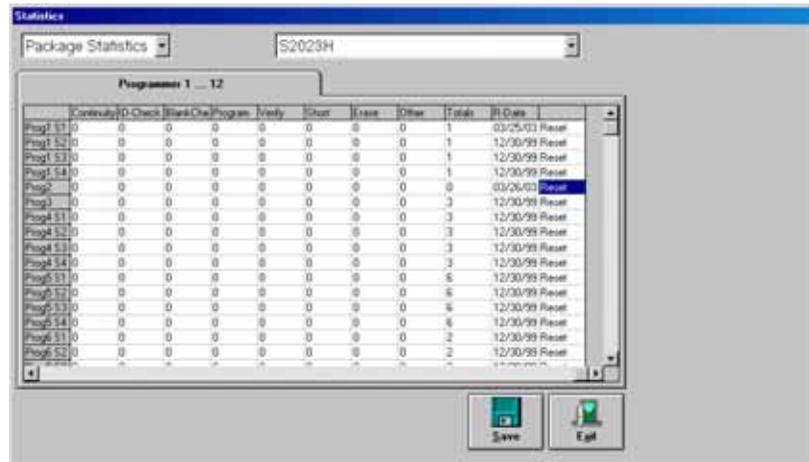3b) The R-date (reset date) is set to the current date and statistics are reset to all zeroes.

Figure 3-90—R-date and statistics are reset

Maximize Programming Yields

Occasional declines in system yields may occur during day to day operation of the PS Series System. While overall yield levels can vary depending on device manufacture, any short term change in yields of more than 0.5% is sufficient reason for investigation of a local or immediate cause of variation. These changes in yield can be attributed to a number of causes, including the manufacture of parts, socket issues, system maintenance, and process errors.

Manufacture of Parts

Variations in the manufacture of parts may affect yields in an automated system, such as:

☞ Variation in dimensions from different manufacturing lots or facilities can cause parts to fit improperly in the sockets or require re-calibration of the system to be placed successfully.

☞ Presence of residual plastic on the edges of the parts ("flashing") can cause parts to rest improperly in the sockets.

☞ Die changes (shrinks, process improvement for improved wafer yield, etc.) require new algorithms. Data I/O tracks these changes with vendors and recommends all customers subscribe to the algorithm update program.

☞ Die processes contain variability. Programming yields can sometimes vary on a normal die. Devices that are in the early part of their life cycle tend to have more fluctuations in yields as the semi-vendor's manufacturing process stabilizes.

☞ Multiple fabrication sites often produce the same devices. Performance characteristics, including programming yield, can vary from location to location.

☞ Lead oxide accumulating on device leads is an issue for some devices. This can vary with age and the conditions with which the devices are stored.

☞ Programming yields decrease with the number of programming cycles. Devices that are processed more than once are more likely to experience problems.

Socket Issues

The programming sockets are perhaps the most important and vulnerable element of the PS Series System. They are subject to residue buildup, damage from mis-inserted devices (perhaps due to poor calibration of the placement system), and general wear and tear. Socket life is generally rated by their manufacturer as insertions per socket, depending on the type, after which yields may drop significantly.

Data I/O recommends that you number adapters for each programmer in order to track an accurate count of insertions on each socket.

Socket conditions that cause varying yields include the following:

☞ Debris of any type can prevent sockets from closing completely. Sometimes the debris may not be visible. Simple actuation may clear debris, or it may be necessary to clean sockets with low pressure air.

NOTE: Once per shift, clean or blow out sockets with low pressure air (20-30 PSI). More frequent cleaning is recommended in a dirty environment.

☞ Small molded tabs between each of the contact fingers may become damaged, preventing one or more fingers from closing completely and causing intermittent socket failures.

☞ Clamping fingers are one piece, from the connector pin to the contact finger. If the connector pin is not seated in the molded base it will affect the contact point of the finger.

☞ Bent or distorted contact fingers can cause intermittent socket failures.

System Maintenance

System maintenance is critical to maintaining high yields. Periodic cleaning, adjustment and replacement of worn elements will ensure the best possible performance. These periodic procedures are outlined in *Chapter 6—Maintenance* and should be followed closely.

Careful system calibration is also critical to maintaining high yields. While not normally required during steady operation, calibration of the PS Series System should be checked anytime yields fall to unacceptable levels.

Process Errors

Finally, a number of process errors can result in reduced yield. While an automated approach eliminates most human error during production, errors in system setup or maintenance programs can result in reduced yield:

☞ Using old algorithms even though the facility has access to updated algorithms, because no formal internal process has been defined for

updating algorithms. PS Series System algorithms are updated weekly at www.dataio.com.

☞ Selecting the wrong part number in a job, thus using the wrong algorithm.

☞ Changing programming parameters (sector protection, security options, verify options, continuity testing, blank checking).

☞ Measuring yields too infrequently, so that a drop in yield rates is not detected until a large number of devices have failed.

☞ Using the wrong data file.

☞ Socket abuse, such as digging failed devices out with sharp instruments.

☞ Changing to second or third source. Lower quality parts tend to produce lower yields.

Monitor Daily Operation Logs

Daily operation logs are saved for each operation that the PS Series System performs. As the operation is performed, its completion status is noted in the log for statistical purposes, or for troubleshooting if necessary.

To view the daily operation logs:

1. Prepare the system—
1a) On the Setup window, select **System**.
1b) From the System window, select **LogFile**. See *Figure 3-91*.
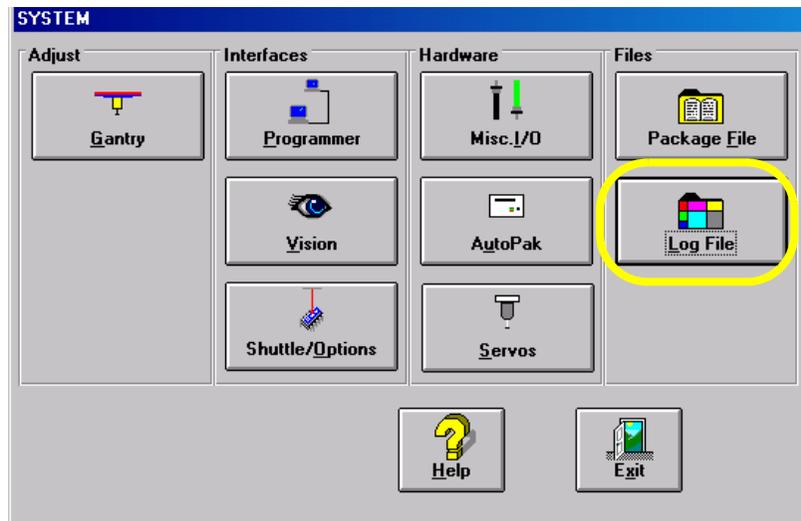
*Figure 3-91—Select **LogFile***

2. The *LogFile* window—
2a) Information is displayed about the successful or unsuccessful completion of any operation of the PS Series System.
2b) (Optional) View, print, or store daily operation logs to another location.

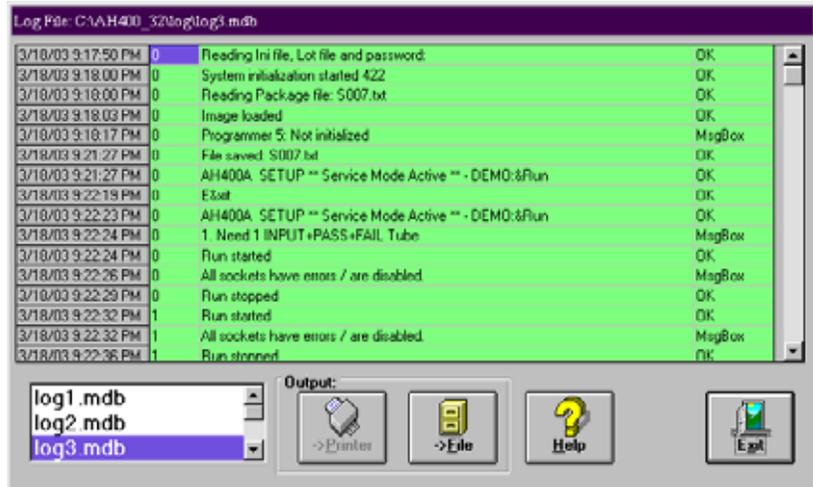*Figure 3-92—LogFile window*

NOTE: *LOG1.MDB = Sunday, LOG2.MDB = Monday, LOG3.MDB = Tuesday, and so on.*

Chapter 4

System Theory

The PS Series System consists of various electrical and mechanical systems which provide facilities for—or perform a portion of—the overall operation of the machine. Their operation and relationship with the other components of the system are described in this chapter.

Main Power System

The main power system provides primary and generated voltages for use within the PS Series System. Input power is received from the input panel on the rear of the machine. It is a 208–240 VAC, 50/60 Hz, 30A circuit.

Circuit Breakers

208–240 VAC is provided to the programmer power supplies, robot servo motor amplifiers, and the AutoPak. There are four circuit breakers on the input panel: three that provide circuit protection for each of the 208–240 VAC circuits, and one 30A main circuit breaker feeding the entire system. The three circuit breakers fed from the main circuit include: a 10A servo motor circuit breaker, a 20A handler circuit breaker (for the AutoPak), and a 15A circuit breaker for the programmer modules.

AutoPak

The AutoPak provides 115 VAC, 60 Hz, for all other systems in the PS Series System including, but not limited to, the Handler Computer, Programmer Computer subsystem, and video monitor. Additionally, the Auto-Pak provides a power-on control signal to the servo motor power contactor, allowing the 208–240 VAC to be applied to the gantry's X and Y servo motor amplifiers, the laser marking stage contactor (if installed), and two low voltage systems used for sensor power and PNP head motor drivers. See *Figure 4-1*.

Figure 4-1—AutoPak

When the E-Stop button is pressed during an emergency condition, power to the AutoPak is removed, resulting in power loss to the robot and the laser marking system, as their contactors are no longer energized.

WARNING: *When the E-Stop button is pressed, power is still applied to the programmer assemblies. The electrical contactors only remove power to the robot, laser marking system, and other components associated with the AutoPak. The programmers and their associated power supplies are directly fed by the 208–240 VAC power source. As long as the front panel main power switch is in the **ON** position, power will be applied to the programmers. Use great caution when working behind the panels of the PS Series System while main power is turned on.*

The AutoPak also provides an interface for all sensor systems, several visual indicators, and power and control of other systems throughout the PS Series System. Sensor conditions are reported back to the Handler Computer through a series of connections on the rear of the AutoPak. Connections supported by the AutoPak include:

- Air pressure sensors
- Totem pole lights
- Remote control of the laser marking stage and associated sensors
- Power contactor for the laser marking stage
- Tube vibration assemblies
- Component position optics
- Vacuum and pressure control solenoids and sensors
- Safety shield interlocks
- Tape output control and associated sensors
- Label marking system controls and associated sensors
- Additional connectivity for future options

For a listing of all status indicator lights on the AutoPak, see Appendix A, "AutoPak LED Status."

Low Voltage Systems

There are two low voltage power supplies used to generate specialty voltages in the system. One creates 12 VDC and the other 24 VDC.

Programmer Assemblies

The PS Series System consists primarily of the handler assembly (the robot and associated framework), programming modules, and their associated control computers. Depending upon the configuration, there may be only a few programmers, or many. Regardless of the number of programmers installed in the PS Series System, each one is an individual entity, operating independently of the others. A basic logical description of the programmer module component locations is shown in *Figure 4-2*:
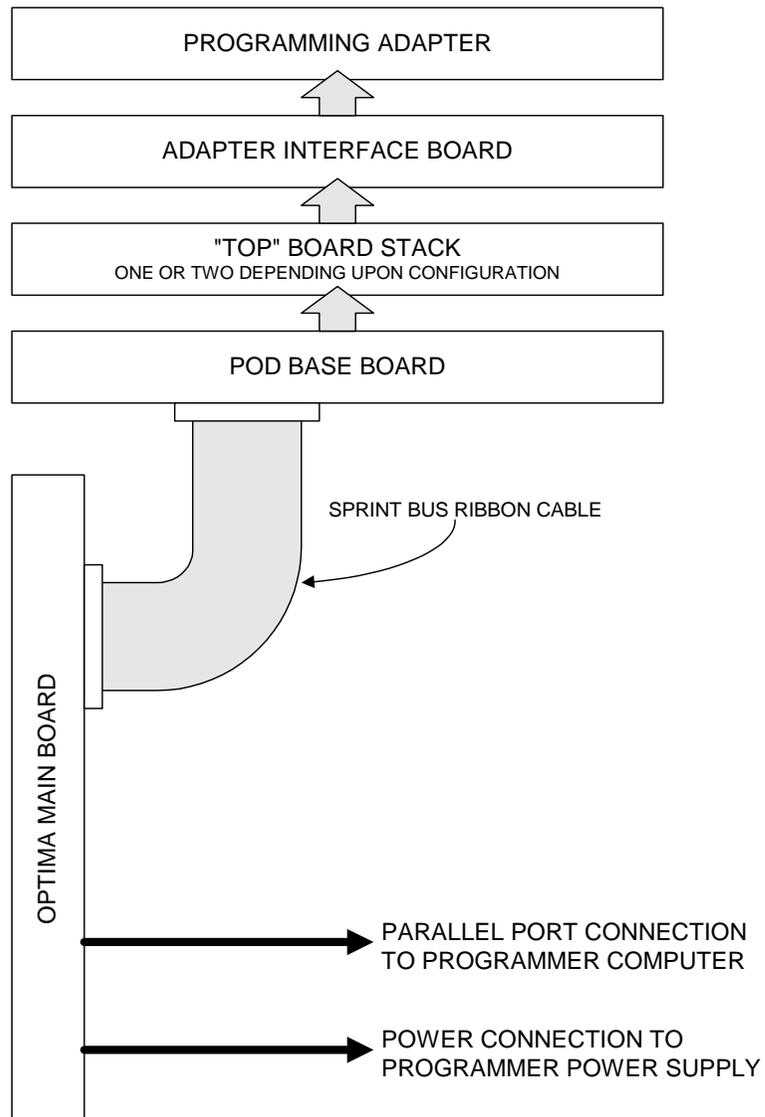
Figure 4-2—Logical layout of Optima programming module

Each of these programmers consists of five functional assemblies which can be located in *Figure 4-2* above:

- **Optima Main Board—**
  Used for communications purposes, provides supply and reference voltages for programming.

- **Pod BASE Board—**
  This PCB contains application specific integrated circuits (ASICs) for use as logic-level pin drivers, relays for providing V_{CC} and ground, and transistors for switching high-potential programming voltages. The BASE can provide programming levels for up to 48 pins.

- **"TOP" Board Stack—**
  Depending upon configuration, a circuit board or set of circuit boards that may also contain additional ASICs, relays, and transistors to support devices up to and beyond 84 pins. It also provides connections for the adapter interface board. This board or board set may change depending upon application, for example with EEPROM or Flash devices.

- **Adapter Interface Board—**
  Provides a method of attaching a programming adapter to the top of the programmer assembly.

- **Programming Adapter—**
  Contains the physical socket into which the device is inserted by the PNP head for programming. These programming adapters are interchangeable so that the PS Series System can be used to program many different device types and packages.

Programmer Power Supply

The programmer power supply provides the necessary voltages to operate the programmers. There are multiple programmers in the PS Series System and one power supply for all programmers. The power supply provides +5 VDC and +12 VDC, and utilizes the system's 208–240 VAC, 50/60 Hz input voltage to create them. There are 24 fuses between the power supply and the programmers: 12 fuses on the +5 V line and 12 fuses on the +12 V line.

The programmer power supply is located on the inside floor of the PS Series System as viewed from the access panel above the input panel on the rear of the machine.

Programmer Computer Sub Frames

The Programmer Computer, a PC-104 format industrial PC, is a small microcomputer with all components on board to operate as a self contained unit. On the PS200, the PC-104 is 486-based, and on the PS300 it is Pentium-based. The Programmer Computer is required to be inserted into a sub frame that is rack mounted. Each sub frame can host up to six Programmer Computers, and one bay is used for a power supply. There is one Programmer Computer for each programmer in the system.

Each Programmer Computer contains a small flash memory component with start instructions and abbreviated Microsoft® DOS® operating system and networking components, as well as a larger memory component acting as a

solid state hard disk. Additionally, there are keyboard, mouse and monitor ports on the front as well as the back of the Programmer Computer for interface purposes.

Each Programmer Computer has a parallel port that is accessed at the rear of the sub frame, and is used to communicate with the Optima programmer. Each Programmer Computer communicates with the Server Computer in the PS Series System via a 10Base2 Ethernet connection also accessed at the rear of the sub frame.

When starting, a network connection is established with the Server Computer, and all the required software components used to operate the programmer are downloaded to the solid state hard disk. Once they are downloaded, the computer runs the programs and receives cues and commands from the AH400 software when programming is required.

The software that is running on the Programmer Computers is also used for programmer job definition. Through a specialized interface that is run directly from the Programmer Computer, a programming job can be created, including device selection, package type, and data file use. When completed, the newly created job is uploaded via Ethernet to the Server Computer for use with all Programmer Computers and the AH400 software.

Computer System

The computer system of the PS Series System consists of two individual computers (the Handler Computer and Server Computer), as well as various networking components that allow them to communicate with each other and the Programmer Computer sub frame.

Server Computer

The Server Computer is used for network device authentication as well as file storage for the various job files and data files to be used when programming devices. It communicates with the network by 10BaseT Ethernet. Additionally, each Programmer Computer downloads its operating software from the Server Computer during its start cycle.

The Server Computer is configured at the factory with an outboard keyboard, mouse, and monitor, and runs on site without any of these components attached. There is generally no user interaction with the Server Computer, thus no interface is required for normal operation. If service to the Server Computer is required, it will be performed with ancillary components provided by the PS Series System service person.

Handler Computer

The Handler Computer operates using the Microsoft® Windows 95/98 operating system and the client network communications. It hosts the AH400 operating software, as well as several subsystems within the machine including:

- Computer vision system and software
- PNP head motion control system
- Label marking system
- AutoPak interface

It communicates with the network by a 10BaseT Ethernet connection, and contains mappings of all the major disk volumes used by the network. Any data transfer required from a major network volume can be accomplished on the Handler Computer using Windows® Explorer. The Handler Computer does not contain mappings to any of the Programmer Computers.

> *NOTE: The 10BaseT Ethernet card is a PCI interface card and **must** be installed into a bus master capable PCI slot in the Handler Computer. Failure to do so may result in the operating system's inability to automatically detect the network card settings and network communications may be hindered.*

The PS Series System user interface (AH400 software) is run from the Handler Computer. It contains all graphic components that the system operator uses during normal operation, including job selection, option configuration, programmer setup, and system adjustments.

The computer vision interface card is installed in the Handler Computer, as well as its operating software. This system is run in conjunction with the AH400 operating software to ensure proper alignment of programmable devices before being placed into the programming sockets.

The motion control system interface allows the AH400 software to communicate with the PNP head gantry system. Movement commands and positional feedback are provided to the AH400 software with this system.

The Handler Computer and AH400 software communicate with the label marking system via serial port on the rear of the Handler Computer. Label data transfer and labelling system responses are sent to and from the label marking stage through this connection.

The AutoPak interface determines the condition of the various sensors and systems located throughout the PS Series System as reported to the AutoPak. These conditions are then read by the AH400 software to determine the state of the machine before issuing system commands. See Appendix A, "AutoPak LED Status."

Network Components

The PS Series System uses a simple network to transfer data between the various computers in the system. The backbone of the machine's network is a 10BaseT hub located above the KVM switch box behind the main power switch. It is accessible from the panel on the left side of the PS Series System.

> *NOTE: Do not attempt to access the network hub from the blank panel above the keyboard on the front of the keyboard. There are no network connections accessible from this location. Damage to network cabling could result while attempting to move network components in this location.*

The Handler Computer and Server Computer each connect to the hub via one of the RJ-45 modular connections on the hub. The Programmer Computers connect to the network via RG-58 BNC coax connection on the back of the hub.

The coax connection, also called a 10Base2 Ethernet connection, is a daisy chained, bus style network topology. Each of the PC-104 network connections is made on the sub frame, as a coax hard line is jumped from slot to slot with a BNC connection found at either end of the chain. Typically, one end of a PC-104 sub frame's network has a 50Ω BNC network terminator. The other end of the sub frame's network uses a small RG-58 BNC jumper cable to attach to one end of the second PC-104 sub frame's network connection. Lastly, an RG-58 BNC jumper cable is run from the other end of the PC-104 sub frame to the hub. Here the other end terminates with a BNC T-connector and a 50Ω terminator. Refer to *Figure 4-3* for details:
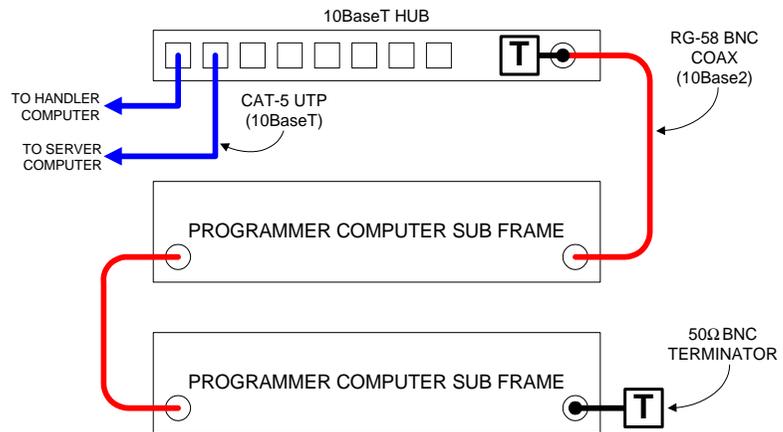
Figure 4-3—Basic PS Series System networking diagram

User Interface System

Operator interaction with the PS Series System is achieved with the following equipment:

- Touch screen monitor
- Keyboard and mouse
- KVM switch boxes
- Light tower

Through the use of these assemblies, the operator may communicate with and control the PS Series System, as well as view system feedback and status indications.

Touch Screen Monitor

The touch screen monitor is a 15-inch LCD flat panel with integrated touch screen. There are three cabled connections: DC electrical power, a DB-15HD SVGA monitor connection, and a DB-9 RS-232 connection for touch screen communications.

The 115 VAC supply is provided by the AutoPak. This monitor is not designed for use with 220 VAC electrical connections and should not be plugged into the 208–240 VAC main power.

The SVGA monitor connection is plugged into the KVM switch box main monitor connection, as the monitor will be the central display for all computer systems on the PS Series System.

The RS-232 connection for the touch screen is plugged into the COM1 port on the Handler Computer. The touch screen can be used in place of the mouse for operations or any other tasks that take place on the Handler Computer. The touch screen does not work with the Programmer Computers or the laser marking system computer.

Keyboard and Mouse

The PS Series System uses an integrated keyboard and mouse/trackball for space saving purposes. The keyboard and mouse are plugged into the KVM switch box main keyboard and mouse connections, and they are used as the central control mechanisms for all systems on the PS Series System.

The keyboard can be used to switch among different computer interfaces, as follows:

1. Press <Ctrl> twice. A list of all computers is displayed on the touch screen monitor.
2. Use the up and down arrows to select a computer.
3. Press <Enter>.

KVM Switch Boxes

The KVM switch boxes have a series of push buttons on the front panel used to select the system to be viewed and controlled.

The components connected to the KVM switch boxes and their positions are as follows:

Upper Switch Box

- **A** - switches screen to **Handler Computer interface**
- **B** - switches screen to **Server Computer interface**
- **C** - switches screen to **Laser Computer interface** (optional)
- **D** - switch location not currently used
- **E through H** - switches screen to **Programmer Computer 1-4 interfaces** respectively

Lower Switch Box

- **A through H** - switches screen to **Programmer Computer 5-12 interfaces** respectively

Each switch box has five sets of connections on its rear panel: one master set used to connect the keyboard, mouse, and monitor; and four identical slave

sets, one for each computer system to be connected to the keyboard, mouse and monitor.

NOTE: The KVM switch box does not switch touch screen signals. The touch screen is hardwired to the Handler Computer, and is only used with programs located on the Handler Computer.

Light Tower

The light tower located on the top of the PS Series System is used as a visual indicator of the operating condition of the machine. It receives system status signals from the AutoPak and displays the following conditions:

Light	Condition	Action Required	Possible Causes	Machine Status
Red	Major error	Operator intervention is mandatory. Likely that tools and troubleshooting skills required.	Motion control system error; actuator error; vacuum sensor malfunction; insufficient air pressure; possible collision ahead; socket opener sensor error; input shutter error; laser not ready; software exceptions.	Stopped
Yellow/ Red (alternating)	Error	Operator intervention is mandatory. Correction through AH400 or minor hardware adjustment.	Unprogrammed devices on Input/Pass tray; labeler error; setup-related errors; serialization errors; laser error; chip lost; tape input error; no programmer can be used; file read/write error.	Stopped
Yellow	Normal stop	Operator intervention is mandatory.	Output media full or input media empty.	Stopped
Yellow/ Green (alternating)	Normal	Operator intervention is suggested.	End of job; vacuum errors present on programmers; sockets disabled due to errors.	Processing or Stopped (end of job)
Green	Normal	No operator action needed.	Processing devices; clearing sockets to reject output.	Processing

Figure 4-4—Light tower status

Safety Systems

The PS Series System employs various safety systems to assist in the prevention of personal injury, as well as potential damage to the equipment. Because of the speed and force by which the PNP head moves, it is imperative that these safety systems are operational and are never bypassed.

Emergency Stop

There are two Emergency Stop buttons—or *E-Stop buttons* as they are often referred to in this manual—mounted within easy reach on the PS Series System chassis. The E-Stop button is a bright red button designed for high visibility and should be pressed in an emergency condition.

The E-Stop button is a series switch in line with the 208–240 VAC power supplying the AutoPak. In its normal operating position, the circuit is closed, and power is supplied to the AutoPak. If the AutoPak is turned on and normal operating conditions exist, all systems powered by the AutoPak will also have power applied.

When the E-Stop button is pressed, 208–240 VAC power to the AutoPak is disconnected, hence power to all of the components powered by AutoPak is removed. The AutoPak also controls the 208–240 VAC contactors for the PNP head servo motor amplifiers and the laser marking system. When the AutoPak power is shut off, these contactors de-energize, and power is shut down to the robot and laser systems as well.

*WARNING: When the E-Stop button is pressed, power is still applied to the programmer assemblies. The electrical contactors only remove power to the robot, laser marking system, and other components associated with the AutoPak. The programmers and their associated power supplies are directly fed by the 208–240 VAC power source. As long as the front panel main power switch is in the **ON** position, power will be applied to the programmers. Use great caution when working behind the panels of the PS Series System while main power is turned on.*

NOTE: Do not press the E-Stop button except in a physical emergency. When pressed, data may be lost, and the job may have to be restarted.

Safety Shield Interlocks

Each of the safety shields found around the operating envelope of the PS Series System has a safety interlock switch associated with it. When any safety shield is opened during normal operation, all robot motion stops, and a "Door Open" message appears on the screen. When the door is closed, motion resumes.

Safety shield condition is monitored by the AH400 software via the AutoPak. The safety shield interlock switches are connected in series and wired to a monitoring port on the rear of the AutoPak. Any open door breaks the circuit and provides a signal representative of an open door to the AutoPak. The

AutoPak, in turn, relays the signal to the AH400 software which halts all robot motion and displays the "Door Open" message.

> **WARNING:** *During tests or normal operation, the safety shield interlocks only halt the motion of the robot when any safety shield is opened. It does not remove power to the robot or stop the cycling operation. When the door is closed, the robot will resume its motion from the point where it stopped moving. In case of a personnel emergency, do not rely on the safety interlocks to create a safe environment in the operating envelope. Always use the E-Stop button to remove power to the PNP head before entering the machine if there is a personnel emergency.*

Pick And Place System

The PNP head consists of two motion subsystems: X- and Y-axes gantry system, and Z- and R-axes motor system. Additionally, there is a vacuum subsystem that is used to pick devices from and place devices into their programming sockets and input/output media. Together, these systems facilitate the movement and proper placement of devices throughout the PS Series System.

Gantry System

The gantry system moves the PNP head on the **X-axis** and **Y-axis**. The system is controlled by the AH400 software and moved with two servo motor amplifiers. Each of the servo motor amplifiers is fed with 208–240 VAC via the servo motor amplifier contactor controlled by the AutoPak. Digital encoders attached to the motors determine the PNP head's position along the lead screws and are accurate to within .0001 inches.

The servo motor amplifiers receive movement commands from the motion controller interface card in the Handler Computer. Positional information from the motor encoders is also interpreted on this card.

Home sensors for both axes provide reference locations for the robot to base movement distances upon, and are also monitored by the motion controller interface card. Each of the optical sensors is powered by the 24 VDC power supply described earlier in this chapter.

The motion controller interface card, in addition to the functions described above, also provides commands and receives responses from the laser transfer assembly (if equipped) and PNP head controls.

Pick And Place Head

The pick and place head facilitates movement on the **Z** and **R** axes using an independent 24 VDC power supply to move the pick and place head up and down, as well as apply rotational corrections. Its motion is controlled by the motion controller interface card in the Handler Computer, and encoders built into the pick and place head provide positional information to the motion controller interface card. When combined with the X–Y robot gantry system, devices may be picked up and placed into any physical location within the

operating envelope. See Appendix B, "PS Series System Work Envelope Robotics and Programmer Schema."

The PNP head has an integrated probe tip through which a vacuum or positive pressure may be applied to attach or remove devices from the probe tip. The probe tip is interchangeable to accommodate various sizes and package types. Always ensure the proper suction cup tip is used for the device to be programmed:

If processing this device type	Use this size tip
FBGA **μBGA**	Small (2mm)
300 mil DIP **20 PLCC** **32 TSOP**	Medium (4mm)
28 PLCC or greater **40 TSOP or greater** **QFP** **600 mil DIP**	Large (6mm)

Figure 4-5—Suction cup tip size

Socket Actuator

The socket actuator is a pneumatic driven solenoid used to actuate the sockets before the PNP head places devices into or removes devices from them. Sensors attached to the solenoid indicate the position of the socket actuator and verify that it is safe to move devices to and from the socket.

The two sensors, one for the up position and one for the down position, are adjustable for optimum sensing of the socket actuator's position. When the "up" sensor is active, the robot system may retract the PNP head and move to another area of the machine. When the "down" sensor is active, the PNP head may extend to pick up a device from or place a device into a programming socket. The socket actuator is not used when picking devices from or placing devices into their input/output media.

Computer Vision System

The computer vision system is used in conjunction with the PNP head to ensure accurate alignment of the devices to be inserted into the sockets for programming. Using data in a reference vision file for the device type to be programmed, the PNP head can compensate for the misalignment of a device in the **X**, **Y**, and **R** (up to 30 degrees) axes. Misalignments can be corrected within .001 inches. The computer vision system cannot compensate for **Z-axis** errors.

The computer vision system consists of a camera, light ring, interface card, and software. The light ring and camera are mounted onto a specialized bracket below the work surface in a location dependent upon the configuration of the machine. The interface card is installed in the Handler Computer, as is its software interface.

The light ring is used to illuminate the device being analyzed by the camera so that an accurate picture may be taken. It is a fiber optic ring illuminated by an outboard light source that is mounted above the network hub, behind the panel above the keyboard and KVM switch box. The light source is powered by 115 VAC provided by the AutoPak.

The camera is mounted to a bracket below the work surface and is optimally focused onto a device attached to the PNP head when in the down position. Focus and alignment data are set using the calibration routine described in "Calibrating the Vision System" on page 6-52, and by the vision system software.

Input and Output Modules

Devices may be presented to and re-packaged from the system in various combinations. The currently supported input and output modules include:

- Tube input
- Tube output
- Tape input
- Tape output
- Tray input
- Tray output

These input and output modules may be used in any combination and are easily configurable when setting up the PS Series System.

Tube Input and Output

The tube input and tube output modules are attached to the work surface toward the front of the machine. Each module accommodates a number of different sized tubes and each is adjustable. Tubes are inserted into the modules through holes in the safety shield designed for them. The input tube module is slanted to cause the devices to slide toward the staging area, while the output tube module is slanted to cause devices to slide away from the staging area. There are no sensors to alert the user when a tube is full or empty.

The tubes are gently vibrated to keep devices moving freely and reduce the likelihood of device jams. The level of vibration may be varied using the adjustment controls found on the right front panel of the machine. Each tube vibrator is powered by 115 VAC from the AutoPak.

Tape Input and Output

Manipulation of devices in a tape and reel form is supported in both input and output modules, depending upon the configuration of the PS Series System. A tape input module may be placed in a bracket on the right front of the PS Series System to provide the machine with devices to be programmed. Additionally, a tape output bay may be attached to the right rear of the machine, and can be equipped with either pressure sealed cover tape or heat sealed cover tape capabilities.

The tape input module provides the system with devices to be programmed via tape and reel. The tape is fed by a toothed sprocket along an adjustable rail system. As the tape is fed, the cover tape is removed by a motorized take-up reel, exposing the device to be picked from the tape. The tape is

advanced into the operating envelope one tape pocket at a time. Optical sensors in the input tape module determine whether the tape pocket has a device in place or is empty, as well as the position of the pocket in the tape. When the PNP head removes the device from the tape pocket, the sensors detect the pocket is empty and the tape is moved one position forward. Empty input tape exits from the bottom of the tape feeder. It is not taken up on a reel, but falls freely.

The tape output module allows programmed and marked (if a marking stage is installed) devices to be placed in an output tape for use with another pick and place machine on the production line or another facility. A reel of empty pocket tape is placed on a spindle, and the tape is fed into an adjustable-width track. The tape is pulled through the track with a toothed sprocket at a rate determined by the *pitch* (pocket size and distance) of the tape. Sensors determine the position of the tape and whether the tape pocket contains a device or is empty. Other sensors determine whether the device is seated properly in the tape before being covered.

When a device has been programmed, the PNP head moves the device to the rear of the machine where a shuttle mechanism transports the device to the marking stage (if installed), then to an empty tape pocket. Sensors determine that the tape pocket contains a device, and the tape is advanced one position as set by the pitch control on the tape output module.

A roll of cover tape is installed on its dedicated spindle on the machine. It is threaded through the tape output module so that it is applied to the pocket tape before it is placed on an output spool. The cover tape may be pressure sealed with a cold adhesive and pressure rollers or heat sealed with a hot iron. The tape output module must be specifically configured for the type of cover tape to be used. Sensors determine when the cover tape roll is empty and needs to be changed.

When the tape is sealed, it is then collected on a takeup spool at the other side of the tape output module. Sensors determine when the takeup spool is full and needs to be removed.

Tray Input and Output

Devices may be presented from and returned to trays within the operating envelope. There are two tray positions. Typically, blank devices are taken from the right-most tray, programmed, and then placed back on the tray from which they came. The left-most tray is typically used as a reject tray for devices that fail an operation during the programming routine.

The tray input and tray output modules accept JEDEC standard trays. Each type of tray must be "learned" by the PS Series System so that the number of rows and columns, as well as the pitch, is properly interpreted when picking devices from, and placing devices in, the tray.

Tray positions are fixed and require no adjustment or calibration. There is a spring loaded knob and plunger on each tray fixture used to hold the tray in place.

Laser Marking System

The optional laser marking system, used to mark devices for easy identification, is enclosed in a separate framework and is attached to the rear of the PS Series System. It contains a Laser Computer accessed from the KVM switch box, a CO_2 laser tube along with its laser marking head and lens controlled by the Laser Computer, and a shutter system for blocking laser radiation while marking.

The laser marking system is set up with a specialized marking program operating on the Laser Computer. Marking jobs are normally executed when the programming job runs. For information on laser marking stage configuration, see "(Optional) Create a Laser Marking File" on page 3-58.

After setting up the laser marking file to be used, the marking system stands ready, waiting for a marking command from the AH400 Handler Computer software. When a device has been programmed and is ready for marking, the PNP head places the device on one of two posts on the *shuttle transport*, a shuttle mechanism that moves the device from the operating envelope to the marking area. Two positions on the shuttle are used to carry devices to be marked, and they are used alternately when using a tray as the output media. Initially, a device is placed in the second marking position and is transported to the marking area.

When the device is ready in the marking area, the Handler Computer sends the Laser Computer a marking command. After the device has been marked, the shuttle moves it back to the drop/pickup location. The system places an unmarked device in the first marking position, then removes the marked device from the second position and routes it to the output tray. The device in the first position is then marked. This process continues, alternating marking positions throughout the remainder of the job.

> **NOTE:** *If the PS Series System is equipped with a tape output module, only one of the marking positions is used. Since the tape output module is placed on the rear of the system, behind the laser marking stage, both marking positions cannot be effectively used in the manner described above. Additionally, if the devices are marked with the labeling system, only one marking position is utilized.*

When the device is moved into position to be marked, a shutter system covers the device before the laser is activated. This blocks any direct or stray laser radiation from harming personnel or equipment. Safety interlocks on the laser shutter prevent the laser from being activated while the shutter is still in the raised position.

> **WARNING:** *Blindness hazard! Always wear eye protection when the laser safety shields are open, such as during service. Direct or diffuse laser radiation can damage eyes. Goggles must block 10.6 µm laser radiation. Goggles protect against scattered energy but not against direct viewing of the laser beam or reflections from metallic surfaces.*

WARNING: *Serious burn hazard! Enclose the laser beam path during service by closing the cover. Direct or diffuse laser radiation can cause serious burns.*

A fume extractor removes toxic fumes and particulate matter from the marking area. It is automatically switched on when using the laser marking stage and should never be bypassed.

WARNING: *Laser marking generates vapors, fumes, and particles that may be noxious, toxic, or even fatal. The fume extractor is required for use with the laser marking option and must not be disabled. Analysis of filter contents obtained following marking a representative variety of devices has revealed a sufficient level of hazardous materials, such as antimony and other heavy metals, to require that the filter be treated as hazardous waste. Filters must be disposed of in accordance with government hazardous waste regulations.*

Label Marking System

Another option for marking devices is the label marking system which uses adhesive labels. The label marking system and laser marking system are mutually exclusive options. The PS Series System may have one or the other, but not both.

Similar to the transport of the laser marking system, in the label marking system the device is moved into the marking position. A newly printed label is removed from its backing tape assisted by an "air knife" mechanism. An air operated solenoid contains a specialized label placement head consisting of a replaceable application surface designed for the specific device package in use and a vacuum system. The labelling head is moved over to and slightly above the waiting label, and a vacuum is applied, removing the label from the backing. The head is then moved over the device and lowered until the label adheres to the surface of the device with direct pressure. Once the label is placed, the vacuum is removed, and the head is moved back to the ready position above a newly printed label. The marked device is then moved to its output media through whatever steps are required.

The label marking system consists of the label feed mechanics (including labelling tape supply reels, labelling head, and take-up mechanics), an air powered transport shuttle mechanism, a print head computer (for printing label data and control of label delivery mechanics), and a motion computer used exclusively for the label placement head. The print head computer receives label printing data from the Handler Computer AH400 software. This data is used throughout the programming job. Each time a job is executed, the labeler is reset and new label data is sent to the print head computer.

The motion computer is a self contained, dedicated computer designed to properly control the placement of the label on the device once it leaves the backing tape. It has a series of sensors used to determine the position of the label placement head and the presence or absence of devices on the labelling pedestal of the shuttle transport. All mechanical adjustments are accom-

plished through software and are accessible through front panel controls of the motion computer.

Chapter 5

Software Maintenance Plan

The Software Maintenance Plan (SMP) allows for the update of programmer algorithm software on Optima programmers to take advantage of newly-supported devices.

Programming algorithms for devices supported by the PS Series System are updated regularly. The customer is entitled to a set period of algorithm updates determined when the system is purchased. Major software releases occur approximately three times a year: January, May, and September. Each one-third of the year is identified by the letter A, B, or C, where **A** indicates the time period from January through April, **B** the time period from May to August, and **C** the time period from September to December. Each release is designated with this letter and the year of the release. For example, B/02 was released in May 2002.

Additionally, intermediate algorithm releases are made available approximately once each week. These releases, called ***interim releases***, are beta algorithms in test and are available as required for the device under test. Interim release algorithms are identified by an additional character in the software version. For example, B6/01, A2/02, Cx/00, Af/99, and Cg/98 are all interim release algorithms as indicated by the letter or number following the release period. Interim releases run from 0-9 and then a-z.

To download intermediate algorithm releases:
1.	**Data I/O Web site—**
1a)	Go to the Data I/O Web site at www.dataio.com.
1b)	Click **Algorithm Updates**.
1c)	Click **Keep your PP100 and PS-Series programmers up to date with the latest programming algorithms**.

2.	**Select algorithms—**
2a)	On the download page, select the Released Algorithms (opt.dos.exe) or the Interim Released Algorithms for logic or memory devices. See *Figure 5-1*.

▶ **Download the latest PP100 and PS-Series programming algorithms here**

Released Algorithms; includes logic and memory algorithms	opt_dos.exe
Interim-Release Algorithms for Logic Devices	paldzipo.exe
Interim-Release Algorithms for Memory Devices	prsdzipo.exe
	Click here for the latest version information

Figure 5-1—Selecting algorithm files

2b)   Follow the onscreen instructions for installing the selected algorithms.

> *NOTE: Interim release algorithms are beta algorithms and should be used with caution in a production environment. During the release period, these algorithms are tested by both staff and customers. If the algorithms test well during this period, they are included in the next major release of Sprint software.*

If the customer is entitled to algorithm updates until the end of C/02, then at the end of C/02 the customer has the option of extending the software agreement to include a greater number of algorithm updates.

> *NOTE: At the end of the software update period, the customer may still use the latest updates of the PS Series System software at any time. However, the customer will only be permitted to use the devices supported up to the expiration date of the software support agreement, as well as any bug fixes that may have been made available after the expiration date. Newly-supported devices and new features will not be available, and will be labelled **SMP** when attempting to select them while creating a job. Once the software support agreement is updated, the customer may take advantage of the new support.*

Updating the Software Maintenance Plan

To update the Software Maintenance Plan, contact Data I/O Sales (see the *Preface* for contact information) for details and to receive a new Keycode. Once you have a new Keycode, complete the following procedure to update the Software Maintenance Plan.

1.   **Prepare the system—**
1a)   Turn on power to the system and start the AH400 software.
1b)   Remove devices and adapters from all programmers.

2.   **First Programmer Computer—**
2a)   Select the first Programmer Computer.
2b)   Press <**D**> to go to DOS.
2c)   At **C:/** type **optitest**. The following message appears:
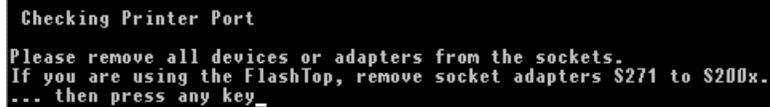
```
Checking Printer Port

Please remove all devices or adapters from the sockets.
If you are using the FlashTop, remove socket adapters S271 to S200x.
... then press any key_
```

Figure 5-2—Prompt to remove adapters

2d)   Verify that all adapters are removed and then press any key to continue.
2e)   The OPTITEST runs in the background. When the test is completed, the Optima Self Test main menu appears:
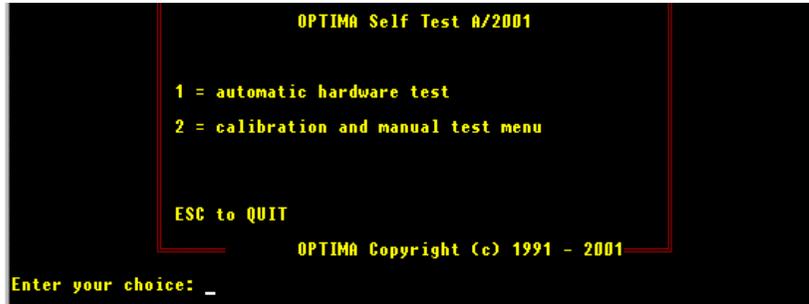
Figure 5-3—Optima Self Test main menu

2f) Type the hidden key **3**. The following message appears:

Figure 5-4—Enter Keycode

2g) Type the Keycode exactly as it was given to you. If the Keycode entered is correct, the following message appears:
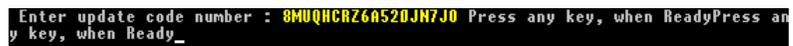
Figure 5-5—Keycode entered is correct

2h) If the Keycode entered is incorrect, the following message appears:

Figure 5-6—Keycode entered is incorrect

2i) Re-type the Keycode. If the message in *Figure 5-6* appears again, contact Data I/O Sales for additional information.
2j) Once the Keycode is entered successfully, run OPTITEST again.
2k) From the Optima Self Test main menu, select option 1 = `automatic hardware test`.
2l) The new Software Maintenance Plan expiration date is now displayed on the right side of the window:

Figure 5-7—New SMP expiration date

3. Repeat Step 2 for all other Programmers—
3a) Select the next Programmer Computer and repeat Step 2.
3b) Repeat until all Programmer Computers have the newly installed Software Maintenance Program.

NOTE: It is important that all Programmer Computers receive updates at the same time. Mismatches in SMP expiration dates may cause intermittent problems with various sites on the PS Series System due to the software's inability to load the proper algorithms if they were introduced after the expiration date.

Chapter 6

Maintenance

Perform the maintenance procedures described in this chapter to optimize uninterrupted operation of your PS Series System and to minimize operational malfunctions. Refer to the manuals that came with your system options for additional maintenance procedures.

NOTE: Only individuals trained on these procedures by Data I/O or its representatives are qualified to perform maintenance on the PS Series System.

Preventive Maintenance

This section describes the preventive maintenance schedule for the PS Series System.

WARNING: Blindness hazard! Always wear eye protection when the laser safety shields are open, such as during service. Direct or diffuse laser radiation can damage eyes. Goggles must block 10.6 μm, laser radiation. Goggles are designed to protect against scattered energy, but not against direct viewing of the laser beam or reflections from other surfaces.

WARNING: Serious burn hazard! Enclose the laser beam path during service. Direct or diffuse laser radiation can seriously burn.

WARNING: Electrocution hazard! Turn off the main power switch before removing any panels. Servicing the PS Series System involves a significant risk of electric shock.

WARNING: The high speed and force behind a moving robot can cause serious bodily injury to anyone working inside the work envelope. Moving the PNP head must be the responsibility of only one qualified individual. All other personnel near the system must stay clear of the work envelope while the robot is moving.

The information in this section is organized as follows:

- Interval Table on page 6-2
- Materials on page 6-3
- Procedures Performed Every Day on page 6-3

Interval Table

The recommended intervals in the table below are based on the system processing 100,000 devices per month. Information about these procedures and intervals can be found on the pages referenced in the **Page** column.

Interval	Component	Action	Page
Every Day	Sockets	Clean with compressed air. Check for wear; replace if necessary.	**6-3**
	Adapter and programmer	Clean with compressed air. Check for wear; replace if necessary.	**6-3**
	Input air pressure	Verify input air pressure is set between 75-80 PSI (517 to 552 kilo Pascals).	**1-16**
Every Week	General system	Clean tops of modules, especially the clamp area, and all areas in work envelope with a clean brush or compressed air.	**6-4**
	Vision camera lens	Clean with compressed air, lens cleaning tissue, and isopropyl alcohol.	**6-4**
	Device probe tip on PNP head, on Tape Output head (if installed), and on Shuttle pedestals (if installed)	Clean and inspect tips to make certain they can create a good vacuum seal on the device. Replace if tip is worn, cut, or damaged.	**6-5**
Every Month	Input air filter	Check; clean and replace if necessary. Drain excess fluid.	**6-5**
	Laser housing	Clean housing to remove laser marking dust.	**6-4**
	Cabinet ventilation fan filters	Clean; replace if necessary.	**6-5**
	Laser marker fume extractor	Replace the pre-filter in the fume extractor if laser marking regularly.	**6-7**
	Laser marker shuttle assembly	Clean.	**6-8**
	PNP head vacuum filter and silencer	Check; replace if necessary.	**6-10**
Every 3 months	Laser marker shuttle belt	Replace if worn; adjust if loose.	**6-12**
	PNP head motor amps	Check connections; tighten if necessary.	**6-12**
	Gantry servo motor amps	Check connections; tighten if necessary.	**6-13**
	Gantry mounting bolts	Check; tighten if necessary.	**6-14**
	Gantry motor flex couplers	Check; tighten or replace if necessary.	**6-15**
	Tray-present sensors	Check; tighten and reset if necessary.	**6-15**
Every 6 months	PNP head and PNP robot wiring harnesses	Check; tighten if necessary.	**6-16**

Interval	Component	Action	Page
	Flexible cables	Clean and check; tighten if necessary.	**6-17**
	Vision camera	Check mounting bolts; tighten if necessary.	**6-18**
	Laser marker fume extractor	Replace the pre-filter and pleated filter in the fume extractor if laser marking regularly.	**6-22**
	Laser Computer	Replace the Laser Computer air filter.	**6-22**
Once a Year	Gantry lead screws	Monthly or whenever the gantries become noisier, clean and lubricate.	**6-24**
	Laser marker fume extractor	Replace the pre-filter, pleated filter, HEPA filter and carbon filter in the fume extractor if laser marking regularly.	**6-24**
	Optima programmers	To optimize programming yields, calibrate the voltages within the Optima programmers.	**6-47**

Materials

To perform preventive maintenance procedures on the PS Series System, you need the following materials:

- Grease gun (THK MG70 with AFB grease or equivalent)
- Lens cleaning paper
- Isopropyl alcohol
- Antistatic cleaner
- Silicone lubrication spray
- Tri-Flow lubricant (Data I/O part number 560-3300-901)
- Compressed air
- Safety goggles
- Disposable protective gloves
- SAE and metric hex head wrenches
- Shop vacuum cleaner

WARNING: Always wear protective eye goggles when you clean with pressurized air. Pressurized air blown directly on the eye or debris blown into the eyes could cause permanent eye damage.

Procedures Performed Every Day

Clean and Check the Sockets on the Socket Module
1. Use compressed air to remove dirt from the sockets.
2. Check the sockets for wear and replace if necessary.

NOTE: The socket replacement cycle depends upon the type of socket used and the socket manufacturer. For the most updated replacement guidelines, refer to the documentation shipped with your sockets.

Check Adapter and Programmer Base Connectors
Each adapter is connected to two programmer base connectors, which are screwed into the work surface of the PS Series System.
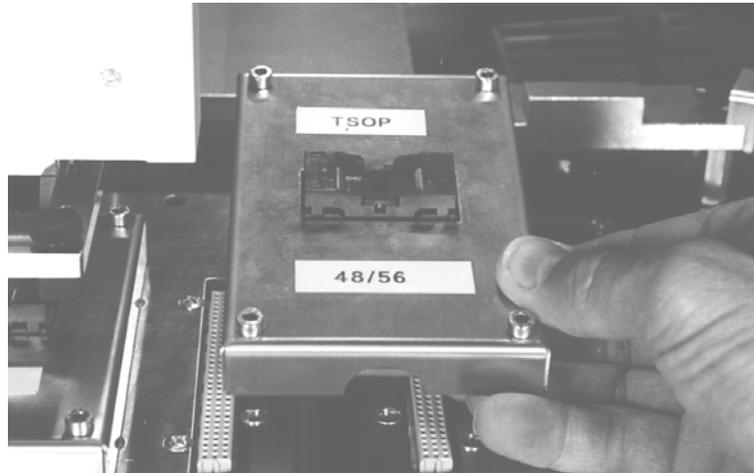
Figure 6-1—Adapter and programmer base connectors

1. Remove the adapter.

NOTE: Remove the adapters by grabbing the sides of the case and gently lifting or rocking.

---

2. Use compressed air to remove dirt from the programmer base connectors.
3. Check the base connectors and adapter connectors for wear, and replace if necessary.

Procedures Performed Every Week

Clean the General System

General cleaning should be performed on a weekly basis. General cleaning includes but is not limited to the following:

1. Remove all dropped components, debris, and other manufacturing materials from all working areas.
2. Remove all components and manufacturing materials that may have fallen inside the system.

WARNING: Do not use compressed air to clean the laser marking assembly or housing.

---

3. Use compressed air to remove all dust and debris from the table surface, under the machine, and from all other visible areas *except* the laser marking assembly and housing.
4. Dust the safety shields, inside and outside, with an antistatic cleaner.
5. Wipe the top and side skins to remove grease, fingerprints, and dust.
6. Dust the top surfaces of the input/output modules.

Clean the Vision Camera Lens

1. **Compressed air—**

1a) Use compressed air to remove all dust and other foreign material from the camera lens.

2. Lens cleaning tissue—

2a) Clean the lens using a lens cleaning tissue dampened with isopropyl alcohol if required.

Check the Device Probe Tip

Worn or damaged probe tips on the PNP head or the Tape Output Module PNP head (if installed) will cause dropped devices and placement problems.

1. Check device probe tip—

1a) Check the device probe tip for cracks or tears in the rubber.

1b) If necessary, replace with a tip of the same size.

2. Verify vacuum on new tip—

2a) From the Setup window, click **System**.

2b) Click **Gantry** to open the Teach Positions window.

2c) Click the Vacuum switch to **ON**.

2d) Place a device on the device probe tip.

2e) If the vacuum does not firmly hold the device, replace the tip with a tip of the same size.

Procedures Performed Every Month

Clean the Input Air Filter and Assembly

1. Disconnect the input factory air line from the input air filter assembly.

2. Remove the air contamination collection bowl.

3. Check the collection bowl and input air filter for dirt, oil, or water. Clean as necessary.

4. Reconnect the collection bowl and air filter.

5. Reconnect the air line.

6. Restore air pressure to the PS Series System.

Clean the Laser Housing

> **WARNING:** *Hazardous materials. Wear safety goggles and disposable protective gloves.*
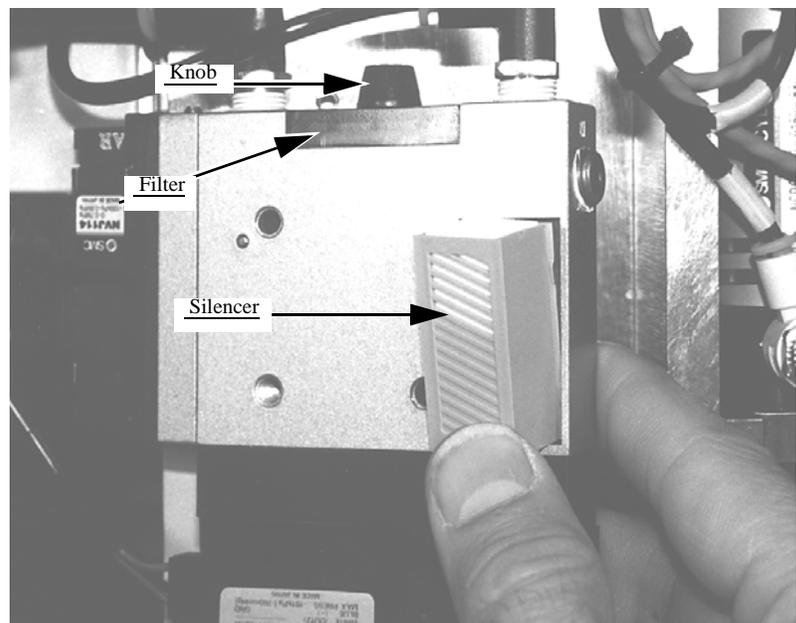
> **WARNING:** *Electric shock hazard. Shut down the PS Series System (see "Shut Down the System" on page 3-16) and turn off the main power switch before removing any panels.*

1. Prepare the system—

1a) Verify that the PS Series System is shut down and the main power switch is in the **OFF** position.

1b) Remove all the laser marker housing panels.

2.   Clean—

2a)   Use a damp paper towel and antistatic cleaner to wipe laser marking dust and other foreign material from the housing into a sealable plastic bag.

2b)   Place the paper towel in the plastic bag. Pull off the disposable protective gloves, place them in the sealable plastic bag, and then close and tightly seal the bag.

WARNING: Numerous government regulations apply to the storage of hazardous waste. Ensure that contaminated filters are properly labeled and stored in your hazardous waste storage area. Also, make sure that they are not stored on your site longer than government regulations allow (the typical limit is 90 days). Check your government (local, state, and federal) regulations for hazardous waste storage requirements.

3.   Reconnect—

3a)   Clean all the clear plastic safety shields with an anti-static cleaner.

3b)   Reconnect all guards and panels.

Clean the Cabinet Ventilation Fan Filters

1.   Prepare the system—

1a)   Verify that the PS Series System is shut down and the main power switch is in the **OFF** position.

1b)   Pull the thin filter drawer out of the cabinet. See *Figure 6-2.*

Figure 6-2—Fan filter drawer

2.   Clean—

2a)   Use a shop vacuum to clean the filters.

2b)   Replace the filters if necessary.

2c)   Push the filter drawer back into the cabinet.

Check Pre-Filter in Fume Extractor

Once a month, check the pre-filter in the laser marker fume extractor to determine if it is clogged. The pre-filter is shown in *Figure 6-3*.
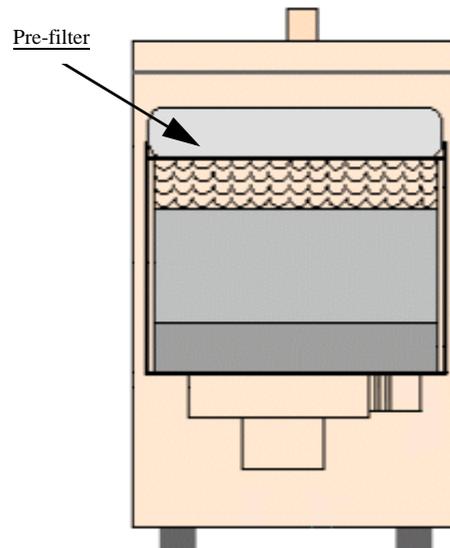
Pre-filter

Figure 6-3—Location of pre-filter

WARNING: *Failure to replace the laser vacuum filters at the appropriate intervals could create a hazardous operating environment.*

WARNING: *Hazardous materials. Wear safety goggles and disposable protective gloves.*

WARNING: *Electric shock hazard. Shut down the PS Series System (see "Shut Down the System" on page 3-16) and turn off the main power switch.*

WARNING: *Do not clean the laser vacuum filters by blowing with compressed air, shaking, or using any other method that allows the particulate trapped by the filters to be released into the work environment.*

1. **Prepare the system—**
1a) Verify that the PS Series System is shut down and the main power switch is in the **OFF** position.
1b) Remove the lower back laser housing panel.
1c) Loosen the vacuum hose clamp and detach the vacuum hose from the extractor top.
1d) Undo the four spring clamps on the extractor top and remove the extractor top.

2. **Inspect the pre-filter—**

2a) If clogged or dirty, remove the filter and discard it in a sealable plastic bag.

NOTE: For detailed instructions, "Replace Pre-filter and Pleated Filter in Fume Extractor" on page 19.

Clean the Laser Marker Shuttle Assembly

During extended or heavy periods of use, the shuttle assembly may become dirty and gummed up by laser dust or other foreign material. This situation may cause the shuttle assembly to stall during movement to and from the laser mark position.

WARNING: Hazardous materials. Wear safety goggles and disposable protective gloves.

WARNING: Electric shock hazard. Shut down the PS Series System (see "Shut Down the System" on page 3-16) and turn off the main power switch. Do not use compressed air to remove laser dust.

To clean the laser marker shuttle assembly:

1. **Prepare the system—**
1a) Verify that the PS Series System is shut down and the main power switch is in the **OFF** position.
1b) Remove the upper left laser housing panel. *Figure 6-4* shows the panel removed.

Laser head

Lens
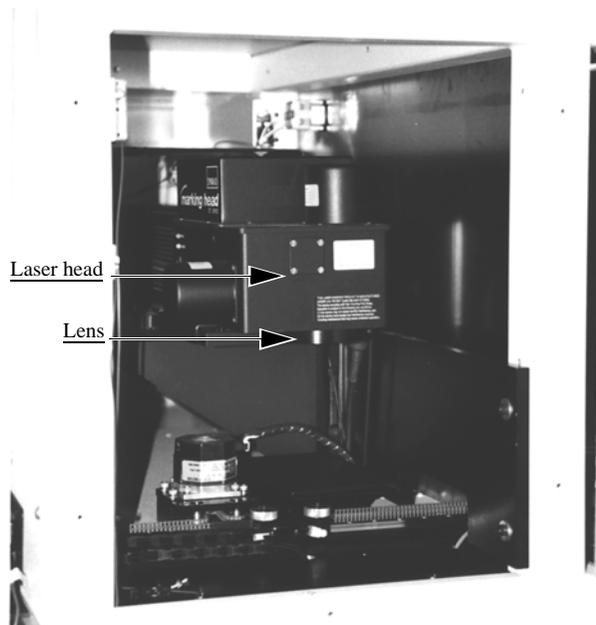
Figure 6-4—Upper left laser housing with panel removed

2. Clean—

2a) Use a damp paper towel and antistatic cleaner to wipe laser marking dust and other foreign material from the housing into a sealable plastic bag.

2b) Place the paper towel in a sealable plastic bag. Pull off the disposable protective gloves, place them in the sealable plastic bag, and close and tightly seal the bag.

WARNING: Numerous government regulations apply to the storage of hazardous waste. Ensure that contaminated filters are properly labeled and stored in your hazardous waste storage area. Also, make sure that they are not stored on your site longer than government regulations allow (the typical limit is 90 days). Check your government (local, state, and federal) regulations for hazardous waste storage requirements.

2c) Clean the laser shuttle track using isopropyl alcohol.

3. Lubricate—

3a) Use Tri-Flow lubricant to lubricate the bearing block and shuttle track.

NOTE: Use a small amount of lubricant, just enough to allow the bearing block to move freely on the track. Too much lubricant will aid in the build up of contamination and cause stalling.

4. Reinstall—

4a) Reinstall all guards and panels.

Adjust Tension on the Shuttle Belt

WARNING: Electric shock hazard. Shut down the PS Series System (see "Shut Down the System" on page 3-16) and turn off the main power switch before removing any panels.

1. Prepare the system—

1a) Verify that the PS Series System is shut down and the main power switch is in the **OFF** position.

1b) Remove the upper left laser housing panel.

2. Check the shuttle belt—

2a) Check the belt for wear and replace if necessary.

3. Adjust shuttle belt tension—

3a) Pull slightly on the center of the shuttle belt to the right of the motor. See *Figure 6-5*.
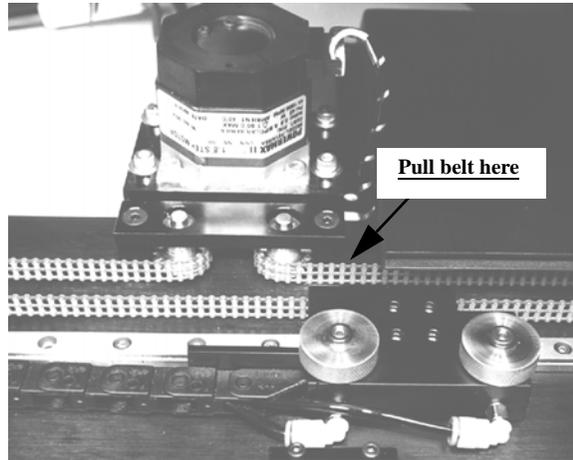
Figure 6-5—Shuttle belt and motor

3b) If the belt moves more than 1/2 inch off its path, loosen the four motor mounting screws (see *Figure 6-6*), and then push the motor away from the belt until the belt tension is correct.
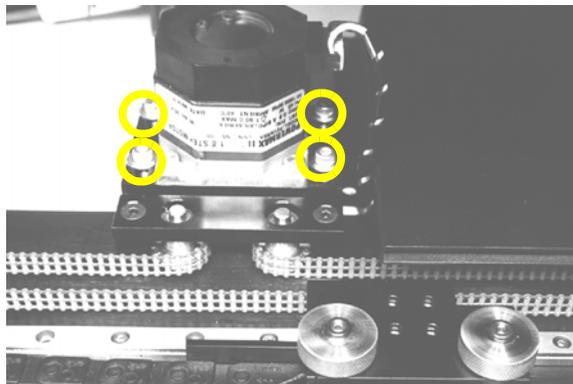
Figure 6-6—Location of four motor mounting screws

3c) If the belt still moves more than 1/2 inch, remove it and cut off as many links as needed to achieve the proper tension.
3d) Replace the belt and tighten the four motor mounting screws.

4.   Check the belt sprocket set screws—
4a) Check the belt sprocket set screws and tighten if necessary.
4b) If a sprocket has loosened and is rubbing against the frame, reposition the sprocket up off the frame and tighten the set screw.
4c) Reinstall all guards and panels.

Check the PNP Head Vacuum Filter and Silencer
A clogged or dirty vacuum filter or silencer will cause vacuum problems, dropped devices, and placement problems.

WARNING: *Electric shock hazard. Shut down the PS Series System (see "Shut Down the System" on page 3-16) and turn off the main power switch before removing the PNP head vacuum filter.*

1. **Prepare the system—**
1a) Verify that the PS Series System is shut down and the main power switch is in the **OFF** position.
1b) Remove the two bolts that hold the vacuum generator to the PNP head.

2. **Check silencer and filter—**
2a) Push the silencer out of the vacuum generator. If dirty or clogged, replace with new silencer (Data I/O part number 288 550 902).
2b) Loosen knob and remove vacuum filter. If dirty or clogged, replace with new filter (Data I/O part number 288 550 901). See *Figure 6-7*.

Figure 6-7—Removing the PNP head vacuum filter and silencer

3. **Reinstall generator—**
3a) Reinstall the generator.

NOTE: For systems with a laser marking option, there are two additional vacuum generators: for Ped 1 and for Ped 2. Follow the procedure described here to check and replace if necessary.

NOTE: For systems with a Tape Output module, there is an additional vacuum generator on the Tape Output PNP head. Follow the procedure described here to check and replace if necessary.

Procedures Performed Every Three Months

### *Replacing a Worn Shuttle Belt*

> **WARNING:** *Electric shock hazard. Shut down the PS Series System (see "Shut Down the System" on page 3-16) and turn off the main power switch before removing any panels.*

1. **Prepare the system—**
1a) Verify that the PS Series System is shut down and the main power switch is in the **OFF** position.
1b) Remove the upper left laser housing panel.

2. **Motor mount—**
2a) Loosen the four motor mounting screws.
2b) Pull the motor all the way forward.

3. **Remove belt—**
3a) Remove the two Allen bolts from the top of the pedestals.
3b) Remove the belt.

4. **Replace belt—**
4a) Replace the belt by reversing the above steps.

PNP Head (Z and R) Motor Amps

> **WARNING:** *Electric shock hazard. Shut down the PS Series System (see "Shut Down the System" on page 3-16) and turn off the main power switch before removing any panels.*

1. **Prepare the system—**
1a) Verify that the PS Series System is shut down and the main power switch is in the **OFF** position.
1b) Open the right side cabinet door and locate the Z-axis and R-axis servo motor amps. See *Figure 6-8*.

Z-axis servo
motor amp

R-axis servo
motor amp

Figure 6-8—Z-axis and R-axis servo motor amps

2.   Check all wiring harness connections—
2a)   Check connections for the Z-axis and R-axis servo motor amps.
2b)   Tighten if necessary.

NOTE: The Z-axis and R-axis servo motor amps are located directly behind the panel to the left of the gantry servo motor amps. Some systems may be slightly different.

2c)   Reinstall all guards. Close and lock door.

Check the Gantry (X-axis and Y-axis) Servo Motor Amps

WARNING: Electric shock hazard. Shut down the PS Series System (see "Shut Down the System" on page 3-16) and turn off the main power switch before removing any panels.

---

1.   Prepare the system—
1a)   Verify that the PS Series System is shut down and the main power switch is in the **OFF** position.
1b)   Open right side cabinet door and locate the X-axis and Y-axis servo motor amps. See *Figure 6-9*.
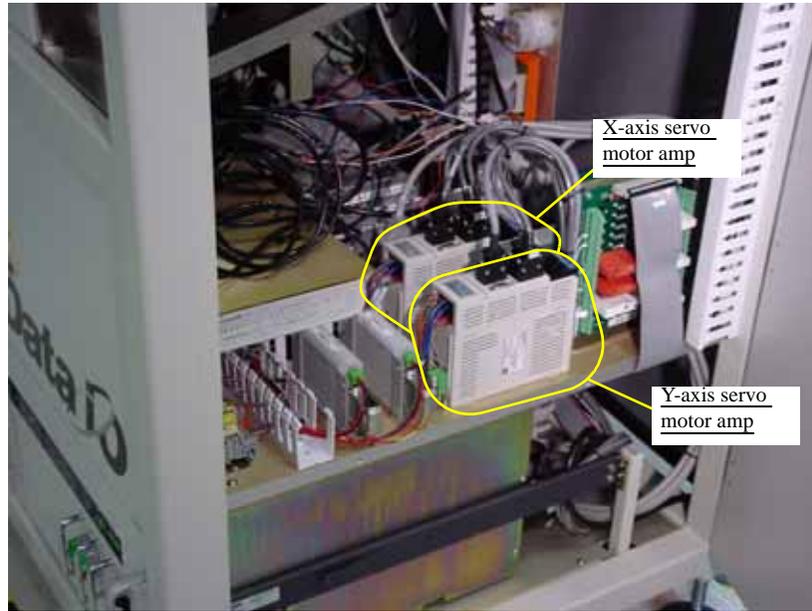
Figure 6-9—X-axis and Y-axis servo motor amps

2. Check wiring harness connections—

2a) Check the wiring harness connections for the X-axis and Y-axis servo motor amps.

2b) Tighten if necessary.

> *NOTE: The X-axis and Y-axis servo motor amps are located just behind the panel and are marked 1Y1 and 1X1.*

2c) Reinstall all guards and panels.

Check the Gantry (X and Y) Mounting Bolts

> *WARNING: Electric shock hazard. Shut down the PS Series System (see "Shut Down the System" on page 3-16) and turn off the main power switch before removing the lead screw shields.*

1. Prepare the system—

1a) Verify that the PS Series System is shut down and the main power switch is in the **OFF** position.

1b) Remove the four bolts that hold the two lead screw shields to the gantry rails.

1c) Remove the shields.

2. Check X-axis lead screw rail—

2a) From the bottom side of the X-axis lead screw rail, check and tighten the mounting bolts located on each end of the rail.

3. Check Y-axis lead screw rail—

3a) From the bottom side of the Y-axis lead screw rail in the center of the rail, check and tighten the four mounting bolts.

4. Reinstall—

4a) Reinstall the two lead screw shields.

Check the Gantry Motor Flex Couplers

The flex couplers are mounted between each axis motor and lead screw.

WARNING: Electric shock hazard. Shut down the PS Series System (see "Shut Down the System" on page 3-16) and turn off the main power switch before removing the lead screw shields.

1. Prepare the system—

1a) Verify that the PS Series System is shut down and the main power switch is in the **OFF** position.

1b) Check and if necessary hand tighten the flex coupler mounting bolts. See *Figure 6-10*.
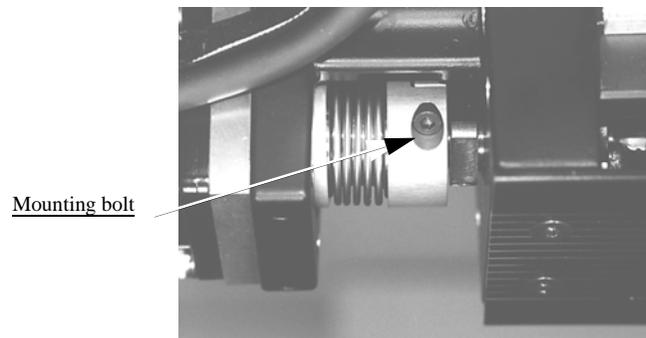
Mounting bolt

Figure 6-10—Flex coupler mounting bolt

2. Flex couplers—

2a) Check the flex couplers for wear or damage.

2b) Replace if necessary using *Loctite 222* on the fastener threads.

Check the Tray-Present Sensors

1. Check fiber optics—

1a) Check that the fiber optics are illuminated at each tray position.

2. Check sensor mounting set screws—

2a) Check and if necessary tighten each sensor mounting set screw.

3. Reset sensor if position has changed—

3a) If the sensor position has changed, loosen the set screws.

3b) Insert a tray into the tray holder.

3c) Adjust the sensor so that AutoPak LED Port 1, Bit 3 is on when Tray 1 is inserted. See *Figure 6-11*.

3d) Adjust the sensor so that AutoPak LED Port 1, Bit 4 is on when Tray 2 is inserted.

3e) If the system includes Tray 3, adjust the sensor so that AutoPak LED Port 1, Bit 5 is on when Tray 3 is inserted.
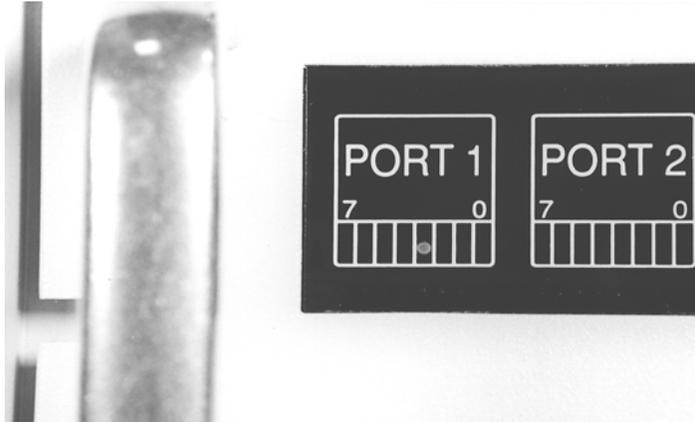
Figure 6-11—AutoPak LED showing Port 1, Bit 3 is on

3f) Tighten the set screws.

3g) Remove the tray and check that the LED is off.

Procedures Performed Every Six Months

Check the PNP Head and PNP Robot Wiring Harnesses

1. Check—

1a) Check and if necessary tighten the mounting screws of the PNP head wiring harness. See *Figure 6-12*.
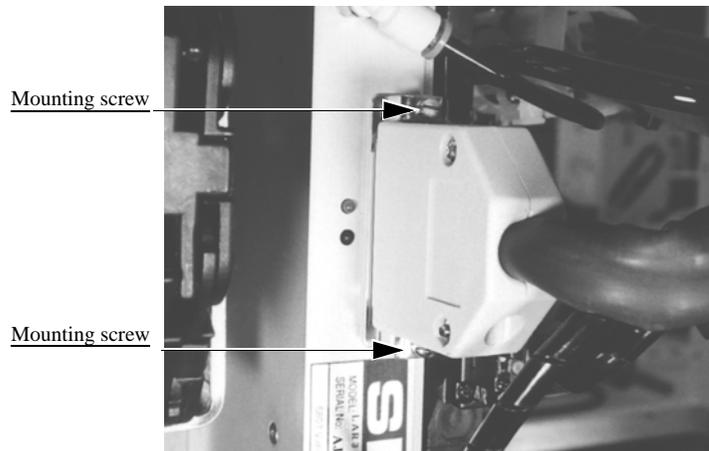
Figure 6-12—PNP head mounting screws

1b) Check PNP robot wiring harness plug connections and make sure that they are secure. See *Figure 6-13*.
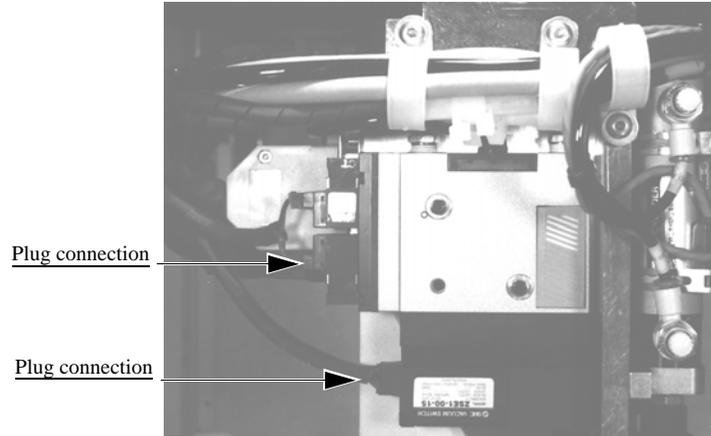
Figure 6-13—PNP robot wiring harness plug connections

Clean and Check the Cable Carriers

1.   Clean—

1a)   Use compressed air to remove all foreign material from the cable carriers.

2.   Check—

2a)   Check that the cables are not too loose or too tight. The cables should be unbroken and in good condition.

2b)   Check the two screws on the ***upper carrier*** and tighten if necessary. See *Figure 6-14*.
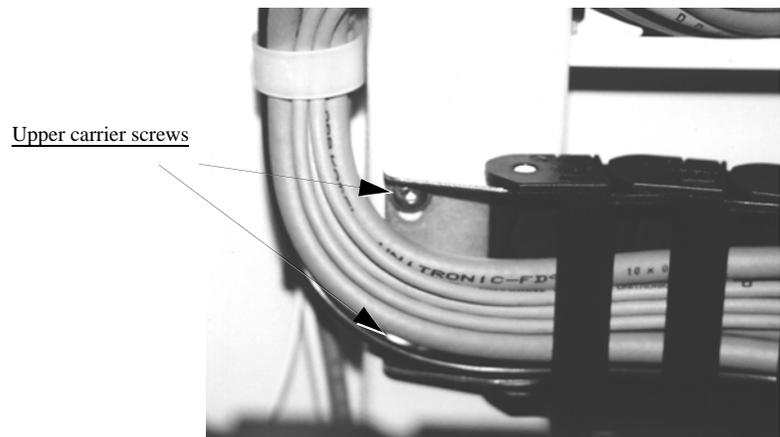
Figure 6-14—Upper carrier screw locations

2c)   Check the two screws on the ***lower carrier*** and tighten if necessary. See *Figure 6-15*.

Lower carrier screws
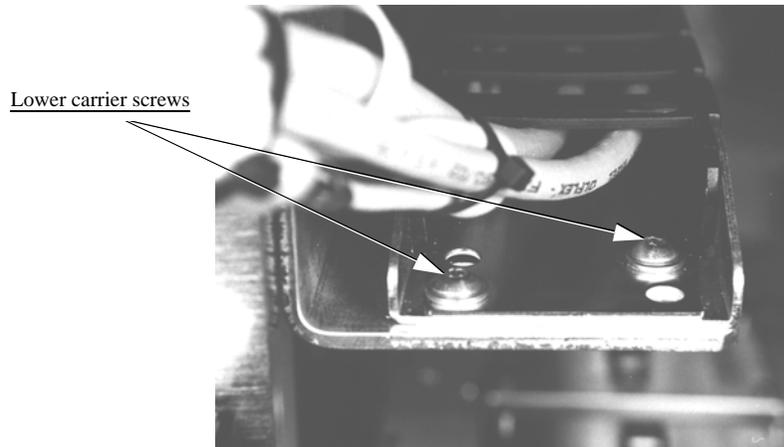
Figure 6-15—Lower carrier screw locations

2d) Check the four screws on the ***center carrier*** and tighten if necessary.
See *Figure 6-16*.
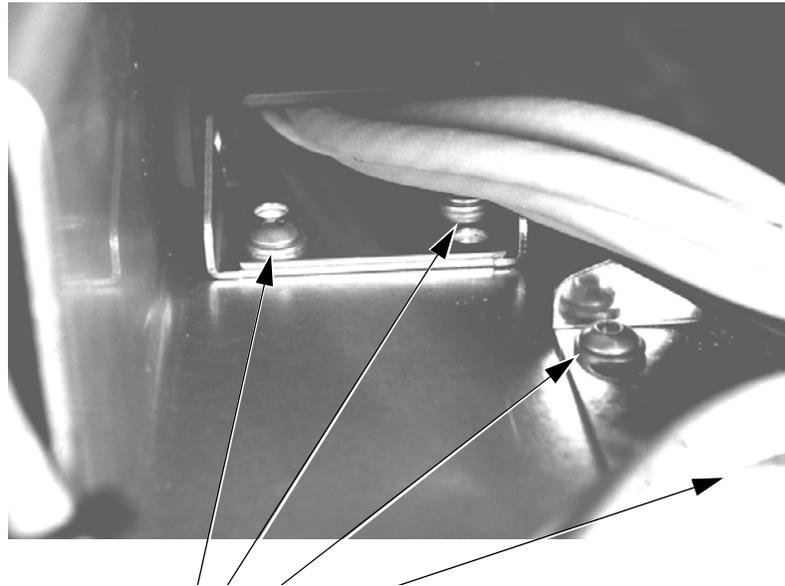
Center carrier screw locations

Figure 6-16—Center carrier screw locations

Check the Vision Camera

WARNING: *Electric shock hazard. Shut down the PS Series System (see "Shut Down the System" on page 3-16) and turn off the main power switch before removing any panels.*

1. **Prepare the system—**

1a) Verify that the PS Series System is shut down and the main power switch is in the **OFF** position.

1b) Remove the right or rear cabinet panel, depending on where the camera is mounted.

2. Check mounting bolts—
2a) Check the mounting bolts above the camera.
2b) Tighten if necessary.

3. Check knob—
3a) Check the knob behind the camera.
3b) Tighten if necessary.

4. Check thumb screws—
4a) Check the cable, aperture and focus thumb screws.
4b) Tighten if necessary.
4c) Reinstall all guards and panels.

Replace Pre-filter and Pleated Filter in Fume Extractor

The laser vacuum filters require changing on a regular basis. The mainte-nance interval depends on the number of devices marked and the amount of text marked. In general, the pre-filter and pleated filter should be changed every six months, or more frequently if low air flow is detected. The carbon filter and HEPA (High Efficiency Particulate Air) filter should be changed every twelve months. See *Figure 6-17* for the location of the four replace-able laser vacuum filters.
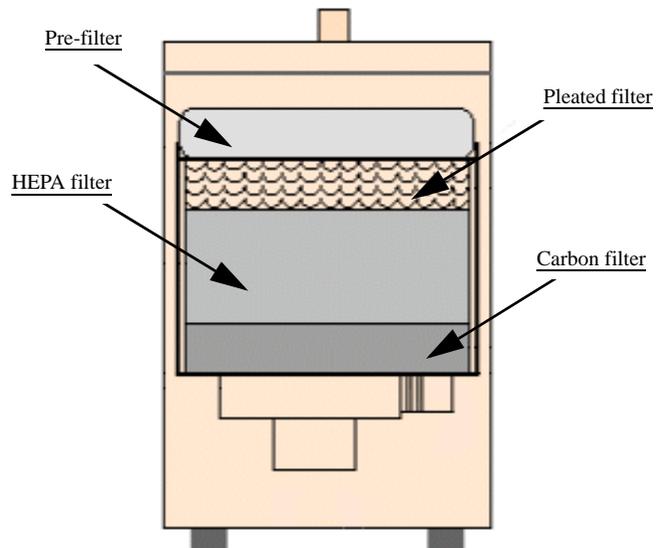
Figure 6-17—Laser vacuum filter locations

The Handler Computer software monitors the air flow sensor on the laser fil-ter system. If the sensor detects low air flow, the error message "Laser filter full" is displayed. When this error message displays, the laser system will mark 10 more devices as defined in the WinAH400.ini file.
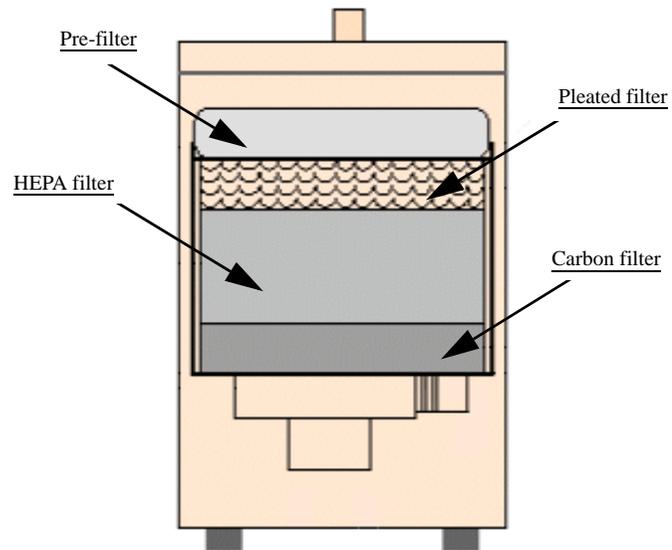
WARNING: *Failure to replace the laser vacuum filters at the appropriate intervals could create a hazardous operating environ-ment.*

WARNING: *This procedure should be performed only by qualified service personnel who have successfully completed Data I/O's laser training class. This procedure involves exposure to hazardous by-products from the laser marking process.*

WARNING: *Electric shock hazard. Shut down the PS Series System (see "Shut Down the System" on page 3-16) and turn off the main power switch.*

WARNING: *Hazardous materials. Wear safety goggles and disposable protective gloves. Do not clean the laser vacuum filters by blowing with compressed air, shaking, or using any method that allows the particulate trapped by the filters to be released into the work environment.*

To replace the pre-filter and the pleated filter:

1. Prepare the system—

1a) Verify that the PS Series System is shut down and the main power switch is in the **OFF** position.

1b) Remove lower back laser housing panel from the laser enclosure by removing the eight screws highlighted in yellow in *Figure 6-18*.

Figure 6-18—Lower back laser housing panel screw locations

1c) Remove side laser housing panel by removing the four screws highlighted in yellow in *Figure 6-19*.

Figure 6-19—Side laser housing panel screw locations

1d) Put on the disposable protective gloves and open the sealable plastic bag.

2. Detach vacuum hose—

2a) Loosen the clamp holding the vacuum hose to the extractor top and detach the vacuum hose from the extractor top. See *Figure 6-20*.

2b) Carefully set the vacuum hose aside.

Figure 6-20—Vacuum hose clamp

WARNING: *Hazardous materials. Do not allow particulate matter in the vacuum hose to be released into the work environment.*

3. Release spring clips—

3a) Release the four spring clips (one on each side) securing the extractor top to the filter system. See *Figure 6-21* for location of one spring clip.

3b) Remove the extractor top and set aside.

WARNING: *Hazardous materials. Do not allow particulate matter in the extractor top to be released into the work environment.*

Figure 6-21—Filter system spring clip

4. Remove pre-filter and pleated filter—

4a) Remove pre-filter and pleated filter and carefully place in sealable bag.

4b) Pull off the disposable protective gloves and place in sealable bag.

4c) Seal the bag and dispose of as a hazardous waste.

WARNING: *Numerous government regulations apply to the storage and disposal of hazardous waste. Ensure that contaminated filters are properly labeled and stored in your hazardous waste*

storage area. Also, make sure that they are not stored on your site longer than government regulations allow (the typical limit is 90 days). Check your government (local, state, and federal) regulations for hazardous waste storage requirements.

5. Replace pre-filter and pleated filter—

5a) Replace the pre-filter with Data I/O Model Name Pre-Filter, Polyester.

5b) Replace the pleated filter with Data I/O Model Name Filter, Panel, Pleated.

6. Re-install extractor top—

6a) Carefully place the extractor top back on the filter system.

6b) Attach the four spring clips that secure the extractor top in place.

7. Re-install vacuum hose—

7a) Carefully attach the vacuum hose to the extractor top.

7b) Tighten the clamp that secures the vacuum hose in place.

8. Re-install panels—

8a) Re-install lower back laser housing panel and side laser housing panel.

Change the Laser Computer Air Filter

The Laser Computer is located in the option bay and can be accessed from the back of the option bay. See *Figure 6-22*.
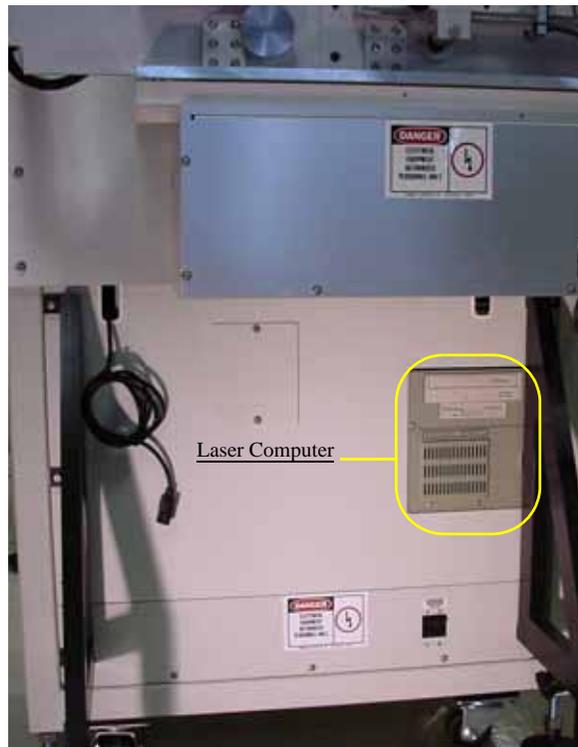
Figure 6-22—Location of Laser Computer

To change the Laser Computer air filter:

1. Remove cover—

1a) Use a screwdriver to remove the two screws holding the filter cover to the Laser Computer. See *Figure 6-23*.
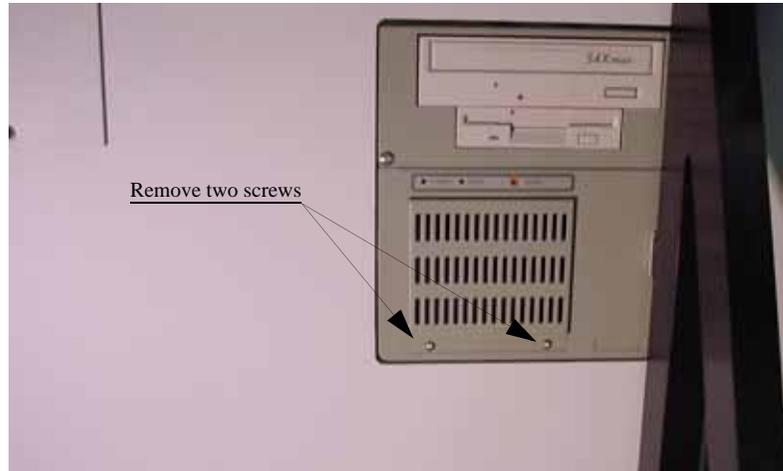
Remove two screws

Figure 6-23—Remove screws from Laser Computer filter cover

2. Replace air filter—

2a) Remove the old air filter and replace with a new air filter. See *Figure 6-24*.

Air filter

Figure 6-24—Replace air filter

3. Reinstall cover—

3a) Use a screwdriver to tighten the two screws holding the filter cover to the Laser Computer.

Procedures Performed Once a Year

Lubricate the Gantry (X and Y) Lead Screws

> ⚠ **WARNING:** *Electric shock hazard. Shut down the PS Series System (see "Shut Down the System" on page 3-16) and turn off the main power switch before removing the lead screw shields.*

1. Prepare the system—

1a) Verify that the PS Series System is shut down and the main power switch is in the **OFF** position.

1b) Remove the four bolts that hold the two lead screw shields to the gantry rails.

1c) Remove the shields.

2. Remove old grease—

2a) Using shop towels and isopropyl alcohol, remove the old grease and dirt build up from the lead screws.

3. Apply new grease—

3a) Using a THK MG70 (or equivalent) grease gun, apply THK AFB Multipurpose lithium (or equivalent) grease to the lead screw grease fittings. See *Figure 6-25*.

3b) Apply grease to the entire length of each lead screw.

> **CAUTION:** *Do not over-apply the grease. Over-applying will cause grease to splatter inside the work envelope.*

Grease fittings
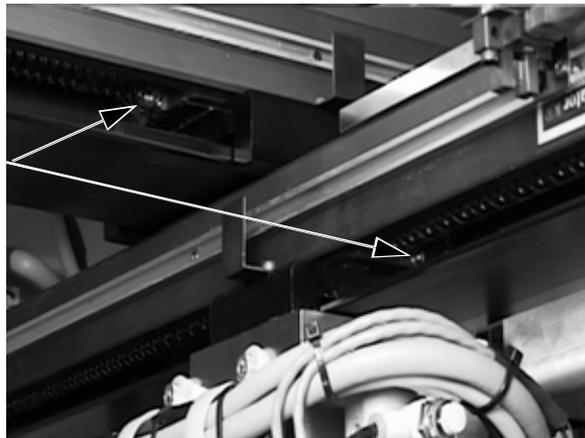
Figure 6-25—Grease fittings

3c) Reinstall the two lead screw shields.

Replace all Filters in the Fume Extractor

Once a year, replace all filters in the laser marker fume extractor. See *Figure 6-26* for the location of the four replaceable laser vacuum filters.

Figure 6-26—Laser vacuum filter locations

WARNING: *Failure to replace the laser vacuum filters at the appropriate intervals could create a hazardous operating environment.*

WARNING: *This procedure should be performed only by qualified service personnel who have successfully completed Data I/O's laser training class. This procedure involves exposure to hazardous by-products from the laser marking process.*

WARNING: *Electric shock hazard. Shut down the PS Series System (see "Shut Down the System" on page 3-16) and turn off the main power switch.*

WARNING: *Hazardous materials. Wear safety goggles and disposable protective gloves. Do not clean the laser vacuum filters by blowing with compressed air, shaking, or using any method that allows the particulate trapped by the filters to be released into the work environment.*

To replace all filters:

1.   Prepare the system—
1a)   Verify that the PS Series System is shut down and the main power switch is in the **OFF** position.
1b)   Remove lower back laser housing panel by removing the eight screws highlighted in yellow in *Figure 6-27*.

Figure 6-27—Lower back laser housing panel screw locations

1c) Remove side laser housing panel by removing the four screws high-lighted in yellow in *Figure 6-28*.

Figure 6-28—Side laser housing panel screw locations

2. Take safety precautions—
2a) Put on the disposable protective gloves and open the sealable plastic bag.

3. Detach vacuum hose—
3a) Loosen the clamp holding the vacuum hose to the extractor top and detach the vacuum hose from the extractor top. See *Figure 6-29*.
3b) Carefully set the vacuum hose aside.

Figure 6-29—Vacuum hose clamp

WARNING: *Hazardous materials. Do not allow particulate matter in the vacuum hose to be released into the work environment.*

4. Release spring clips—

4a) Release the four spring clips (one on each side) that secure the extractor top to the filter system. See *Figure 6-30* for location of one spring clip.

4b) Remove the extractor top and set aside.

> ⚠ *WARNING: Hazardous materials. Do not allow particulate matter in the top cover to be released into the work environment.*

Figure 6-30—Filter system spring clip

5. Remove filters—

5a) Remove all four filters and carefully place in the sealable bag.

5b) Pull off the disposable protective gloves and place in the sealable bag.

5c) Seal the bag and dispose of as a hazardous waste.

> ⚠ *WARNING: Numerous government regulations apply to the storage and disposal of hazardous waste. Ensure that contaminated filters are properly labeled and stored in your hazardous waste storage area. Also, make sure that they are not stored on your site longer than government regulations allow (the typical limit is 90 days). Check your government (local, state, and federal) regulations for hazardous waste storage requirements.*

6. Replace filters—

6a) Replace the pre-filter with Data I/O Model Name **Pre-Filter, Polyester**.

6b) Replace the pleated filter with Data I/O Model Name **Filter, Panel, Pleated**.

6c) Replace the HEPA filter with Data I/O Model Name **Filter, HEPA, Particle, BD Frame**.

6d) Replace the carbon filter with Data I/O Model Name **Activated Carbon Cell, 3lb NET**.

7. Re-install extractor top—

7a) Carefully place the extractor top on the filter system.

7b) Attach the four spring clips that secure the extractor top in place.

8. Re-install vacuum hose—

8a) Carefully attach the vacuum hose to the extractor top.

8b)   Tighten the clamp that secures it in place.

9.   Re-install panels—
9a)   Re-install lower back laser housing panel and side laser housing panel.

Laser Computer

The Laser Computer is used to laser mark devices. Located in the option bay, the Laser Computer requires no maintenance other than cleaning and changing the filter. The filter on the Laser Computer should be cleaned every month and changed every six months. See "Change the Laser Computer Air Filter" on page 6-22.

Server Computer

Enabling "Purge Deleted Files" Option

Some PS Series System Server Computers have the "purge deleted files" option disabled. Over time these deleted files build up, and this build up could slow server traffic.

To enable the "purge deleted files" option:

1.   Select the Server Computer—
1a)   Select the Server Computer.
1b)   Press <Esc> to go to **Available Options**.
1c)   Use the down arrow key to select **Server Parameters**.
1d)   Press <Enter>.

2.   Server Parameters—
2a)   Use the down arrow key to select **File system.**
2b)   Press <Enter>.
2c)   Use the down arrow key to select **Immediate purge of deleted files**.
2d)   Press <Enter> to toggle to On.
2e)   Press <Esc>.
2f)   Press <Esc> again.
2g)   Under Update options, select **Update AUTOEXEC.NCF** and **STARTUP.NCF now**.
2h)   Press <Enter>.
2i)   Press <Enter> again.

3.   Select a Programmer Computer—
3a)   Select any Programmer Computer.
3b)   Press <Esc> to exit the Optima window.
3c)   Press <**D**> to go to DOS.
3d)   Type **m:**
3e)   Press <Enter>.
3f)   Type **purge *.* /a**
3g)   Press <Enter>.

NOTE: This purges all previously deleted files from the Server Computer and frees memory.

3h)   When the purge is complete, type **exit** to quit DOS and return to the Optima window.

Enabling "Long File Names" Option

On some older systems, this option may not be enabled.

To enable the "long file names" option on the Server Computer:

1.   Select the Handler Computer—
1a)   Select the Handler Computer.
1b)   From the AH4000 main window, press **Exit** to quit the AH400 software.

2.   Select the Server Computer—
2a)   Select the Server Computer.
2b)   Press <Esc>.
2c)   Press <Esc> again.
2d)   At the **Exit Monitor?** window, select **YES**.
2e)   Press <Enter>.
2f)   At the SMS1: prompt, type
      add name space long to volume data
2g)   Press <Enter>.
2h)   At the SMS1: prompt, type **down**
2i)   Press <Enter>.
2j)   At the SMS1: prompt, type **exit**
2k)   Press <Enter>.
2l)   At the C:\NWSERVER> prompt, type **server**
2m)   Press <Enter>. Wait for the Server to open the blue **Console Monitor** window.
2n)   Select the Handler Computer.
2o)   Using the Windows Start menu, restart the Handler Computer.
2p)   Login the Handler Computer.
2q)   Start the AH400 software and resume normal operation.

Programmer Computer

Removing and Replacing a Programmer Computer

1.   Prepare the system—
1a)   Turn off the PROGRAMMERS circuit breaker on the rear of the PS Series System. See *Figure 6-31*.

PROGRAMMERS circuit breaker

Figure 6-31—PROGRAMMERS circuit breaker

1b)   If your system has the old style KVM switch box, remove the keyboard and monitor cables. See *Figure 6-32*.

Keyboard and
monitor cables

Figure 6-32—Old style KVM with cables

2.   Remove screws—

2a)   Remove the four screws that hold the Programmer Computer in the
      rack. See *Figure 6-33*.

Four screws
(lower two hidden)
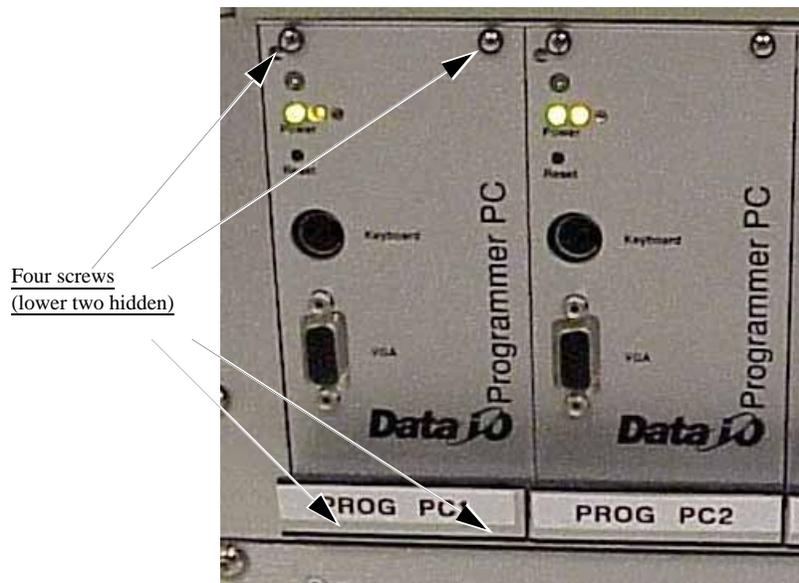
Figure 6-33—Four screws holding Programmer Computer in rack

3.   Remove Programmer Computer—

3a)   Remove the Programmer Computer by sliding it out of the rack. See
      Figure 6-34.

Figure 6-34—Rack with Programmer Computer removed

4.   Install new Programmer Computer—

4a)   Slide the new Programmer Computer into the rack.

CAUTION: Carefully align the slides properly. Do not force the Programmer Computer. Only slight pressure is required to install.

4b)   Tighten the four mounting screws.

NOTE: Reinstall the cables if your system has the old style KVM switch boxes.

---

5.   Turn on the Programmer Computers—

5a)   Turn on the PROGRAMMERS circuit breaker on the rear of the PS Series System. See *Figure 6-31*.

5b)   Select the recently installed Programmer Computer.

5c)   Verify that the Optima window comes up.

6.   Edit the autoexec.bat file—

All Programmer Computers come configured as Programmer 1. If you have installed this Programmer Computer on any programmer other than Programmer 1, edit the autoexec.bat file.

CAUTION: Make a back-up copy of your autoexec.bat file before proceeding. For example, name it autoexecOLD.bat.

6a)   Press <Esc> to exit the Optima window.

6b)   Press <D> to go to DOS.

6c)   Type `C:`

6d)   Press <Enter>.

6e)   At the C:\> prompt, type `edit autoexec.bat`

6f)   Press <Enter>.

6g)   Locate the line **Set Station = 1**

6h)   Change to the correct Programmer Computer number. For example, if you just removed and replaced Programmer Computer in position 3, type: **Set Station = 3.**

6i)   Press **Alt-F-S** to save the changes.

6j)   Press **Alt-F-X** to exit.

Updating Algorithms

To keep your PS Series System up to date with the most current algorithms:

1.   **Download algorithms—**

1a)   Go to the Data I/O Web site at www.dataio.com.

1b)   Click **Algorithm Updates**.

1c)   Click the link for **Keep your PP100 and PS-Series programmers up to date with the latest programming algorithms**.

1d)   On the download page, select the Interim Released Algorithms for logic devices (paldzipo.exe) or memory devices (prsdzipo.exe). See *Figure 6-35*.

▶ **Download the latest PP100 and PS-Series programming algorithms here**

Released Algorithms; includes logic and memory algorithms	opt_dos.exe
Interim-Release Algorithms for Logic Devices	paldzipo.exe
Interim-Release Algorithms for Memory Devices	prsdzipo.exe
	Click here for the latest version information

Figure 6-35—Select interim release algorithm files

2.   **Install algorithms—**

2a)   Follow the onscreen instructions for installing the selected algorithms.

2b)   Save the selected executable file (paldzipo.exe or prsdzipo.exe) and then copy it to the Handler Computer.

> *NOTE: If the installed version of PROM is AE2002, rename files:*
> ***ADAPTER.txt** to **ADAPTER Ae2002.txt***
> ***Lookup.txt** to **Lookup Ae2002.txt***
> ***PROM.exe** to **PROM Ae2002.exe***

2c)   Double click the executable file (paldzipo.exe or prsdzipo.exe) to extract files on I:\SPRINT\ directory.

Updating the BIOS Settings

If the BIOS settings on Pentium-based Programmer Computers need to be updated, this is accomplished by reflashing the BIOS in each Programmer Computer. New BIOS settings will be sent to you electronically or on floppy diskettes from Data I/O Customer Support.

To update the BIOS settings:

1.   **Prepare the system—**

1a)   Verify that the PS Series System is shut down and the main power switch is in the **OFF** position.

2. Prepare the Programmer Computers—

2a) Pull each Programmer Computer out of the rack.

NOTE: See "Removing and Replacing a Programmer Computer" on page 6-29 for detailed instructions.

2b) On each Programmer Computer, verify there is no jumper installed on J30. See *Figure 6-36*.
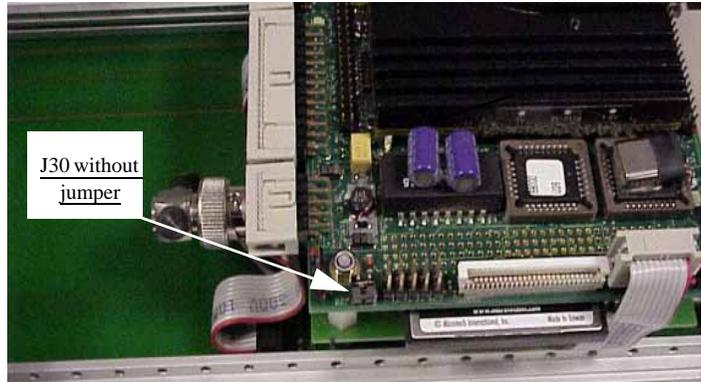
J30 without jumper

Figure 6-36—J30 without jumper

2c) Reinstall each Programmer Computer in the rack.

3. Restart the system—

3a) Turn the main power switch to the **ON** position and verify that the system is running.

NOTE: If you received the BIOS file electronically, copy the file to a floppy diskette.

4. Handler Computer—

4a) Select the Handler Computer.

4b) On the I:\ drive, add a new folder named **BIOS**.

4c) Insert the floppy disk into the Handler Computer.

4d) Unzip the BIOS.zip file from the floppy disk into the folder named **I:\BIOS**. Five files are unzipped:

   P5up.bat
   Eraseeep.exe
   Mp5s_234.cor
   Phlash.exe
   Platform.bin

5. Create a temporary directory—

5a) Select a Programmer Computer.

NOTE: You must repeat Step 5 through Step 10 for each Programmer Computer. The first time through these steps, select the first

Programmer Computer. Repeat until you have updated the BIOS settings on all installed Programmer Computers.

5b) Press <Esc> to exit the Optima window.
5c) Press <D> to go to DOS.
5d) Type **C:**
5e) Press <Enter>.
5f) Type **md P5sev**
5g) Press <Enter>.
5h) Type **I:**
5i) Press <Enter>.
5j) Type **cd BIOS**
5k) Press <Enter>.
5l) Type **copy *.* C\P5sev**
5m) Press <Enter>.

NOTE: All five files are copied to C:\P5sev.

6. Edit the config.sys file—

CAUTION: Make a back-up copy of your config.sys file before proceeding. For example, name it configOLD.sys.

6a) Type **edit C:\config.sys**
6b) Press <Enter>.
6c) Locate the first two lines of config.sys file. They will look like these:
      DEVICE=c:\dos\HIMEM.sys
      DEVICE=c:\dos\EMM386.exe noems i=B000-B7FF x=E000-EFFF
6d) Type **rem** followed by a space at the beginning of the first two lines. After editing, the first two lines will look like these:
      rem DEVICE=c:\dos\HIMEM.sys
      rem DEVICE=c:\dos\EMM386.exe noems i=B000-B7FF x=E000-EFFF
6e) Press Alt-F-S and press <Enter> to save changes to config.sys file.
6f) Press Alt-F-X and <Enter> to exit config.sys file.

7. Update the Flash memory—
7a) Press **Ctrl-Alt-Delete** to restart the Programmer Computer.

NOTE: You will see that the Programmer Computer did not start properly. The messages "Invalid drive in search path" and "Bad command or file name" are displayed.

7b) Press <Esc> to exit the Optima window.
7c) Press <D> to go to DOS.
7d) Type **C:**
7e) Press <Enter>
7f) Type **cd P5sev**
7g) Press <Enter>.

CAUTION: Do not remove power during the reflashing process.

7h) Type **P5up**

7i) Press <Enter>.

7j) You will see "Flash memory has been successfully programmed. PRESS ANY KEY TO RESTART THE SYSTEM."

7k) Press any key. This reboots the Programmer Computer.

7l) Press F2 quickly to enter the BIOS setup utility.

*NOTE: If you miss the BIOS setup, repeat **Ctrl-Alt-Delete** to restart the Programmer Computer.*

8.   Configure the BIOS settings—

8a) From the Main menu, use the down arrow to select "Floppy A."

8b) Use the + key to toggle Floppy A to "Disabled."

8c) Page down to select "USB."

8d) Use the + key to toggle USB to "Disabled."

8e) Use the right arrow to select the Advanced menu.

8f) Use the down arrow to select "PS/2 Mouse."

8g) Use the + key to toggle PS/2 Mouse to "Disabled."

8h) Use the down arrow to select "Large Disk Access Mode."

8i) Use the + key to toggle Large Disk Access Mode to "Other."

8j) Press F10 to exit.

8k) When prompted, select "YES" to save changes.

9.   Restore the config.sys file—

9a) Press <D> to go to DOS.

9b) Type **Edit C:\config.sys**

9c) Press <Enter>.

9d) Locate the first two lines of the config.sys file. They will look like these:
    rem DEVICE=c:\dos\HIMEM.sys
    rem DEVICE=c:\dos\EMM386.exe noems i=B000-B7FF x=E000-EFFF

9e) Remove the **rem** and space from the first two lines: After editing, the first two lines will look like these:
    DEVICE=c:\dos\HIMEM.sys
    DEVICE=c:\dos\EMM386.exe noems i=B000-B7FF x=E000-EFFF

9f) Press Alt-F-S and press <Enter> to save changes to the config.sys file.

9g) Press Alt-F-X and <Enter> to exit the config.sys file.

10.   Delete the temporary directory—

10a) Press **Ctrl-Alt-Delete** to restart the Programmer Computer.

10b) Press <Esc> to exit the Optima window.

10c) Press <D> to go to DOS.

10d) Type **C:**

10e) Press <Enter>.

10f) Then type **DEL P5sev**

10g) Press <Enter>.

10h) When prompted, select **Y** to remove all files.

10i) Type **RD P5sev**

10j) Press <Enter>.

11.   Repeat—

11a) Repeat Step 5 through Step 10 for **all** other Programmer Computers.

Handler Computer

Installing AH400 Service Releases

Periodically you will receive AH400 Service Releases as changes and improvements are made to the software.

> *NOTE: Service Releases are numbered AH400_XXYY, where XX = the version number and YY = the minor release number.*

To install a new AH400 Service Release on your Handler Computer:

1.   Handler Computer—
1a)   Create a backup folder of C:\AH400_32.
1b)   Unzip AH400_XXYY.zip into a temporary folder.
1c)   Rename the file winah400.ini to winah400BU.ini.
1d)   Copy AH400_XXYY.exe, winah400.ini and AH400_Msgs.dll to C:\AH400_32.
1e)   Copy PackageTemplate.txt to C:\AH400_32\Package.

2.   Windows Explorer—
2a)   From Windows Explorer, make C:\AH400_32 the current directory.
2b)   From the Windows Start button, select **Run**.
2c)   Type **regsvr32 ah400_msgs.dll** See *Figure 6-37*.
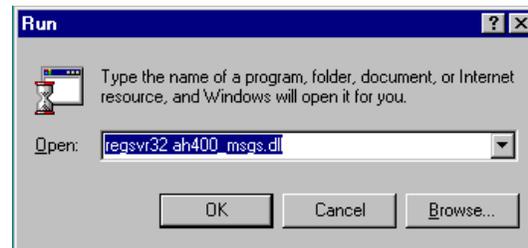
Figure 6-37—Run window

2d)   Click **OK**.
2e)   The message **DllRegisterServer in ah400 msgs.dll succeeded** appears. See *Figure 6-38*.
2f)   Click **OK**.
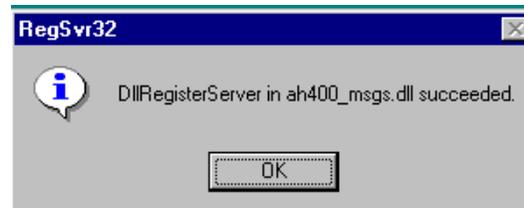
Figure 6-38—Click OK

3.   Edit winah400.ini—
3a)   Using Windows Explorer, browse to and open (with NOTEPAD editor) C:\AH400_32\winah400.ini.
3b)   Using Windows Explorer, browse to and open (with NOTEPAD editor) C:\AH400_32\winah400BU.ini.
3c)   Ensure that the options and settings in the new file are the same as in the backup file.

4.   Update shortcut—

4a)   Right-click the AH400 icon on the Handler Computer desktop.

4b)   Select the Shortcut tab.

4c)   Ensure the Target is pointing to the latest AH400_32.XXYY.exe file. See *Figure 6-39*.
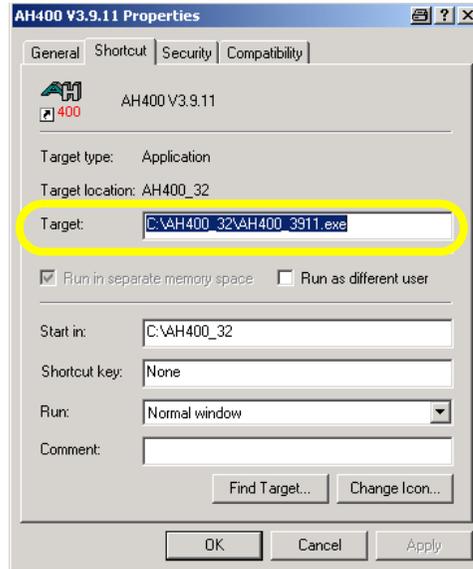
Figure 6-39—Target pointing to latest AH400_32.exe file

> **NOTE:** *Each Service Release contains Installation Notes and a Version Description which lists new features and fixes.*

Adjustments, Calibration, and Functional Tests

The PS Series System requires periodic adjustments, calibration, and functional tests to maintain optimum performance of the sensor systems, the PNP head system, and programmer modules.

> **WARNING:** *Blindness hazard! Always wear eye protection when the laser safety shields are open, such as during service. Direct or diffuse laser radiation can damage eyes. Goggles must block 10.6 μm, laser radiation. Goggles are designed to protect against scattered energy, but not against direct viewing of the laser beam or reflections from other surfaces.*

> **WARNING:** *Serious burn hazard! Enclose the laser beam path during service. Direct or diffuse laser radiation can seriously burn.*

> **WARNING:** *Electrocution hazard! Turn off the main power switch before removing any panels. Servicing the PS Series System involves a significant risk of electric shock.*

WARNING: *The high speed and force behind a moving robot can cause serious bodily injury to anyone working inside the work envelope. Moving the PNP head must be the responsibility of only one qualified individual. All other personnel near the system must stay clear of the work envelope while the robot is moving.*

Adjusting the Sensors

Three types of sensors on the PS Series System are adjustable: vacuum, blow-off, and socket actuator. Other sensors cannot be adjusted. The **I/O Interface** window displays a list of the sensors in the system and the status of each sensor.

NOTE: The number of sensors on the PS Series System depends on the options installed. For example, if a laser marker is installed, there are twelve sensors. If no laser marker is installed, there are seven sensors.

To view the status of sensors in the system, on the AH400 main window click **System**, and then click **Misc. I/O** to open the **I/O Interface** window.
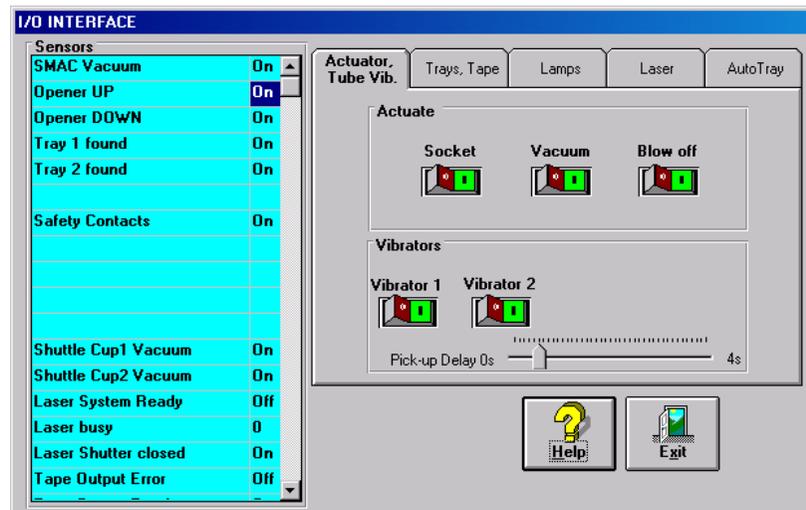
Figure 6-40—I/O Interface window

The PS Series System can have up to four vacuum generators located on:
• PNP head
• Shuttle Ped 1 (option)
• Shuttle Ped 2 (option)
• Tape Output head (option)

If you notice consecutive picking errors while programming, first complete the Z-Axis Automatic adjustment. For instructions, see "Teach the Package File" on page 3-40.

If completing the Z-Axis Automatic adjustment does not reduce or eliminate picking errors, complete the vacuum sensor adjustments described here:

PNP Head Vacuum Sensor
1.   Gantry window—
1a)   On the Gantry window, move the PNP head to either the Tape or Vision location.

NOTE: To move the PNP head, on the touch screen place the arrow over either the Tape or Vision location and right-click the mouse.

1b)   Click the Gantry Vacuum switch to **ON**.

2.   Vacuum sensor—
2a)   On the vacuum sensor, locate the adjustment screws labeled HYS and SET. Locate the red vacuum sensor light. See *Figure 6-41*.

Figure 6-41—Vacuum sensor light. SET and HYS adjustment screws

3.   Adjust the HYS and SET screws—
3a)   Using a small flat screwdriver, turn the HYS screw all the way counter-clockwise.
3b)   Then turn the SET screw counterclockwise until the red vacuum sensor light comes on.

3c) Then turn the SET screw clockwise until the light goes off.

3d) Finally turn the SET screw another 1/8th turn clockwise.

4. Check adjustments—

4a) Block the hole on the PNP probe tip with a device. The red vacuum sensor light should come on immediately.

4b) Unblock the hole. The red vacuum sensor light should go off immediately.

5. Repeat—

5a) Repeat Step 4 three times to ensure the red vacuum sensor light goes on and off as described.

5b) If the red vacuum sensor light does not go off and on properly, turn the SET screw slightly clockwise and retry.

Shuttle Ped 1 and 2 Vacuum Sensors

1. Prepare the system—

1a) Verify that the PS Series System is shut down and the main power switch is in the **OFF** position.

1b) Remove the access cover located below the laser or labeler unit. Set the cover aside.

2. Vacuum sensor for Shuttle Ped 1—

2a) Locate the vacuum sensor for Shuttle Ped 1

2b) Locate the adjustment screw labeled HYS.

2c) Locate the adjustment screw labeled SET.

3. Vacuum sensor for Shuttle Ped 2—

3a) Locate the vacuum sensor for Shuttle Ped 2

3b) Locate the adjustment screw labeled HYS.

3c) Locate the adjustment screw labeled SET.

4. System window—

4a) On the System window, click **Shuttle/Options**.
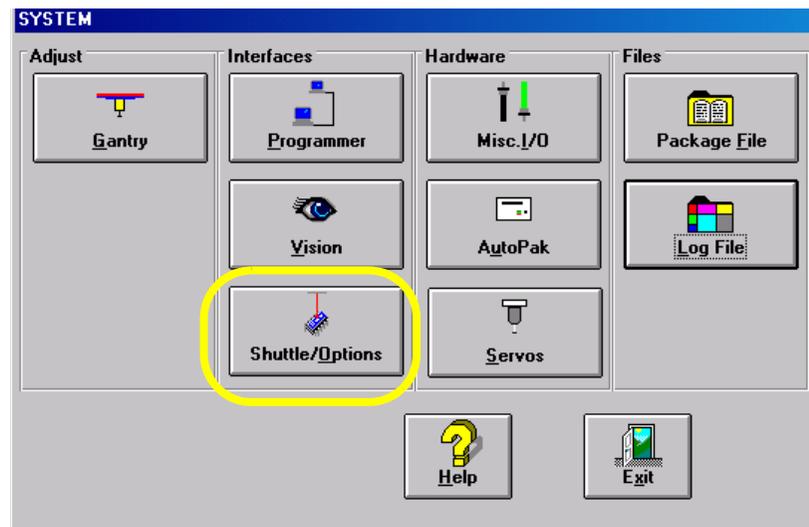
Figure 6-42—System window

5. Shuttle tab—

5a) On the Shuttle tab, click **GO** next to **Ped 2 Load Pos**.

5b) Click the Ped 2 Vacuum to **ON**.

.
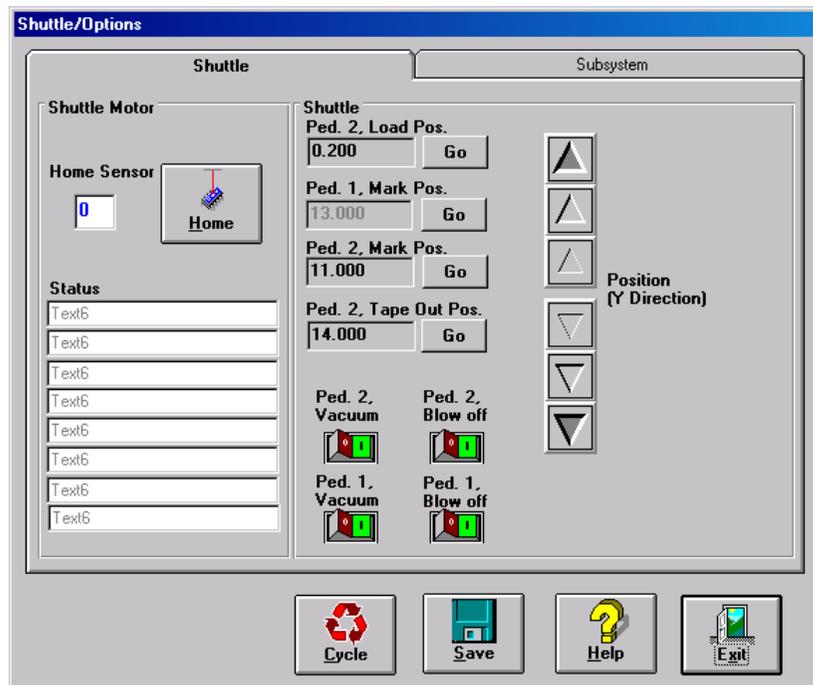
Figure 6-43—Shuttle tab

6. Adjust Shuttle Cup 2 HYS and SET screws—

6a) Using a small flat screwdriver, turn the HYS screw all the way counter-clockwise.

6b) Then turn the SET screw counterclockwise until the red vacuum sensor light comes on.

6c) Then turn the SET screw clockwise until the light goes off.

6d) Finally turn the SET screw another 1/8th turn clockwise.

7. Check adjustments—

7a) Block the hole on the shuttle pedestal. The red vacuum sensor light should come on immediately.

7b) Unblock the hole. The red vacuum sensor light should go off immediately.

8. Repeat check—

8a) Repeat Step 7 three times to ensure the red vacuum sensor light goes on and off as described.

8b) If the red vacuum sensor light does not go off and on properly, turn the SET screw slightly clockwise and retry.

9. Repeat for Shuttle Ped 1—

9a) Repeat Step 6 through Step 8 for Shuttle Ped 1.

10. On the Shuttle tab—

• Click Ped 1 Vacuum to **OFF**.

• Click Ped 2 Vacuum to **ON**.

11. Reinstall cover—

11a) Reinstall access cover located below the laser or labeler unit.

Tape Output Head Vacuum Sensor

If your system includes an optional tape output module, you will also need to adjust the vacuum sensor on the tape output head.

1. Prepare the system—

1a) On the PLC Controller, turn the **Apply Vacuum** switch to the **ON** (up) position. See *Figure 6-44*.

Figure 6-44—Apply Vacuum switch UP

1b) Lift the Plexiglas cover.

2. Vacuum sensor—

2a) On the vacuum sensor, locate the adjustment screws labeled HYS and SET. See *Figure 6-45*.
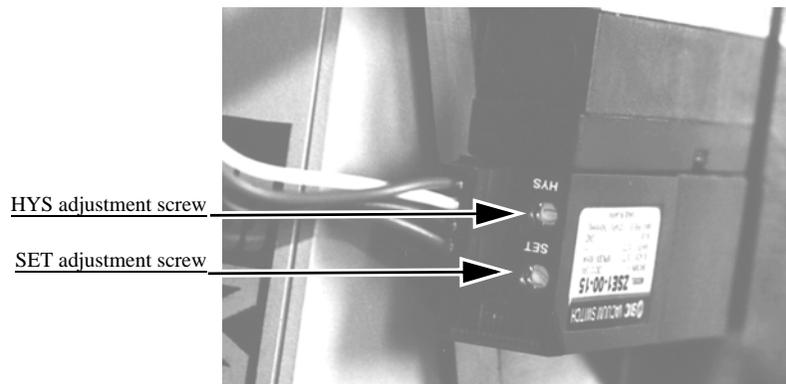
Figure 6-45—HYS and Set screw locations

3. Adjust the HYS and SET screws—

3a) Using a small flat screwdriver, turn the HYS screw counterclockwise.

3b) Then turn the SET screw counterclockwise until the red vacuum sensor light comes on.

3c) Then turn the SET screw clockwise until the light goes off.

3d) Finally turn the SET screw another 1/8th turn clockwise.

4.   Check adjustments—

4a)   Block the hole on the tape output PNP head. The red vacuum sensor light should come on immediately.

4b)   Unblock the hole. The red vacuum sensor light should go off immediately.

5.   Repeat—

5a)   Repeat Step 4 three times to ensure the red vacuum sensor light goes on and off as described.

5b)   If the red vacuum sensor light does not go off and on properly, turn the SET screw slightly clockwise and retry.

6.   Complete—

6a)   Close the Plexiglas cover.

NOTE: If the hysteresis adjustment is set too high, the PS Series System may return a vacuum error due to its inability to sense a vacuum within the time limits set in the AH400 software. The delay should be set as short as possible to prevent this occurrence. However, if the delay is set too short, vacuum line pulsations from usage throughout the rest of the system could inadvertently turn the sensor on when it should be off. Adjustments should be made to accommodate both conditions.

Adjusting Blow-Off

NOTE: The flow/valve controls are set at the factory and should not require adjustment. If adjustments need to be made, they should be done in small steps until the desired results are reached.

"Blow-off" is a small puff of positive pressure air applied for a short time during the drop period to assist in removing a device from the suction cup. Blow-off is produced by vacuum generators on the PNP head (or the Tape Output head, if installed). If set too high, blow-off may cause a misalignment during device placement.

To adjust blow-off on any vacuum generator:

1.   Prepare the system—

1a)   From the I/O Interface window, select the desired vacuum generator.

1b)   Click **Vacuum** to the **OFF** position.

1c)   Click **Blow off** to the **ON** position.
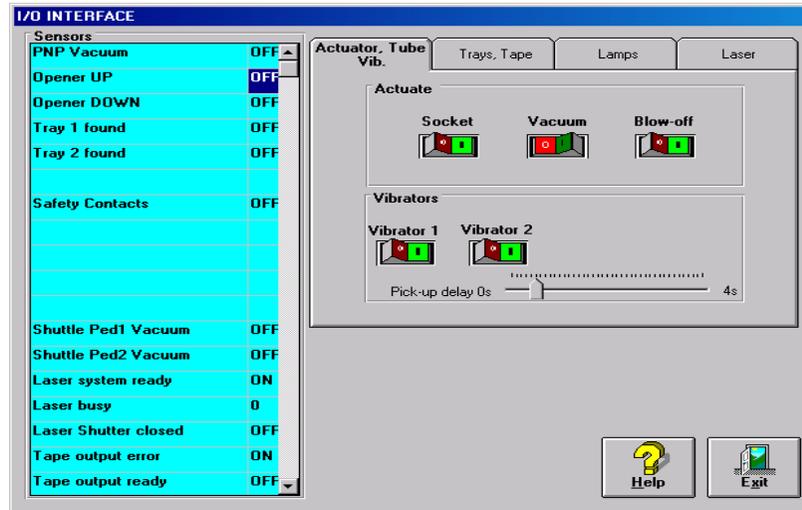
Figure 6-46—I/O Interface

2. Vacuum generator—

2a) On the top of the vacuum generator, locate the blow-off adjustment screw above the valve coils (where the wires plug in). See *Figure 6-47*.
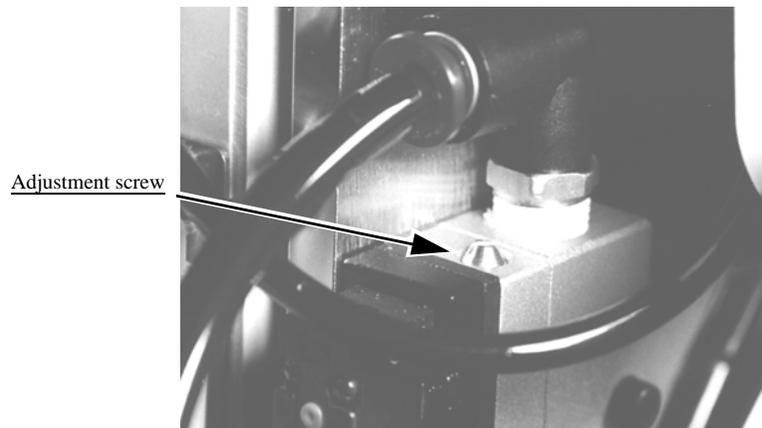
Figure 6-47—Blow-off adjustment screw on vacuum generator

3. Adjust—

3a) Turn the adjustment screw fully clockwise. This blocks all air and there is no "blow-off" puff of air at the PNP probe tip.

3b) Turn the adjustment screw about 1/2 turn counterclockwise.

Adjusting the Socket Actuator Sensor

The socket actuator sensor is used to tell the handler software the position of the socket actuator, and when a device can be put into the socket.

To adjust the socket actuator sensor:

1. Prepare the system—

1a) From the Setup window, click **System**.

1b)   On the System window, click **Gantry** to open the Teach Positions window.
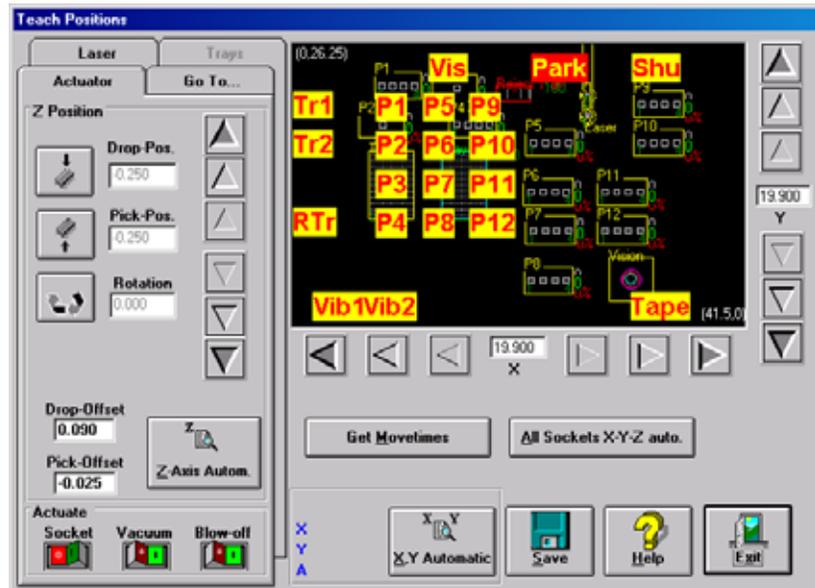
Figure 6-48—Teach Positions window

1c)   Click on any programmer label (**P1** through **P12**) to move the PNP head to that programmer.

1d)   On the PNP head, locate the up sensor and up sensor bracket screw. Locate the down sensor and down sensor bracket screw. See *Figure 6-49*.

NOTE: On some PS Series Systems, the up sensor and down sensor contain LEDs that indicate the position of socket actuator.
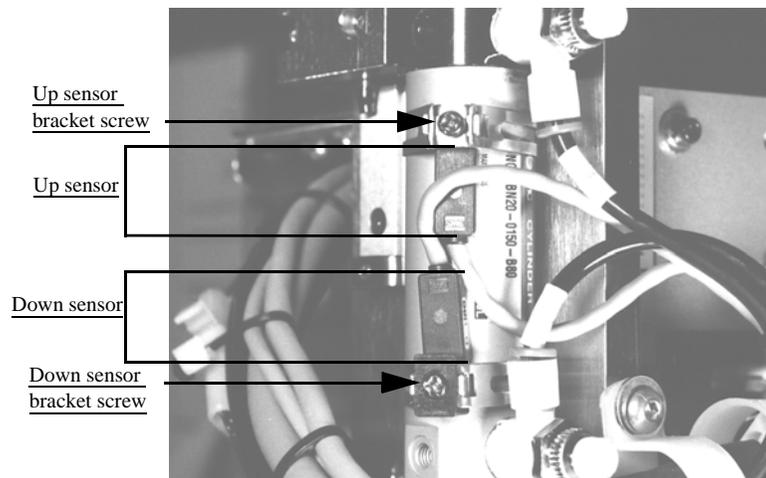
Figure 6-49—Sensors and brackets as viewed from back of PNP head

2.   Adjust up sensor—

2a)   Loosen the Phillips-head screw on the up sensor bracket.

2b) Move the up sensor upwards until the green AutoPak LED for Port 1, Bit 1 illuminates. See *Figure 6-50*.
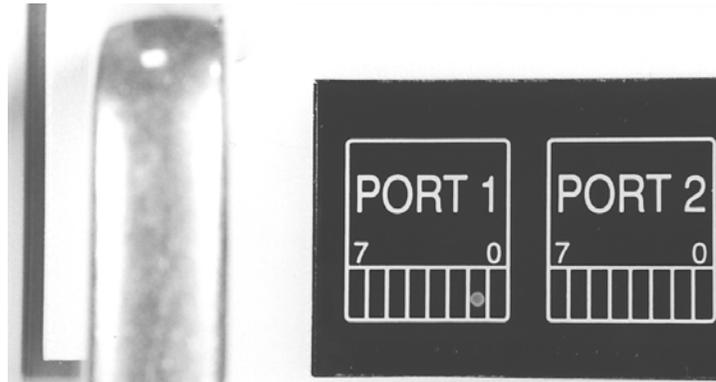
Figure 6-50—Port 1, Bit 1 LED illuminated

2c) Tighten the up sensor bracket screw.

2d) On the Actuator tab, click **Socket** to the **ON** position.

3.   Adjust down sensor—

3a) On the Teach Positions window, toggle the socket actuator to **ON** (see *Figure 6-51*). The socket actuator will move down.
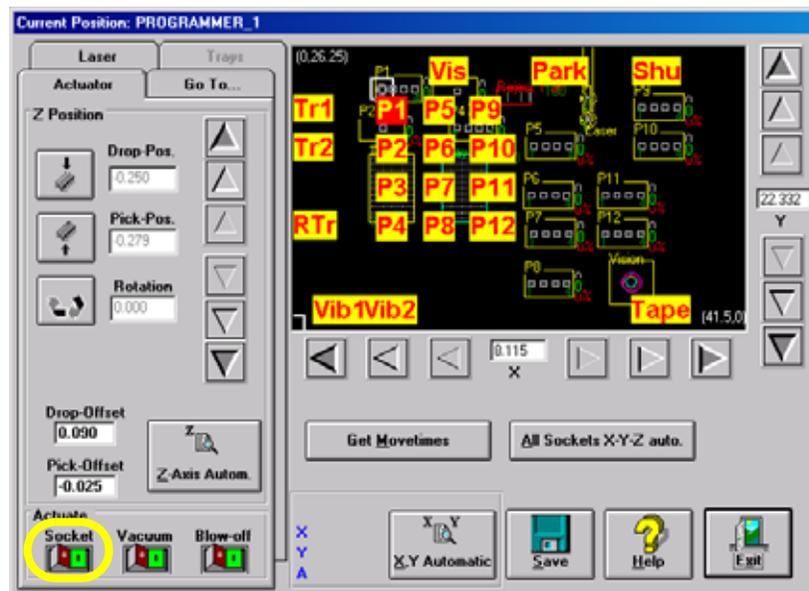
Figure 6-51—Socket actuator ON

3b) On the input panel (on rear of PS Series System), turn the Main air pressure to **OFF** (see *Figure 6-52*). The socket actuator can now be moved up or down by hand.

Figure 6-52—Turn Main air OFF

3c) By hand, move the socket actuator down until the socket actuator ribs make contact with the socket top. See *Figure 6-53*.
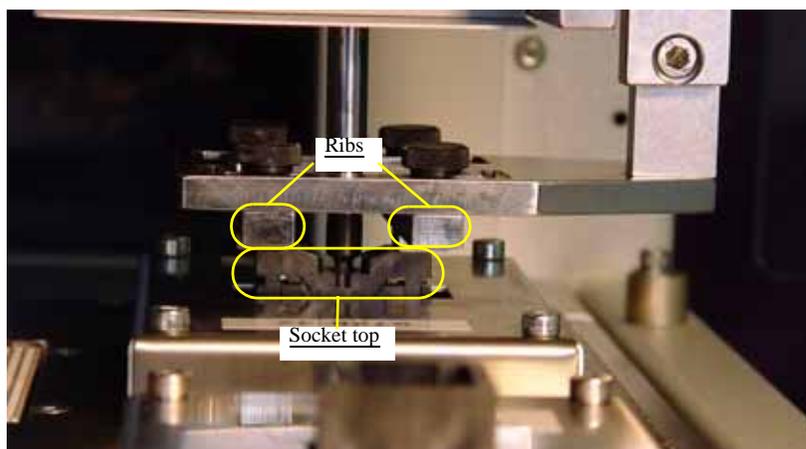
Figure 6-53—Socket actuator ribs contact socket top

3d) Loosen the Phillips-head screw on the down sensor bracket.
3e) Move the down sensor downward until the green AutoPak LED for Port 1, Bit 2 illuminates.
3f) Tighten the down sensor bracket screw.
3g) By hand, push the socket actuator down farther and ensure that AutoPak LED Port 1, Bit 2 remains illuminated.
3h) On the input panel (on rear of PS Series System), turn the Socket Actuator air pressure to **ON**.
3i) Click the socket switch OFF and ON several times to verify that the LED turns off and then on.

This completes the adjustment procedures for sensors. All other sensors are non-adjustable.

Calibrating Optima Programmers

PS Series System power is provided by a highly accurate switching power supply. Secondary voltages are subsequently generated within the Optima programmers to provide the signals required for processing the many

devices supported. To optimize programming yields, voltages within the Optima programmer need to be calibrated *once each year*.

You will need:
*   Digital voltmeter (calibrated)
*   Small trimmer potentiometer adjustment screwdriver
*   OPTITEST software

1.   Prepare the system—
1a)   Remove all adapters from the programmer sites.
1b)   Select the Programmer Computer you wish to calibrate.

> *NOTE: If you have an older style KVM switch box, you will need to switch the cables to the proper Programmer Computer.*

2.   Programmer Computer—
2a)   Press <Esc> to exit the Optima window.
2b)   Press <D> to go to DOS.
2c)   Type **C:**
2d)   Type **optitest -c**
2e)   Press <Enter>.
2f)   Verify that all devices and adapters have been removed from programming sockets.
2g)   At the prompt, press any key to continue.

```
Checking Printer Port

Please remove all devices or adapters from the sockets.
If you are using the FlashTop, remove socket adapters S271 to S200x.
... then press any key_
```

Figure 6-54—Checking printer port

2h)   From the Optima Self Test menu, press <2> for the calibration and manual test menu. See *Figure 6-55*.

```
                    OPTIMA Self Test A/2001


   1 = automatic hardware test

   2 = calibration and manual test menu



   ESC to QUIT
                    OPTIMA Copyright (c) 1991 - 2001

Enter your choice: _
```

Figure 6-55—Press 2 to calibrate

2i)   From the Optima Calibration utility menu, press <2> to set Vcc voltages. See *Figure 6-56*.

Figure 6-56—Press 2 to set Vcc voltages

2j)   Press <Esc>.

3.   Controller board—

3a)   Open the side door of the PS Series System and locate the OPTIMA board of the programmer you will calibrate.

3b)   On the top of the board are four adjustment potentiometers (VR1, VR2, VR3, and VR4).

3c)   Just above these are five test pins (GND, 1, 2, 3 and 4). See *Figure 6-57*.
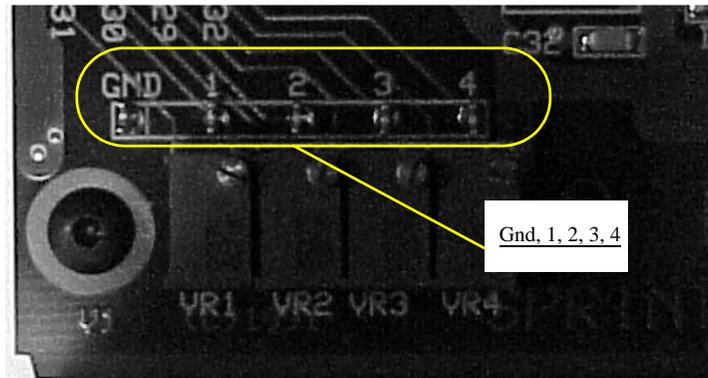
Figure 6-57—Test pins

4.   Calibrate Vcc voltage—

4a)   Follow onscreen instructions.
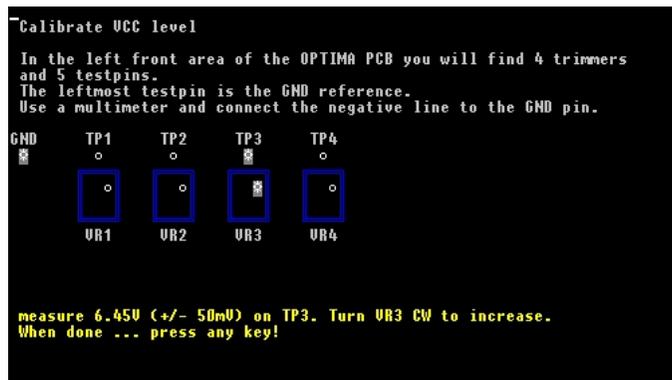
Figure 6-58—TP3 (measure and adjust)
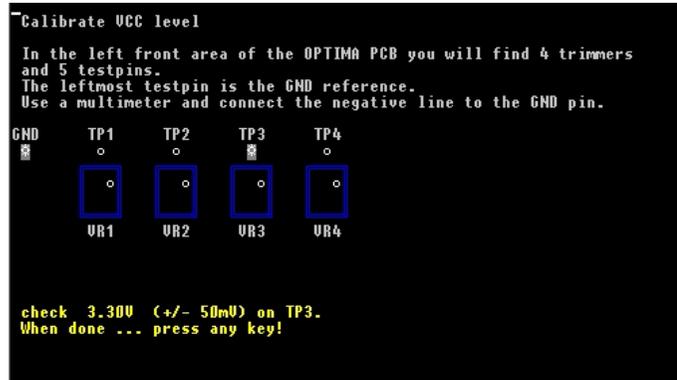
Figure 6-59—TP3 (check only)

5.   Set Vpp voltages—

5a)   From the Optima calibration utility, press <3> to set Vpp voltages.

Figure 6-60—Set Vpp voltages

5b)   Follow on-screen instructions.
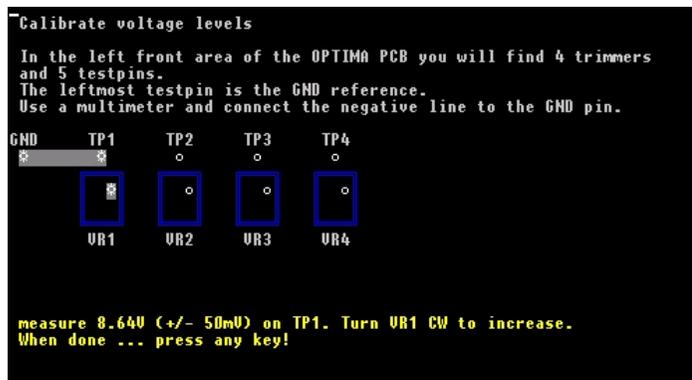
Figure 6-61—TP1 (measure and adjust)
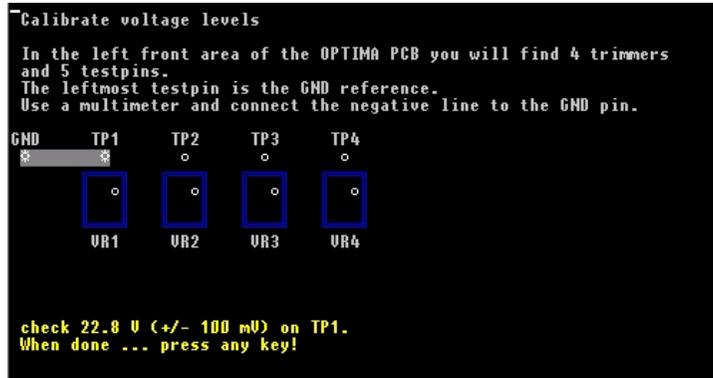
Figure 6-62—TP1 (check only)
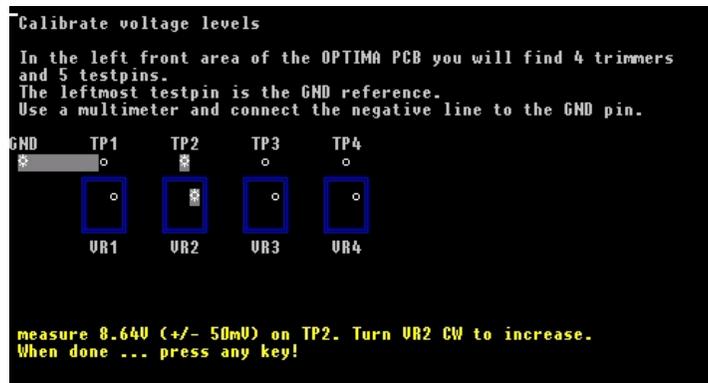
Figure 6-63—TP2 (measure and adjust)
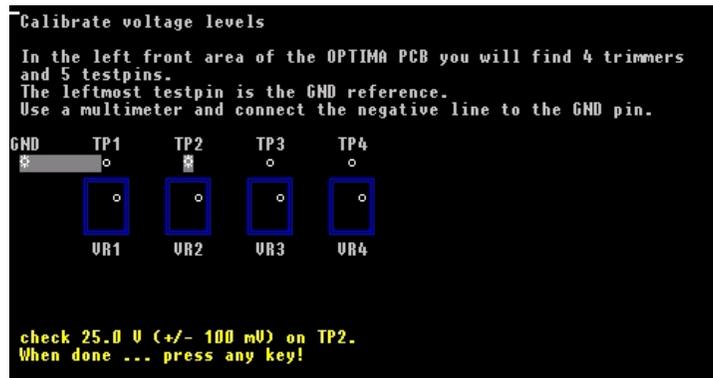
Figure 6-64—TP2 (check only)

NOTE: Do not adjust the voltage of this second check because it will affect the prior voltage.
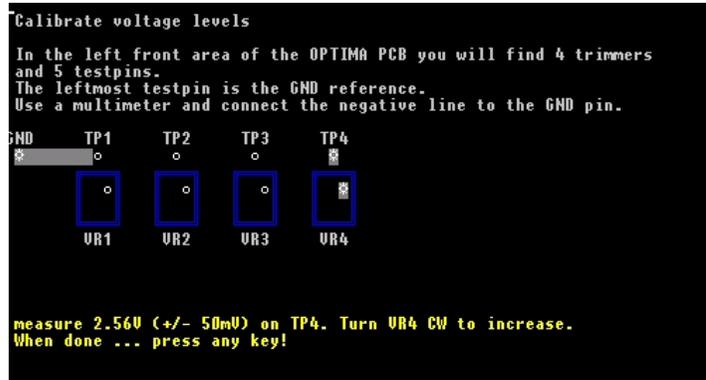
Figure 6-65—TP4 measure and adjust
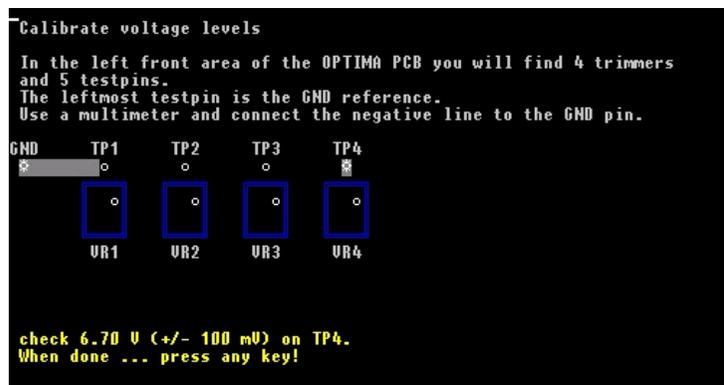
Figure 6-66—TP4 (check only)

NOTE: *Do not adjust the voltage of this second check because it will affect the prior voltage.*

6. **Complete calibration—**
6a) Press <Q> to quit when you are back to the main calibration menu.
6b) Type **exit** to return to the Optima menu.

Calibrating the Vision System

The vision system provides for angular correction up to 30 degrees for devices on the probe tip before they are placed in the programming socket. This angular correction is performed to reduce the likelihood of device damage from improper insertion.

If any of the following are true, the vision system may require calibration:

☞ The camera has been replaced, moved, refocused, or contrast changed (by aperture setting or device position).

☞ Many devices are being misaligned or rejected, and you suspect the motion settings or vision system may be at fault.

☞ There are continuity failures.

You will need:
Data I/O Part number 701-3165-001 Vision Calibration Plate

• Select the Handler Computer.

• On the main window, click **Load Job**.

• On the Windows Open dialog, select a job (for example: **NEWJOB**) and click **Open**.

• Click **System**. If asked for a password, provide the password and click **System** again.

• Click **Gantry** to go into the Gantry window.

• Click the **PARK** yellow position label and then the **Vis** yellow position label. Verify that the following values display at both positions:
DropPos= -250
PickPos= -250
Rotation= 0
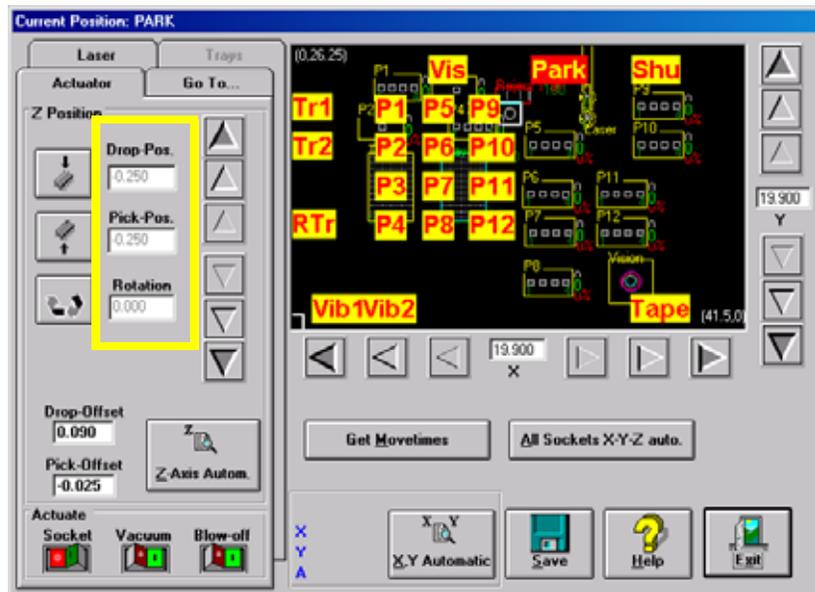
Figure 6-67—Verify values

• Open the package file for this job (for example: **S273.txt**) and ensure the following values:
Record #22 = 0
Records #46, #194, and #195 = -250

• Remove the clear plastic vision cover disk on the camera hole at the Vision position. Mark the center of the cover disk with a washable felt pen or dry erase marker. Replace the cover disk over the camera hole.

• Within the Gantry window, click the **Vis** yellow position label to bring the PNP head to Vision.

- Double click the small acuWin32 window on the desktop.

- On the acuWin32 window, click the Right Boxes to open the Object Manager box.
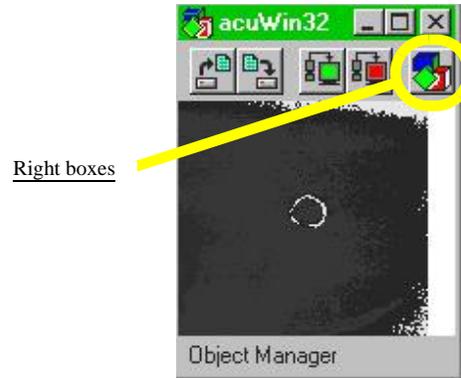
Right boxes

Figure 6-68—Right boxes on acuWin32 window

- On the Object Manager box, click the display icon. See *Figure 6-69*.
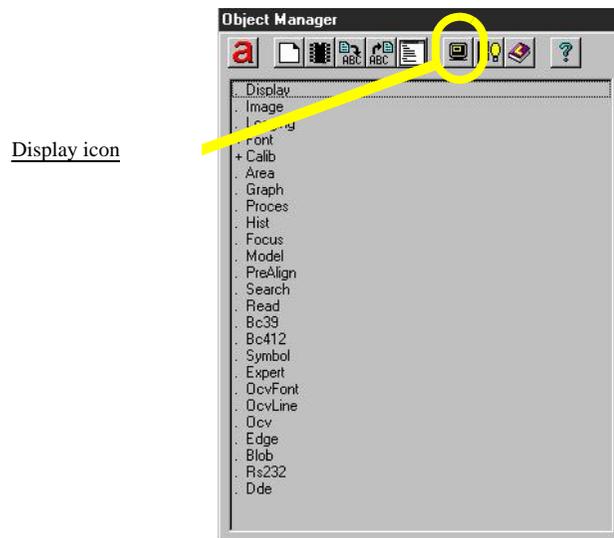
Display icon

Figure 6-69—Display icon on Object Manager box

- On the DisplayObjMan.Display box, set the DigRate to 0 "High" and the Format to 0 "Large." See *Figure 6-70*.
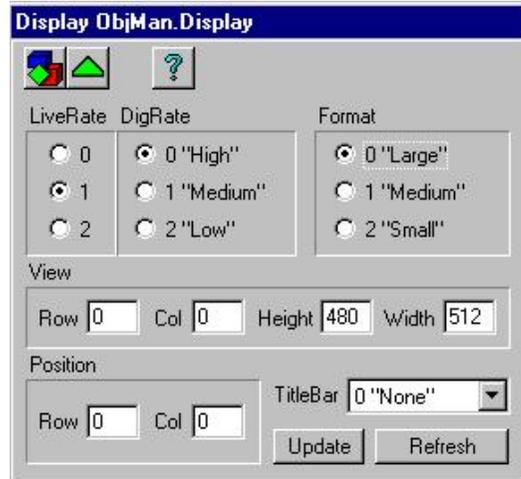
Figure 6-70—Display ObjMan.Display window

• Press the green triangle to return to the Object Manager window.

• On the Object Manager window, click the right mouse button on "—" before "Search."
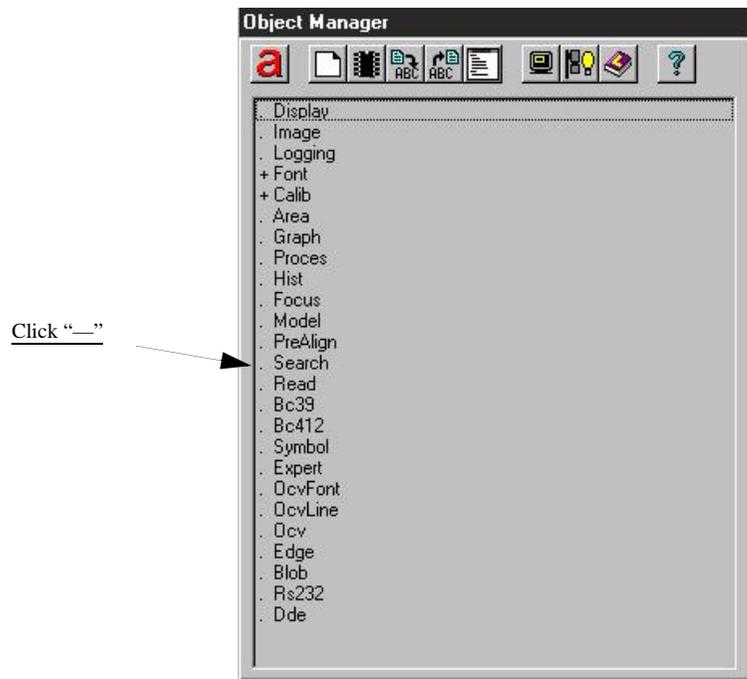
Figure 6-71—Object Manager window

• Select **New**.

• On the Create New Object box, press **OK** to accept **Search00**.

Figure 6-72—Create New Object

- On the Object Manager box, click "+" before "Search Search00" to expand the menu.

- Click "—" before "Calib SysCalib."

.
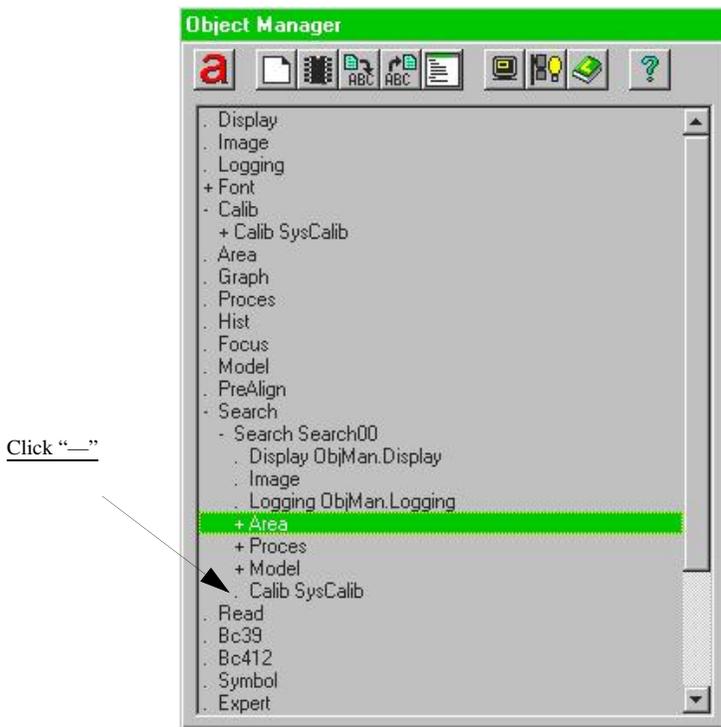
Click "—"

Figure 6-73—Open Calib SysCalib

- On the acuWin32 window, click the Red icon to Acquire Image.

Acquire image

Figure 6-74—Acquire image

- Adjust the light source control box (inside the left door of the PS Series System) by turning the knob until the image of the black vacuum pickup cup is clearly visible and the background is light. The black dot marked on the vision cover will be visible as a dot or white "blemish."

- Return to the Gantry window. Using the adjustment buttons for the X-axis and Y-axis, position the "blemish" so that it is in the center of the vacuum pickup cup. Press the Red icon to Acquire Image after adjusting the X-axis and the Y-axis. Repeat until the blemish is centered.

- Using the adjustment buttons for the X-axis and Y-axis, center cross hair 4 on the vacuum pickup cup as well. When correctly adjusted, the vacuum cup, "blemish" and Red Cross hair 4 are all lined up, as shown in *Figure 6-74*.

- In the Gantry window, turn the Vacuum rocker switch to **ON**, as shown in *Figure 6-75*.
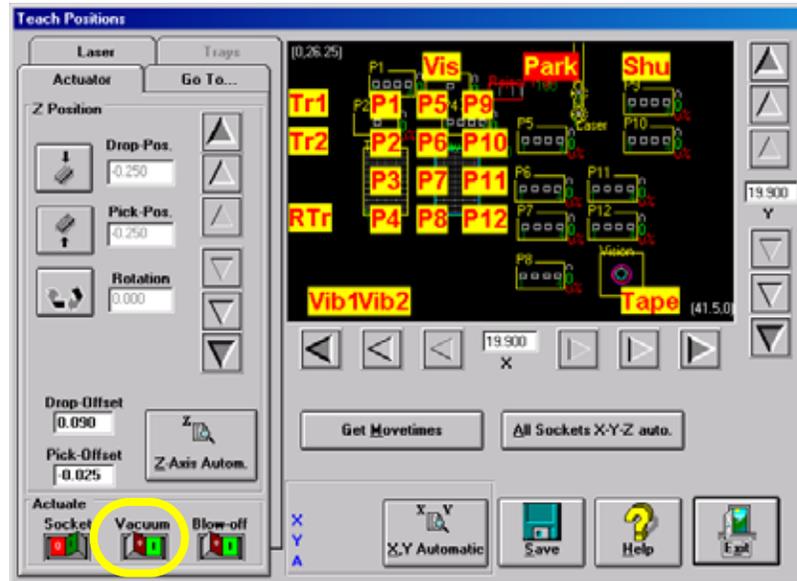
Figure 6-75—Vacuum switch is ON

- Place the Vision Calibration Plate on the Vacuum Cup nozzle. Adjust the Plate location manually until the center White Cross hair fully covers Red Cross hair 4. Press the Red Acquire Image icon.

- Move the Red Cross Hairs-0, 1, 2 and 3 on top of the four White Cross hairs in the four corners, as shown in *Figure 6-76*. Between each Red Cross hair, there should be three White Cross hairs.
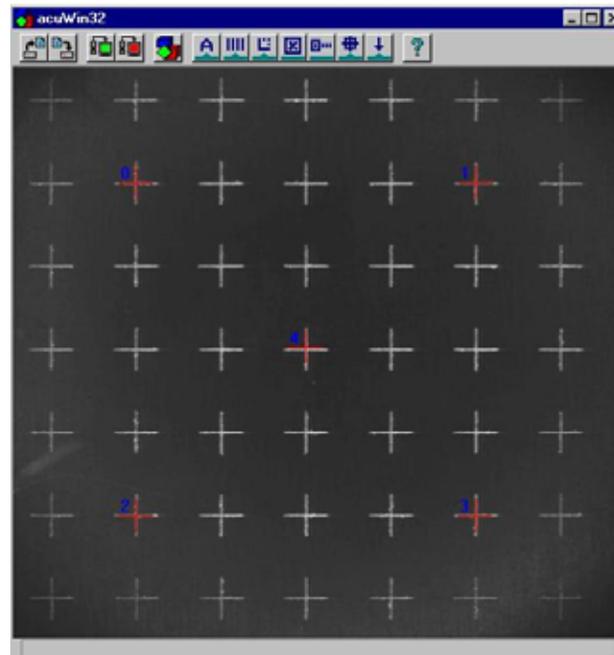
Figure 6-76—Cross hairs line up

- On the Calib SysCalib window, set the **World X** and **Y** values as shown in *Figure 6-77*.

- Press the **Solve** button. Then press the green triangle to return to the Gantry window.
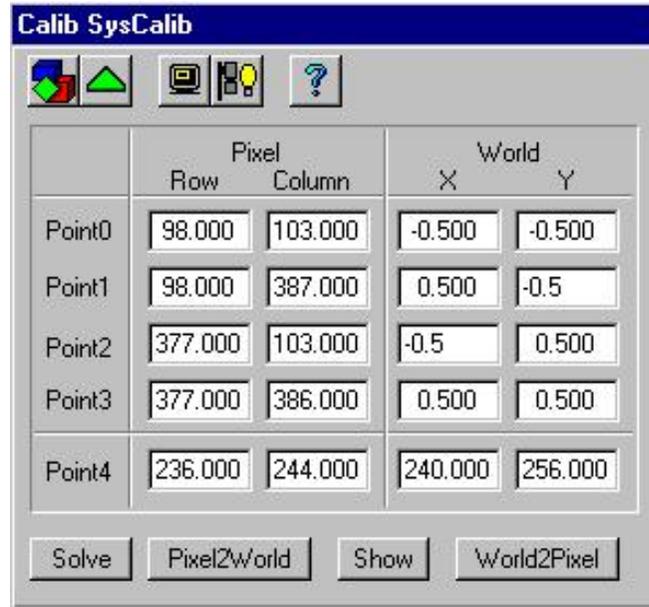
Figure 6-77—World values for X and Y

- Manually remove the Vision Calibration Plate from the Vacuum Cup nozzle. On the Gantry window, turn the Gantry Vacuum switch to **OFF**.

NOTE: In this example, Programmer 8 is used for illustration purposes. Choose any programmer near the front of the PS Series System.

- Click the **P8** yellow position label for Programmer 8. The PNP head will move to Programmer 8. Center the vacuum cup nozzle on the socket in Programmer 8. Use the X-axis and Y-axis adjustment buttons on the Gantry window to center the PNP head on the socket.

- Click the **Park** yellow position label to move the PNP head to the Park position. Manually place a device in the socket of Programmer 8. Click the **P8** yellow position label to move the PNP head back to Programmer 8. Adjust the width of the socket actuator ribs so that the ribs make contact with the socket top and yet are far enough apart to be clear of the device when the device is picked.

- On the Actuator tab, click **Z-Axis Autom**. See *Figure 6-78*. Ensure that the device is picked from the center.
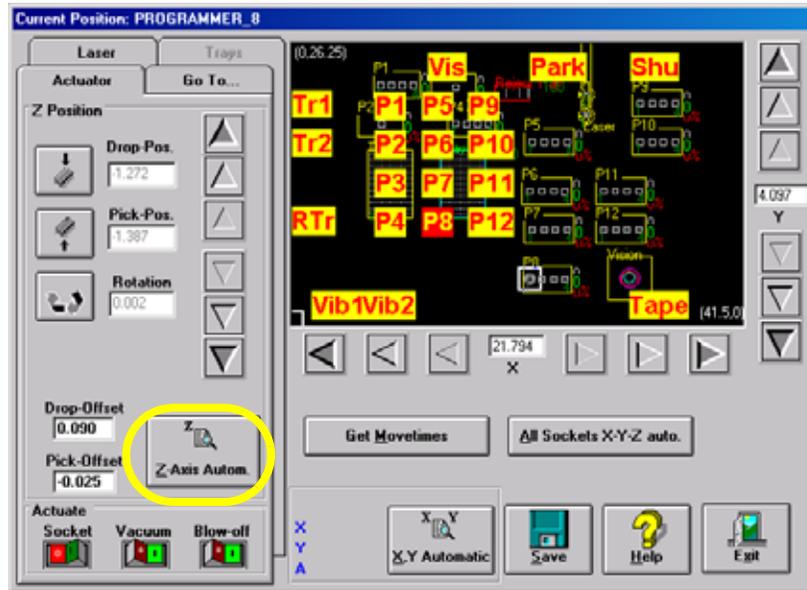
Figure 6-78—Z-Axis autom

- Pick up the device by right-clicking the mouse over the device. Left-click over the **Vis** area on the window to move the device to the Vision system.

- Inspect the device to make sure that no writing is visible. If you see writing, adjust the light source so that the writing is no longer visible.

- On the Object Manager box, click "+" before "Search Search00" to expand the menu.

- Click the "+" before "Area."
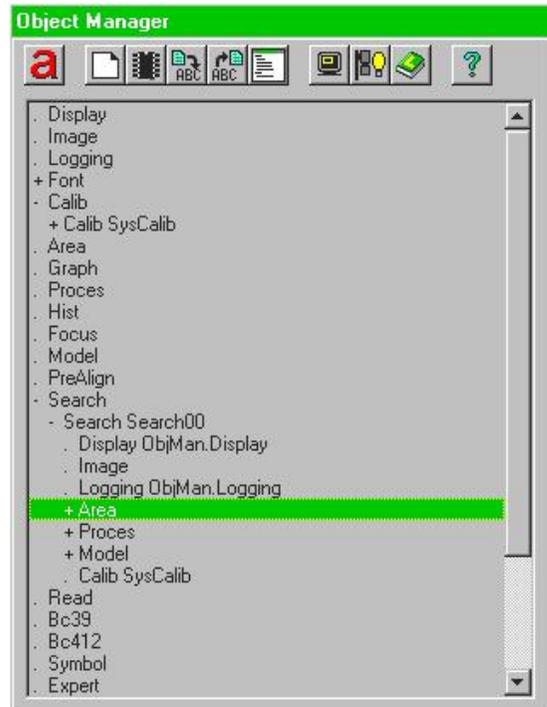
Figure 6-79—Click "+" next to Area

- Adjust the size of the device search area (red rectangle) around the device so that it is 30-50% larger than the device. To adjust the device search area, place the arrow on any line, hold the left mouse button down, and use the trackball to drag the line.
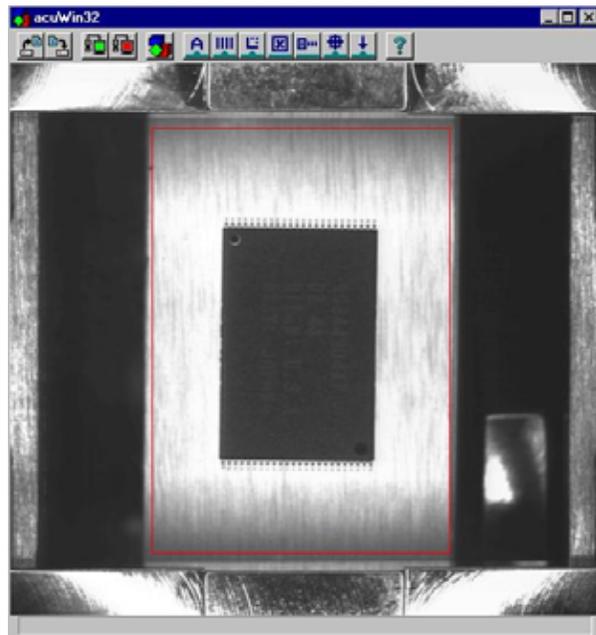
Figure 6-80—Adjust device search area around device

- When the device search area is adjusted, click the green triangle on the Area Search00.Area window to exit. See *Figure 6-81*.
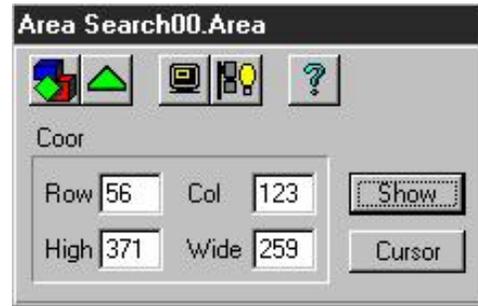
Figure 6-81—Click green triangle

- On Object Manager, double click the "Search Search00" line to open the Search Search00 window.
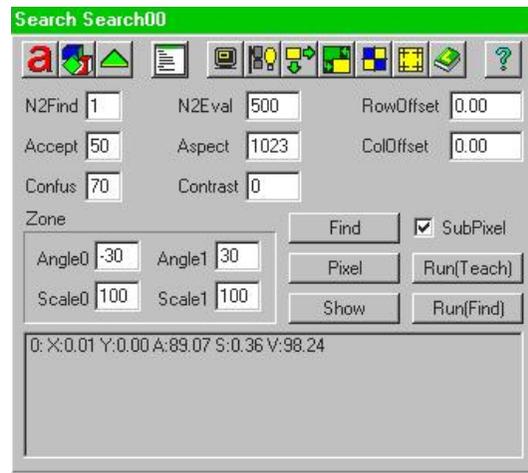
Figure 6-82—Set values in Search Search00 window

- Set values in the Zone fields so that Angle0 is -30 and Angle1 is 30. See *Figure 6-82* above.

- Click the Green triangle to exit.

- On the Gantry window, click the **P8** yellow position label to return the PNP head to Programmer 8. Right-click to place the device in the socket.

- On the Handler Computer, use Windows Explorer to copy the reference vision file just modified (in this example, *S273.prj*).

- Paste a copy of *S273.prj* file to create *Copy of S273.prj*.

- Rename *Copy of S273.prj* to *VisionTemplate.prj*. This ensures that the new vision calibration values are saved to the template used to teach reference vision files.

NOTE: To teach a reference vision file, see "Teach the Reference Vision File" on page 3-28.

Replacing Major Assemblies

The PS Series System is a modular system that easily facilitates the removal and replacement of most major assemblies. Basic instructions for their replacement can be found in this section.

CAUTION: Replacement of any mechanical assembly requires machine recalibration to ensure proper placement of devices and prevent damage to the PS Series System or potential injury to personnel.

Replacing the Pick And Place Head

To replace the PNP head:

1. **Prepare the system—**
1a) From the Gantry window, move the PNP head to the front of the work envelope so it can be easily reached. The Tape input location works well. See *Figure 6-83*.
1b) Verify that the PS Series System is shut down (see "Shut Down the System" on page 3-16) and the main power switch is in the **OFF** position.
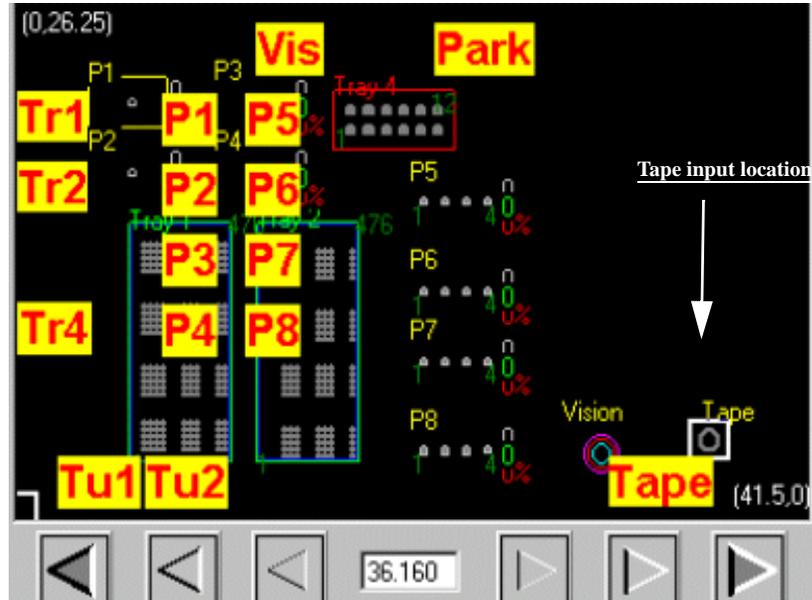
Figure 6-83—Move PNP head to Tape input location

2. **Remove vacuum line and cable—**
2a) Remove vacuum line by pulling the line gently while pushing the red collar.
2b) Remove cable by loosening two screws (indicated in *Figure 6-84*).
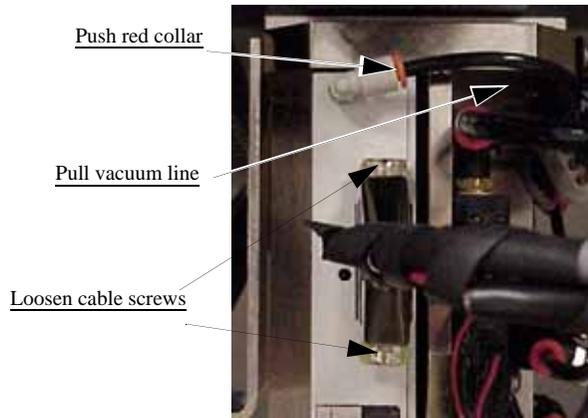
Figure 6-84—Location of vacuum line and cable screws

3.   Remove socket actuator—

3a)   Using a 3/32" Allen wrench, remove the two socket actuator screws indicated in *Figure 6-85*.

3b)   Remove socket actuator.

.
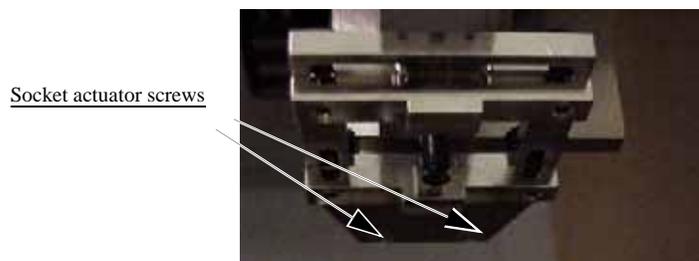
Figure 6-85—Location of two screws holding socket actuator

4.   Remove socket actuator air shaft—

4a)   Using a 9/16" wrench, hold the air shaft.

4b)   Using a 7/16" wrench, loosen the lock nut.

4c)   Unthread the lock nut from the air shaft.

4d)   Remove the air shaft.
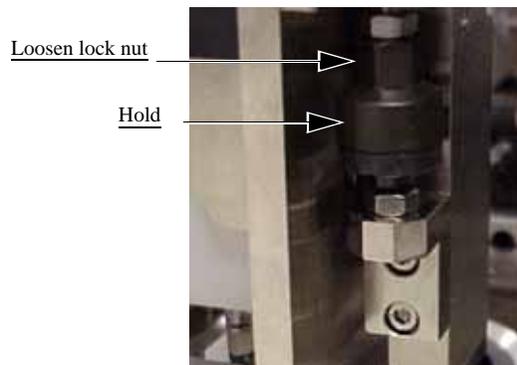
Figure 6-86—Removing air shaft

5.   Remove socket actuator from guide—

5a)   Using a 2.5mm Allen wrench, remove the four screws that hold the socket actuator to the guide.
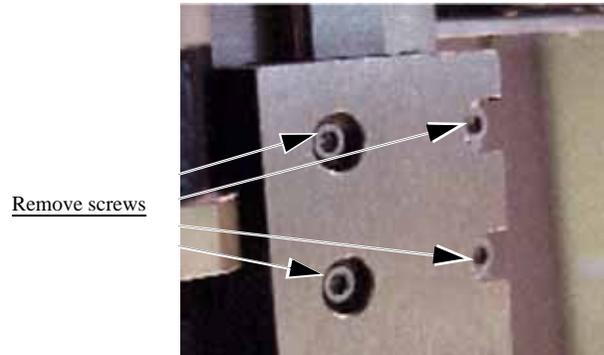
Figure 6-87—Removing socket actuator from guide

6.   Remove old PNP head—

CAUTION: Hold the PNP head while removing the screws to prevent the PNP head from falling.

6a)   Using a 2.5mm Allen wrench, remove the two lower screws that hold the PNP head in place. See *Figure 6-88*.
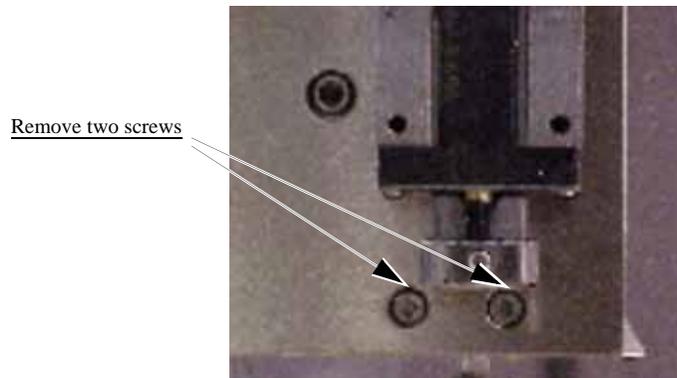
Figure 6-88—Removing lower screws

6b)   Using a 2.5mm Allen wrench, remove the two upper screws that hold the PNP head in place. See *Figure 6-89*.
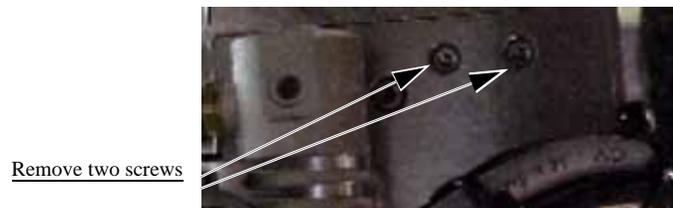
Figure 6-89—Removing upper screws

7.   Install new PNP head—

7a)   Install new PNP head by securing the two upper and two lower screws.

7b)   Reassemble in reverse order.

7c)   Verify that all screws are tight.

Replacing a Programmer Module or Assembly

Depending upon the configuration of the PS Series System, a programmer module may contain one, two, or four programmer assemblies.

WARNING: *Electrocution hazard! Turn off the main power switch before removing any panels. Servicing the PS Series System involves a significant risk of electric shock.*

To replace a programmer module or assembly:

1. **Prepare the system—**
1a) Verify that the PS Series System is shut down and the main power switch is in the **OFF** position.
1b) Open the outer access panel closest to the failed programmer module or assembly.

2. **Disconnect cables—**
2a) Disconnect the power and communications cables from the vertical main board of the programmer module or assembly. If there is more than one programmer assembly on the programmer module, ensure that the cables are disconnected from each of them.

NOTE: *Each cable should be labelled to facilitate proper reinstallation when the programmer module is replaced.*

2b) Remove the four hex screws that fasten the programmer module to the work surface.

3. **Remove programmer module—**
3a) Carefully remove the programmer module from the PS Series System, ensuring that none of the circuit boards, cables, or other mechanical assemblies catch on any other cables or brackets during the removal process.

4. **Remove programmer assembly from top plate—**
4a) Remove the four mounting screws holding the programmer assembly to the top plate, and carefully remove the defective programmer board set. If there is more than one programmer assembly in the programmer module, remove the four mounting screws for the failed programmer board set, and carefully remove the defective set.
4b) If the defective board(s) in the removed programmer assembly are known, they may be replaced as required. Otherwise, replace the entire programmer assembly, including main board, Pod BASE, TOP(s), and adapter interface board.

5. **Replace—**
5a) Replace the defective assembly with new parts in the reverse order of the above steps.

NOTE: If an entire programmer assembly is replaced, or if the pro-grammer main board only is replaced, the programmer's Software Maintenance Plan (SMP) must be updated to match those of the other programmers in the system. If this is not performed, mis-matches in the SMP expiration dates may cause intermittent prob-lems due to the software's inability to load the proper algorithms introduced after the expiration date.

Fixing Common Failures

This section contains solutions to problems that may arise during operation of the PS Series System. While this list is not a comprehensive compilation of all possible failures, it provides helpful troubleshooting tips for systems most likely to cause problems.

Fixing PNP Head Problems

Verify values in the package file to prevent possible damage to the PNP head.

1. Handler Computer—
1a) Go to the C:\AH400_32\package\ directory.
1b) Locate the package files. They will be named for the adapter they fit, with a *.txt* extension, e.g., 048TSOP.txt, S273.txt, etc.

2. Open package files—
2a) Open each package file (using NOTEPAD editor) and verify that:
Record #22 value = zero (0)
Record #46 value = negative 250 (-250)

CAUTION: Any positive value in these Record #s can cause dam-age to the PNP head.

Fixing Tube Input and Output Problems

Problem:
• The vibration controls are fully clockwise and neither of the tube plat-forms vibrates.

Check this:
☞ Make sure that tube input or tube output has been selected on the **Setup** window.

Problem:
• Only one tube platform vibrates.

Check this:
☞ Shut down the PS Series System (see "Shut Down the System" on page 3-16) and check the 2A 250V fuse above the three-wire connector on the back of the AutoPak. The input vibrating motor connector is labeled 9-1; the output vibrating motor connector is labeled 9-2.

☞ Make sure that the power cable on the back of the AutoPak is fully con-
nected.

☞ Check the 5A 250V fuse on the bottom of the vibration controller box
(behind the control knobs).

☞ Remove the controller and make sure that the on/off switch was left on
when it was last installed.

If the fuses are continually being blown, the vibration controller box may be
defective and must be replaced. You can switch the wire from the working
controller to the defective controller to determine if this is the case.

Problem:
• The PNP head will not center on the devices.

Check this:
☞ Adjust the **X-**, **Y-**, and **Z-axis** positions using the Teach Positions win-
dow. See "Teach the Package File" on page 3-40 for more information.

Problem:
• The PS Series System is putting the wrong number of devices into the
tubes.

Check this:
☞ From the Setup window, on the Options tab, ensure that Input and/or
Output options are set to tubes. Click the **System** icon, then click **Gan-
try** to open the Teach Positions window.   Click the yellow **Vib1** label
to move the PNP head to the first position of the input vibration con-
troller.
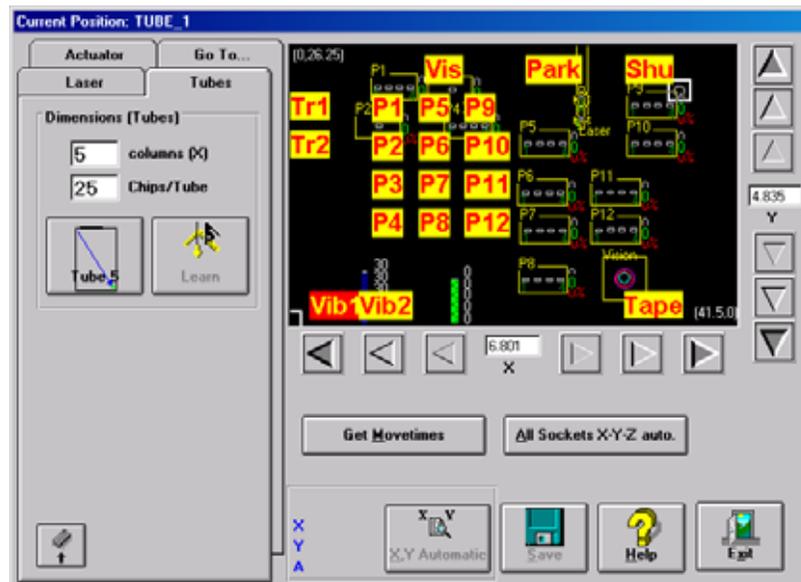
Figure 6-90—Enter correct number of devices

☞ Click the Tubes tab, and then enter the correct number of devices per
tube in the Chips/Tube box.

☞ Click **Save** to store the new settings to the package file.

Correcting Programmer Errors

Programmer errors discussed:
- Increasing Programmer Initialization Time Out
- Removing and Replacing Adapters
- Clearing a Programmer Disabled Status
- Re-initializing a Programmer
- Re-initializing All Programmers
- Checking Power to a Programmer
- Fixing Programmer Continuity Failures
- Fixing Programming Failures in All Programmers
- Disabling a Programmer that Fails Self-test

Increasing Programmer Initialization Time Out

Error messages: "Error Initializing Programmer #"
"Checksum does not match on Programmer #"

Sometimes when a job is loaded, an error message indicates that a programmer did not initialize or that the checksum does not match. These error messages might be caused if the data file for the job is larger than 20MB. Increasing the Programmer Initialization Time Out value corrects this problem.

To modify the Programmer Initialization Time Out setting:

1. Prepare the system—
1a) Select the Handler Computer.
1b) If the AH400 software is running, click **Exit** on the main window to exit completely.

2. On the Handler Computer—
2a) Navigate to the directory C:\AH400_32\
2b) Open Winah400.ini.
2c) Locate the line **TotalProgrammers=Nbr**
2d) Press <Enter>.
2e) Type the following line:
   PgmrInitTimeOut=200
2f) Save Winah400.ini.
2g) Restart the AH400 software.
2h) Reload the Job.
2i) If the error messages display again, proceed with Step 3.

3. Adjust time out—
3a) On the Handler Computer, navigate to the directory C:\AH400_32\
3b) Open Winah400.ini.
3c) Locate the line **PgmrInitTimeOut=200**
3d) Increase the time out value in increments of 50 (250, 300, 350, etc.) up to a maximum value of 1900.

NOTE: The correct value depends on the size of the data file, number of programmers and the device selected. Experiment to determine the lowest value that works.

3e) Save Winah400.ini.

3f) Restart the AH400 software.

3g) Reload the Job.

Removing and Replacing Adapters

Error messages: "Error Initializing Programmer #"

"Checksum does not match on Programmer #"

"Invalid device code"

If one or more programmers repeatedly fail to initialize at job start up, the cause may be that the job was started with the wrong adapter installed on the programmer. The error messages "Error Initializing Programmer #" and "Checksum does not match on Programmer #" are displayed when the job is started. The error message "Invalid device code" is displayed when you select the Programmer Computer for that programmer.

The solution is to remove the adapter and install the correct adapter.

To remove the incorrect adapter and install the correct adapter:

1.   Prepare the system—

1a)   Select the Handler Computer.

1b)   If the AH400 software is running, click **Exit** on the main window to exit completely.

2.   Adapters—

2a)   Remove the incorrect adapter from the programmer.

2b)   Install the correct adapter on the programmer.

3.   Circuit breakers—

3a)   Cycle the PROGRAMMERS circuit breaker located on the back of the PS Series System.

4.   Handler Computer—

4a)   Navigate to **I:\Machine1\ProgN**
(where "**N**" is the programmer with the incorrect adapter installed).

4b)   Locate and delete the file `default.job`.

4c)   Restart the AH400 software.

4d)   Reload the job.

> *NOTE: Repeat Step 4 for all programmers with incorrect adapters installed.*

Clearing a Programmer Disabled Status

If the status indicator disappears from any of the programmer outlines, or the PNP head skips a programmer, first try to clear the programmer disabled status.

1.   Prepare the system—

1a)   On the Run window, click **Pause**, then click **Exit**.

1b)   From the Setup window, select the Programmers tab.

1c) Note which programmers are disabled. In *Figure 6-91* below, Programmer 3 and Programmer 6 are disabled.
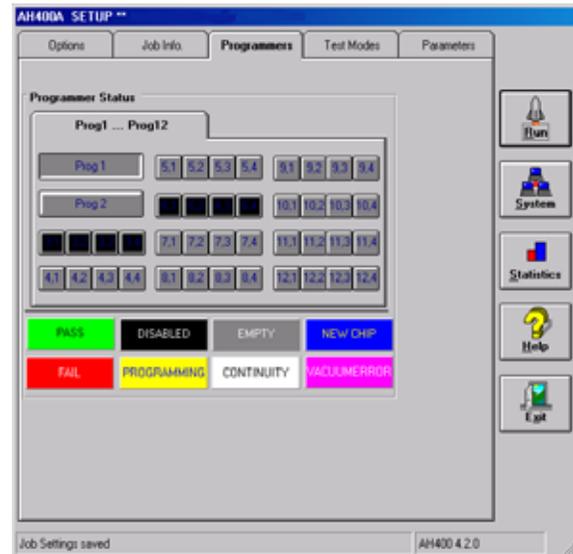
Figure 6-91—Programmers

1d) Click the label for the disabled programmer, and then click the EMPTY (grey) button. The programmer label changes to grey.

> *NOTE: If the programmer label does not turn grey, note whether the green light on the programmer site is on. If it is on, call Data I/O Customer Support.*

2. Repeat—
2a) Repeat Step 1 for other disabled programmers.

3. Restart job—
3a) Remove any devices in programmer sockets.
3b) Click **Run**, and then click **Run** again.

Re-initializing a Programmer
Error messages: "Error Initializing Programmer #"

If you see the error message "Error Initializing Programmer #" you may need to re-initialize the programmer.

To re-initialize a programmer:

1. Prepare the system—
1a) Make sure the correct adapter is securely inserted onto the programmer, and that there are no devices in any sockets.
1b) Turn the PROGRAMMERS circuit breaker switch on the back of the PS Series System to **OFF**.
1c) Wait 5 seconds and then turn back **ON**.
1d) Exit and restart the AH400 software.

NOTE: After exiting the software, you cannot continue a job that was in progress. It must be restarted.

2. Select the Programmer Computer—
2a) Select the Programmer Computer associated with the programmer you wish to re-initialize.

NOTE: You may have to wait several minutes before you will see the window in the next step. If you have an old-style KVM switch box, the keyboard and monitor cables must be connected to the computer you want to view.

3. Check the status indicator—
3a) If the large status indicator in the center of the window is grey, the programmer is in the handler-ready mode and is successfully re-initialized.
3b) If the indicator is not grey, exit and restart the software.
3c) If the indicator is still not grey, note whether the green light on the programmer is on. If it is on, call Data I/O Customer Support.

Re-initializing All Programmers

If all programmers fail to initialize, try the following procedures to reinstate communications. If you determine that a particular programmer is defective, you may remove it and contact Data I/O for servicing or further diagnostics.

1. Prepare the system—
1a) If just prior to this initialization problem the AH400 software had an abnormal termination, then shut down the PS Series System. See "Shut Down the System" on page 3-16.
1b) Restart the PS Series System.

2. Check the directory structure—
2a) Using Windows Explorer, navigate to C:\AH400_32.
2b) For each PS Series System there is a Machine X directory, where X is the number of the PS Series System.
2c) Within the Machine X directory is a subdirectory for each Programmer Computer called ProgX, where X is the number of the programmer. See *Figure 6-92*.
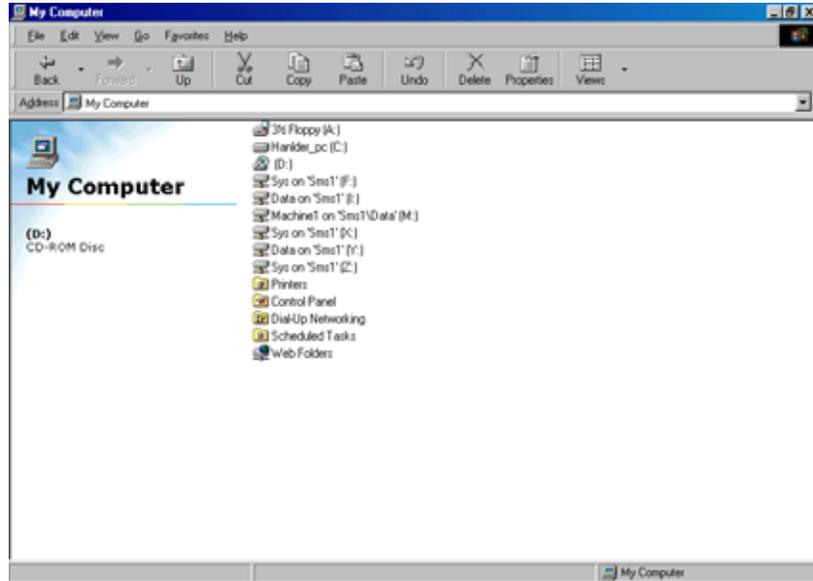
Figure 6-92—Handler Computer directory

3.   Check handshake directory—

3a)   Expand the ProgX folder to show the **HANDSHK** directory.

NOTE: When power is turned on, the Programmer Computer writes a text file indicating that it is ready to run. The Handler Computer erases it and writes a command to the programmer, which the programmer then executes. All communication consists of writing and erasing these small text commands and responses.

3b)   Delete any files in the **HANDSHK** folder.

3c)   Restart the PS Series System.

Checking Power to a Programmer

To check power to a programmer:

WARNING: Electric shock hazard. Shut down the PS Series System (see "Shut Down the System" on page 3-16) and turn off the main power switch. The terminal strip can cause a dangerous electrical shock.

1.   Check power cord connections—

1a)   Verify that the PS Series System is shut down and the main power switch is in the **OFF** position.

1b)   Check the AC power cord connections from the supply to the terminal strip.

1c)   Restart the PS Series System and check the left LED of the Programmer Computer.

2. Replace power cord—

2a) Verify that the PS Series System is shut down and the main power switch is in the **OFF** position.

2b) Switch the AC power cord with another power cord.

2c) Restart the PS Series System and check the left LED of the Programmer Computer.

3. Check power connection—

3a) Verify that the PS Series System is shut down and the main power switch is in the **OFF** position.

3b) Check the power connector on the bottom of the programmer for a loose connection.

3c) Restart the PS Series System and check the left LED of the Programmer Computer.

Fixing Programmer Continuity Failures

If only one programmer fails to program devices and continuity failures predominate in the **Statistics** window, try the following:

☞ Move the socket module to another programmer. If the failure moves with the socket module, check for bent, damaged or worn pins on the socket and socket module. If the failure persists in the same programmer, re-calibrate the device centers for this socket. For information regarding calibration of the PNP head, see "Teach the Package File" on page 3-40.

☞ Check the power supplies and communication cable from the Programmer Computer.

☞ Remove the programmer and check the programmer board stack to see if any have come loose.

☞ Check the cable between the programmer main board and the pin driver circuits. The communication cables should be labeled with the number of the programmer. If not, trace the cables and label them so that they may be returned to the correct programmer.

> *CAUTION: Do not switch programmer communication cables between programmers. If you do, the wrong programmer will receive the commands to program.*

☞ Select the Programmer Computer and then run the self test. For more information about the self test, see "Calibrating Optima Programmers" on page 6-47.

Data I/O does not encourage you to perform repairs of the programmer, especially if still under warranty. Should you decide to repair your programmer, common failures include:

• **Pin driver failures**: These are almost always caused by a defective transistor and/or application specific integrated circuit (ASIC) chip. The ASIC chip is a 28 pin PLCC socketed IC and provides logic-level voltages to the various pins of the socket. There are two variations of the ASIC chip. It is not recommended that different versions of the ASIC chip reside in the same programmer.

- **Relays fail**: They can be diagnosed by measuring the resistance between the inner pins (coil). 500 Ohms is common on a working relay.

Fixing Programming Failures in All Programmers

If all programmers fail to program devices, try the following:

☞ Check your job to verify that you have selected the correct algorithm for your device. If there has been a mistake, you must recreate the job. See "Create a Job" on page 3-17 for information about job creation.

☞ Check for a new release of Sprint software. The algorithm may have been updated.

☞ Check that you have installed the correct socket modules for the devices. The wrong socket module will give an unseen error that will be interpreted as an initialization error.

☞ Check that you have inserted the trays or tubes in the correct orientation. Backward devices may pass the vision system but will not program.

☞ Check that the **Programmer Simulation** switch on the Setup window is **OFF**.

Disabling a Programmer that Fails Self-test

If a programmer is not performing and you cannot correct the error, you can continue to use other programmer sites after disabling the non-functional programmer.

To disable a programmer:

1. From the Setup window, click the Programmers tab.
2. Click the label for the failed programmer.
3. Click the black DISABLED button. The programmer label changes to black and the programmer is disabled.

Fixing AutoPak Problems

Problem:
- The AutoPak green power LED doesn't light when the START button is pressed.

Check this:
☞ Check the power source.

☞ Make sure that the front circuit breaker is on.

☞ Check that the loop back plug is inserted into the connector labeled "Remote ON/OFF 24V" at the rear of the AutoPak.

☞ Make sure that the top AutoPak I/O module lid is screwed tight. There is a safety interlock switch inside the lid.

☞ Check the fuse at the rear of AutoPak; if you can hear the contactor "clunk" internally, and the **START** switch lights, this indicates the 24 VAC low voltage loop circuit works, but the 5VDC supply is not working.

Problem:
• The AutoPak shuts off by itself after a while.

Check this:
☞ Check for power surge causing the circuit breakers to open.

Problem:
• An output relay is not activating, and its corresponding green LED is off at the front panel.

Check this:
☞ Make sure that the four 30-connector ribbon cables labeled J1–J4 are connected to the AutoPak I/O Module from the PC AT Module.
☞ Make sure that the direction selection at that port's jumper patch is not missing or set for an input type of port.

Problem:
• An output relay is not activating, but the green LED on the front panel indicates that it should be.

Check this:
☞ Check the voltage selection at that port's jumper patch.
☞ Check the fuse on the case of the solid state relay.

Fixing Air Pressure Problems

Problem:
• There is no main air pressure.

Check this:
☞ Make sure that the main air switch on the input panel is in the **ON** position.
☞ Check the fuse in the AutoPak connector.
☞ Make sure that the sensor switch in the pneumatic control panel (+24V) is on.
☞ Check the pico fuse in the sensor/dump bank inside of the AutoPak.

Problem:
• There is no or low vacuum on the PNP probe.

Check this:
☞ Make sure that there is voltage at the sensor mounted on the PNP head.
☞ Check the vacuum/blow-off solenoid.
☞ Check solenoid 4 (vacuum and blow-off) mounted on top manifold.
☞ Check solenoid 1 (up/down) mounted of top of manifold.

Fixing Servo Motor Problems

When you need to reload the software on the motion controller card of the PS Series System, complete this procedure:

You will need Software MC_DSP_95 (Windows version) or MEI SETUP.EXE (DOS version).

1. Prepare the system—
1a)   Open the door on the right side of the PS Series System.
1b)   Examine the X and Y servo motors. PS Series Systems come with either Yaskawa or Mitsubishi servo motor amps.
1c)   Determine which type of servo motor your system has. See *Figure 6-93* and *Figure 6-94*.
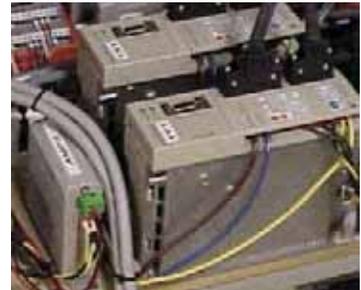
Figure 6-93—Yaskawa servo motor amps

Figure 6-94—Mitsubishi servo motor amps

1d)   Open Windows Explorer.

2. For DOS—
2a)   On the Handler Computer, go to C:\Install\Setup.
2b)   Run Setup.exe.
2c)   If the system is equipped with Yaskawa® X- and Y-axis motors and servo amps, then confirm that MEI1128Y.ABS (dated 11/28/00 or later) is in this directory.
2d)   If there are Mitsubishi® X- and Y-axis motors and servo amps, then confirm that MEI1214M.ABS is in this directory. See *Figure 6-95*.

Figure 6-95—Confirm file

2e) Press **OK**.

2f) Press **Alt-F** and then select **Load Defaults From File**. This reads the file containing the firmware, which includes the parameters for the PID filter, limit switch configurations, software limit configurations, etc.

2g) Delete any name in the "box"

Figure 6-96—Delete file name

2h) For Yaskawa motors, type **MEI1128Y.ABS**. For Mitsubishi motors, type **MEI1214M.ABS**.

Figure 6-97—Enter new file name

2i) Exit setup program by pressing **Alt-X**.

3.   For Windows—

3a) Go to C:\Install\Setup.

3b) Run MC_DSP_95.

4.   Add controller—

4a) If your window shows no controller in the Controller List field (see *Figure 6-98*), click **Add Controller**.
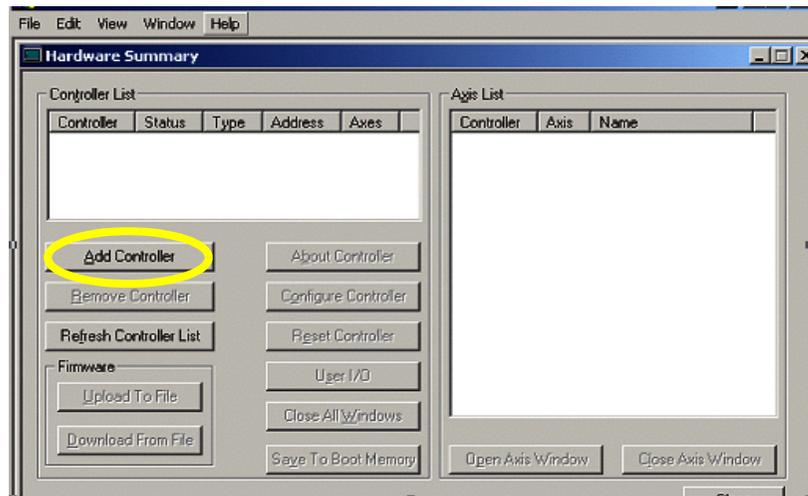
Figure 6-98—No controller in list box

4b) In the Add Controller window, type MEI. Click **OK**. See *Figure 6-99*.
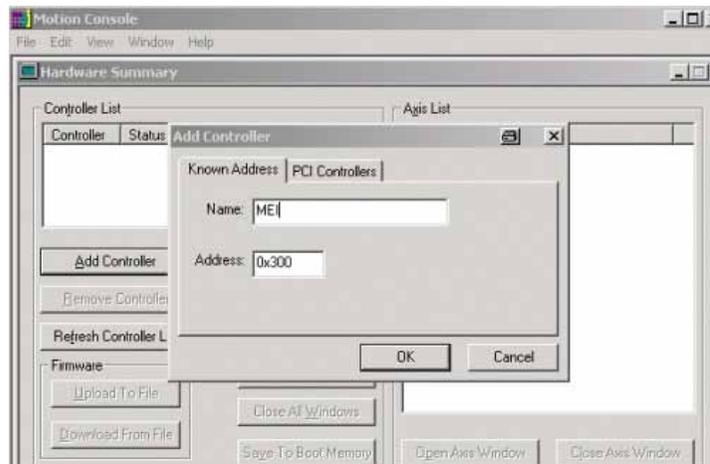
Figure 6-99—Add controller

5.   Download file—

5a) On the Hardware Summary window, select **Download From File**. See *Figure 6-100*.
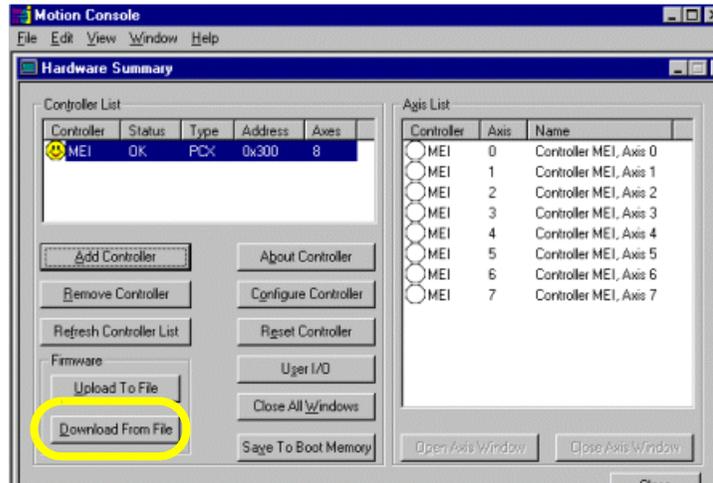
Figure 6-100—Download from file

5b) Select the correct software file for the type of servo motor installed. For Yaskawa motors, select MEI1128Y.ABS. For Mitsubishi motors, select MEI1214M.ABS.

5c) Click **Open**.
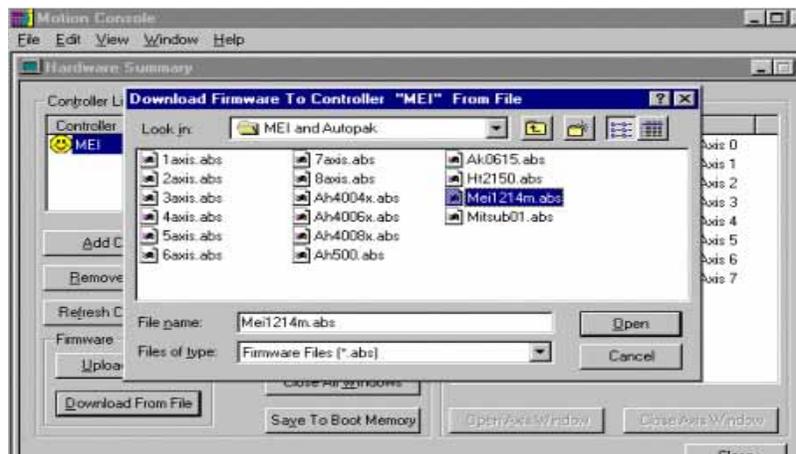
Figure 6-101—Select file

5d) Click **Yes** to replace the firmware on controller "MEI," as shown in *Figure 6-102*.

Figure 6-102—Replace firmware

6. Complete process—

6a) Press Alt-X to exit.

The motion controller card now has the new software loaded and the process is complete.

Option Unit: Tape-Out System

Cleaning the Pressure Seal Tape Output System

Pressure seal tape output systems require cleaning to prevent problems with breaking the carrier tape or tearing the carrier tape sprocket holes. The cleaning process removes adhesive build up from the cover tape application rollers and the drive sprocket top pressure idler wheel.

To clean the pressure seal tape output system:

TOOLS REQUIRED: Shop towel and alcohol or commercial alcohol wipes.

1. Prepare the system—

1a) Turn on the PS Series System and start the AH400 software on the Handler Computer.

1b) Load a job that requires the use of the tape output Controller.

1c) Start the job and let the AH400 complete its startup process.

1d) Turn on the tape output Controller.

2. Configure the tape output Controller—

2a) Configure the tape output Controller by setting the following:

• From the *Setup* menu, reset Count Stop to desired amount.

• From the *Setup* menu, reset Present Count to zero.

• From the *Setup* menu, select the desired carrier tape pitch from the pitch selection menu. The pitch selection choices are 4, 8, 12, 16, 20, 24, 28, 32, and other.

• From the *Advance* menu, set the number of pockets to advance to 1.

• From the *Speed* menu, set the advance speed from 40 to 100 depending on the carrier tape width and device size. Smaller devices and narrower tape widths run best with slower speeds, in the range 40 to 60. Higher speeds may cause the parts to be dislodged from the pockets or may cause the sprocket holes on the tape to rip out. A recommended speed is 60 to prevent carrier tape advance problems and breakage.

- From the *Jog* menu, jog the carrier tape forward to line up the pocket with the PNP head.
- From the *Mode* menu, press option 3 (PSA) for pressure seal cover tape.
- From the *Run* menu, place the unit in the run mode. The run window displays all the selected setup parameters.

2b) Verify all settings for accuracy.

3. Inspect the cover tape application rollers—

3a) Visually inspect the cover tape application rollers (see *Figure 6-103*) for build up of adhesive from the cover tape.
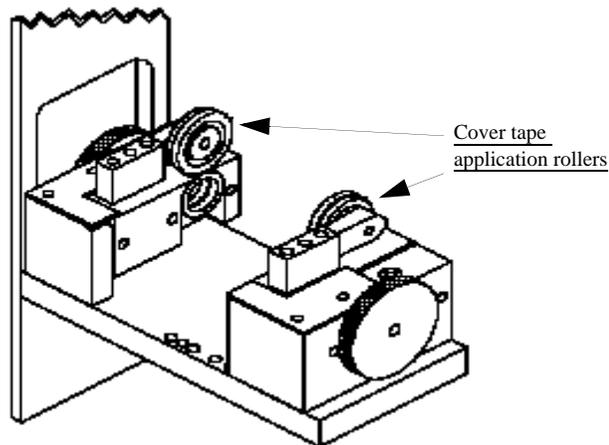
Figure 6-103—Cover tape application rollers

4. Inspect drive sprocket idler pressure wheel and rubber O-rings—

4a) Visually inspect the drive sprocket top idler pressure wheel and rubber O-rings for any build up of adhesive from the cover tape. See *Figure 6-104*.
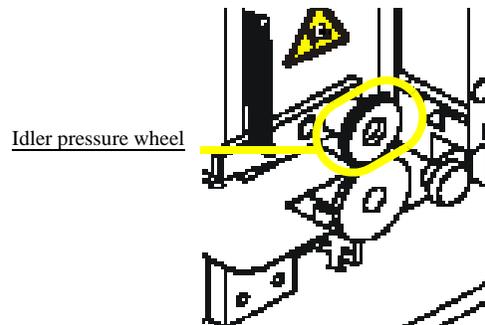
Figure 6-104—Idler pressure wheel

5. Remove adhesive build up from drive sprocket idler pressure wheel and O-rings—

5a) Gently remove the O-rings from the drive sprocket top pressure idler wheel. Avoid damage to the O-rings.

5b) Using a shop towel damp with alcohol or a commercial alcohol wipe, remove all adhesive from O-rings.

CAUTION: Wipe gently to avoid breaking the O-rings.

5c) With the O-rings removed from the idler wheel, clean the top idler pressure wheel using the shop towel and alcohol or alcohol wipes.

5d) Once all adhesive has been removed from the O-rings and idler wheel and the alcohol has dried, reinstall the O-rings on the top idler wheel.

6. Remove adhesive build up from the cover tape application rollers—

6a) Using a shop towel and alcohol or alcohol wipes, clean the adhesive build up from the cover tape application rollers. Hold the alcohol towel or wipe on the roller and spin the roller until the entire roller has been cleaned.

6b) Repeat procedure for the other application roller.

7. Check pressure of cover tape application roller—

7a) Advance the carrier tape with the cover tape through the application rollers using the manual advance pedal. Advance enough pockets to correctly align the cover tape on the carrier tape.

7b) Perform a "peel back" test by peeling the cover tape from the carrier tape. Note how well the cover tape adhered to the carrier tape. Perform a "twist" test by giving the tape a slight twist. Note if the cover tape detaches from the carrier tape.

7c) If either test produces loose cover tape, increase the application roller pressure by screwing in on the roller mounting screw and spring assembly.

7d) If both tests look acceptable, visually inspect the sealed carrier tape for adhesive that may have been squeezed out during application. If adhesive is visible, the application roller pressure is too high. Decrease the application roller pressure by screwing out on the roller mounting screw and spring pressure assembly.

The cleaning procedure for the pressure sealing tape output system is now complete.

Tape Output Sensors

The tape output system contains adjustable sensors that detect when the carrier tape is not inserted in the Carrie Tape Input Guide (Carrier Tape Sensor), when a device is jammed in the carrier tape (Device Jam Sensor), and when a pocket in the carrier tape is empty (Pocket Empty Sensor).

When the AH400 software displays the error message "Tape Out Unit," one of the tape output sensors has been triggered. The most likely sensors to trigger are the Device Jam and Carrier Tape sensors. See *Figure 6-105*.
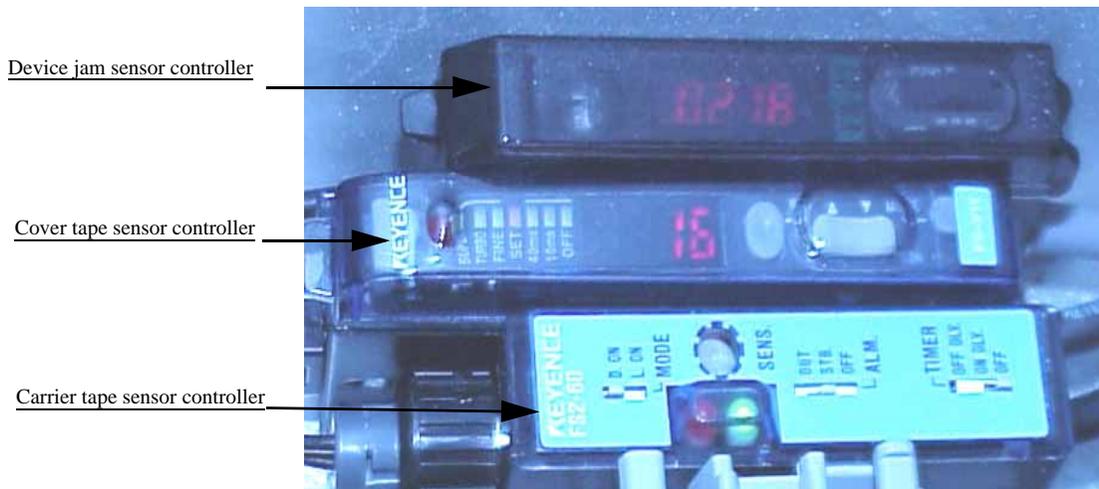
Figure 6-105—Sensor controllers

Device Jam Sensor

The Device Jam sensor is located on the Adjustable Loading Track immediately before the carrier tape enters the Carrier Tape Guide. This sensor detects when a device is not properly seated in the pocket.

The Device Jam Sensor Controller displays an orange LED when the Device Jam sensor is triggered.

Problem:
• Error message "Tape Out Unit" displays and an orange LED is illuminated in the Device Jam Sensor Controller.

Check this:
☞ Use a vacuum tool to seat the device in the carrier tape pocket.

☞ Re-seat the carrier tape in the Adjustable Loading Track.

☞ Use air to blow any debris out of the Device Jam sensor path.

Cover Tape Sensor

The Cover Tape sensor detects cover tape on the reel. If there is no cover tape, the red LED will come on the Cover Tape sensor, indicating a fault condition.

Problem:
• Error message "Tape Out Unit" displays and red LED is illuminated in the Cover Tape Sensor Controller.

Check this:
☞ Ensure that the Output Selector Switch is set to D.ON.

☞ Install a roll of cover tape on the unit.

☞ Press and release the (SET) button. The Calibration Indicator, [SET] LED bar, will light up.

☞ Remove the cover tape.

☞ Press and release the (SET) button.

NOTE: If an error occurs or the sensor fails to detect the cover tape after switching from a different type of cover tape, then the Cover Tape sensor may need to be re-taught to sense that particular type of cover tape.

Carrier Tape Sensor

The carrier tape sensor detects when carrier tape is not inserted in the Carrier Tape Input Guide. When the sensor is triggered, a red LED is illuminated on the Carrier Tape Sensor Controller.

Problem:
• Error message "Tape Out Unit" displays and the red LED on the Carrier Tape Sensor Controller is illuminated.

Check this:
☞ Replace the carrier tape reel if it is empty.
☞ Adjust the carrier tape sensor if the reel still contains carrier tape.

Pocket Empty Sensor

The Pocket Empty sensor verifies that a pocket is empty as the carrier tape approaches the Tape Out head location. The sensor shines a fiber optic light through the small hole in the center of the pocket. If the fiber optic light is blocked, for example by a device in a pocket, the sensor is triggered. There is no controller that displays this condition.

Problem:
• Error message "Tape Out Unit" displays and no other sensor has triggered an LED.

Check this:
☞ Adjust the Pocket Empty Sensor. Using an Allen wrench, loosen the two cap screws that hold the sensor bracket. Move the bracket in the Y-axis direction until the fiber optic light shines through the hole in the center of the pocket. Tighten the screws.

Option Unit: Laser Marking System

Modifying the Shuttle Stepper Motor

For shuttle motor P21 Single Stack (2" high), the value of the resistor should be 20K Ohms, +/- 20%, ¼ W.

For shuttle motor P22 Double Stack (3" high), the value of the resistor should be 15K Ohms, +/- 20%, ¼ W.

To replace the incorrect resistor in a shuttle motor:

You will need:
• P21 Single Stack Resistor: Data I/O Part number 104-1118-001
• P22 Double Stack Resistor
• Flat screwdriver
• 1/8" hex nut driver

> ⚠️ **WARNING:** *Electric shock hazard. Shut down the PS Series System (see "Shut Down the System" on page 3-16) and turn off the main power switch.*

1. Prepare the system—

1a) Verify that the PS Series System is shut down and the main power switch is in the **OFF** position.

1b) Remove the panel on the option bay and locate the stepper motor controller, highlighted in *Figure 6-106*.
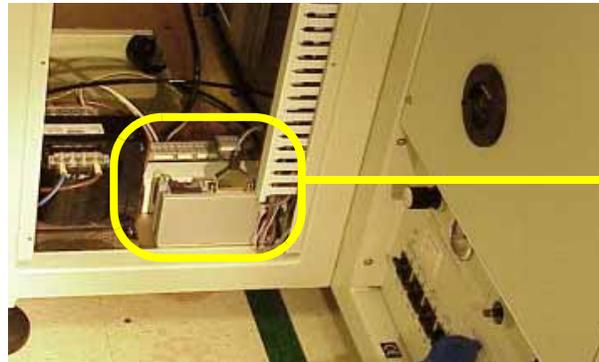
Stepper motor controller

Figure 6-106—Stepper motor controller

1c) Remove the DB-25 Connector.

1d) Remove the two hex-nuts (1/8") holding the stepper motor controller on the base plate.

1e) Remove all the wires from the screw terminals, making note of the connector numbers and wire colors as shown in *Figure 6-107*.

Screw Terminal Connector Numbers and Wire Colors		
1	Remote	No connection
2	Ref	Resistor
3	Current	Resistor
4	Dump	No connection
5	VDC+	RED power
6	VDC-	BLACK power
7	A+	Red/Red
8	A-	Black/Black
9	B+	Brown/Brown
10	B-	Green/Green

Figure 6-107—Connector numbers and wire colors

1f) Remove the old resistor and discard it.

2. Stepper motor controller box—

2a) Open the stepper motor controller box and pull out the PCB.

2b) Locate DIP switch number three, marked "SW3." See *Figure 6-108*.
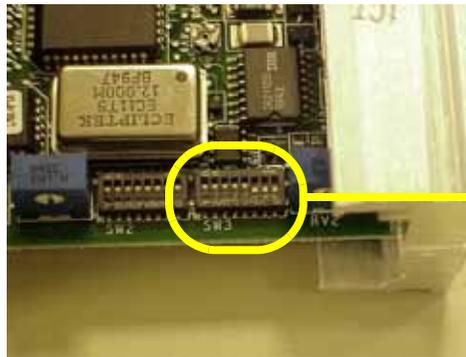
DIP switch number three

Figure 6-108—DIP switch number three

3. On SW3—

3a) Set #5 to OFF

3b) Set #6 to ON

3c) Set other switches as shown:
#1, #2, #3 & #4 = ON
#7 and #8 = OFF

NOTE: On SW2, all switches should be in the ON Position.

4. Reinstall—

4a) Push the PCB back into the stepper motor control box.

4b) Reattach the stepper motor controller box to the base plate using the two hex nuts.

5. Install correct resistor—

5a) Install the correct resistor between screw terminal #2 and #3. See *Figure 6-109*.

Figure 6-109—Install resistor

6. Test shuttle transfer assembly—

6a) Close the option bay panel.

6b) On the Shuttle tab, click **Home**.

6c) Click **Go** next to **Ped 2 Load Pos**. Click **Go** next to **Ped 2 Mark Pos**. Click **Go** next to **Ped 2 Tape Out Pos**. See *Figure 6-110*.
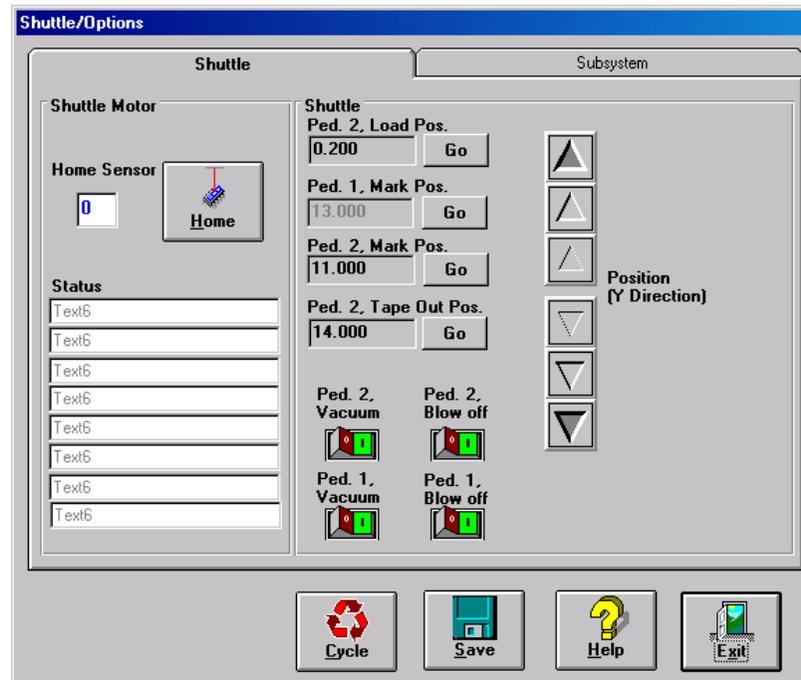
Figure 6-110—Test shuttle transfer assembly

6d)   Verify that the shuttle transfer moves as directed. Repeat three times.

Option Unit: Label Printing System

For detailed information on completing regular maintenance, replacing assembly units, making mechanical alignments and adjustments, and troubleshooting the label printing system, see the *Apollo 1 Service Manual* that came with your label printing system.

OPTIMA Configuration File

To avoid problems on programmers within the PS Series System, especially systems having both 486-based and Pentium-based Programmer Computers, edit the Optima configuration file.

To edit the file:

1. **Prepare the system—**
1a)   Turn on the PS Series System, but do not start the AH400 software. If the AH400 software is running, click **Exit** on the main window to completely exit.
1b)   Using Windows Explorer, navigate to I:\MACHINE1\BATCH
1c)   Locate and highlight the file **CNFGETOP.BAT**

CAUTION: Make a backup of **CNFGETOP.BAT** *and save as* **CNFGETOPOLD.BAT**.

---

2. **Edit the file—**
2a)   Open **CNFGETOP.BAT** file
2b)   Locate the line:
      COPY M:\SETTINGS\EXIOADDP.CNF D:

2c)   Change this line so that it reads:
      COPY C:\EXIOADDP.CNF D:

NOTE: Do NOT change any other line in this file.

2d)   Save and close.

OPTITEST

Run the OPTITEST program under any of the following conditions:
- A Programmer Computer is replaced.
- A Programmer Computer changed from a 486-based CPU to a Pentium-based CPU.
- A programmer PCB is replaced.
- A programming station is added or re-located.

To run the OPTITEST program:

1. **Prepare the system—**
1a)   Remove adapters from ALL programming stations.

2. **Programmer Computer—**
2a)   Select Programmer **N** ("**N**" for the programmer you wish to test).
2b)   Press <Esc> to exit the Optima window.
2c)   Press <D> to go to DOS.
2d)   Type **C:** to go to the C drive.
2e)   At the C:\> prompt, type **optitest.** This begins the test.
2f)   As the test is running, if any messages are shown, type <Y> to accept the changes.
2g)   The test is complete when the Optima menu reappears.
2h)   Press <Esc> to exit.

---

*NOTE: Repeat Step 1 and Step 2 for **all** programmers.*

---

3. **Restart the system—**
3a)   Turn off the PROGRAMMERS circuit breaker switch at the back of the PS Series System.
3b)   Wait two minutes and then turn the PROGRAMMERS circuit breaker switch back on.
3c)   Resume normal operation by starting the AH400 software and loading the required job.

Appendix A

AutoPak LED Status

PS Series System Owner's Manual

AutoPak LED Status: Input Ports

ON = LED turned On (i.e. lit green) - indicates logical bit value of 0 (zero).

INPUT Ports - Sensor Signals coming Into the AutoPak (as sensed by AutoPak)	
Port-1	
Bit-0	Pickup (SMAC) Head Vacuum Sensor. ON= sensed device on pickup tip.
Bit-1	Socket Opener - UP. ON= Socket Opener is in the UP position.
Bit-2	Socket Opener - down. ON= Socket Opener down, socket is pressed open.
Bit-3	Tray #1 Present. ON= Tray-1 Present - OR Tray Feeder #1 READY
Bit-4	Tray #2 Present. ON= Tray-2 Present - OR Tray Feeder #2 READY
Bit-5	Tray #3 Present. ON= Tray-3 Present
Bit-6	Safety Shield/Door Interlocks. ON= Doors Closed, OFF= Door Open. Machine will NOT run.
Bit-7	Not Used
Port-2	
Bit-0	ON= Auto Tray Feeder #1 ERROR-1
Bit-1	ON= Auto Tray Feeder #1 ERROR-2
Bit-2	ON= Auto Tray Feeder #2 ERROR-1
Bit-3	ON= Auto Tray Feeder #2 ERROR-2
Bit-4	Not Used
Bit-5	ON= Device present on Cup#2, Laser Vacuum Sensor -SV14, Cup#2 on Laser Transfer Shuttle.
Bit-6	Labeler Sensor
Bit-7	ON= Device present on Cup#1, Laser Vacuum Sensor -SV12, Cup#1 on Laser Transfer Shuttle.
Port-3	
Bit-0	ON= Input Shutter Piston, Open - Shutter should NOT be covering Laser Bay
Bit-1	ON= Input Shutter Piston, Closed - Shutter should be covering Laser Bay
Bit-2	Label Sensor - Limited Use, only on some units
Bit-3	Inl Marker Door Closed - Limited Use, only on some units
Bit-4	Labeler (Apollo) Finished Marking. 0=On Not Ready, 1=Off=Ready for Marking
Bit-5	ON= Output Shutter @ Tape Out Unit Closed
Bit-6	ON= Output Tape Ready. (V-Tek) Taping unit Ready
Bit-7	ON= Output Tape Error, could be due to one of the 5 sensors on the Tape-Out Unit
Port-4	
Bit-0	ON= Input Shutter Closed - Door Sensor. Door Closed and sensed by Opto Sensor on side.
Bit-1	Air Flow Sensor for FUMEX filter. ON indicates insufficient air flow -> Replace Filter(s)
Bit-2	Laser System Ready. ON indicates Device under Laser Head and ready to be marked
Bit-3	Not Used
Bit-4	Not Used
Bit-5	Not Used
Bit-6	Not Used
Bit-7	Laser Done Marking. O=On, Laser has finished marking the device. Device ready to proceed.

AutoPak LED Status: Output Ports

ON = LED turned On (i.e. lit green) - indicates logical bit value of 0 (zero).

	OUTPUT Ports: Signals or Commands generated by AutoPAK (commands from AutoPak)
Port-5	
Bit-0	ON= Socket Opener **Down** command (via Solenoid 1SV1)
Bit-1	ON= Turn on Pickup Head Vacuum @ PnP (SMAC) head (via Solenoid 1SV2)
Bit-2	ON= Turn on Pickup Head Blow-off @ PnP (SMAC) head (via Solenoid 1SV3)
Bit-3	ON= Turn On Vacuum on shuttle pedestal, Cup-1 (Laser Vacuum - 2SV4)
Bit-4	ON= Turn On Vacuum on shuttle pedestal, Cup-2 (Laser Vacuum - 2SV2)
Bit-5	ON= Turn on Blow-off on shuttle pedestal, Cup-1 (via 2SV1)
Bit-6	ON= Turn on Circuit Breaker K1 (Main Contractor)
Bit-7	ON= Turn on Blow-off on shuttle pedestal, Cup-2 (via 2SV3)
Port-6	
Bit-0	Synrad Laser Key
Bit-1	Tray Transfer Cylinder
Bit-2	Tray Position-1 Stop Cylinder
Bit-3	Auto Tray Feeder #1 INDEX command / signal
Bit-4	Auto Tray Feeder #2 INDEX command / signal
Bit-5	Tray Output Support Cylinder
Bit-6	Tray Output Singulate Cylinder
Bit-7	Part Ready at Tape-Out
Port-7	
Bit-0	Output Shutter Piston @ Tape-Out Unit.
Bit-1	Inkmark Vacuum. O=On, Turn On Vacuum on shuttle pedestal
Bit-2	Inkmark Blow-Off. O=On, Turn on Blow-off on shuttle pedestal
Bit-3	ON= Engage Tray Clamps (via Solenoid 1SV7)
Bit-4	Laser Mark Command. ON= Mark the device Command to Synrad Laser System
Bit-5	Input Shutter Piston Command - 0=On Close Shutter. Tied to Port-3 Bit-1
Bit-6	Label Apply Command - tied to "Applicator" button in AH400
Bit-7	ON= Advance Input Tape Feeder unit by one device
Port-9	
Bit-0	Over Head Lamps - Gantry Light - Not Used
Bit-1	ON= Turn On Tube Feeder Vibratory Motor-1 (Input)
Bit-2	ON= Turn On Tube Feeder Vibratory Motor-2 (Output)
Bit-3	Tube Feeder Vibrator Motor-3 - Not Used
Bit-4	Vision Power - Not Used
Bit-5	Tube Feeder Vibrator Motor-4 - Not Used

Appendix B

PS Series System Work Envelope Robotics and Programmer Schema

PS Series System Work Envelope and Block Diagram
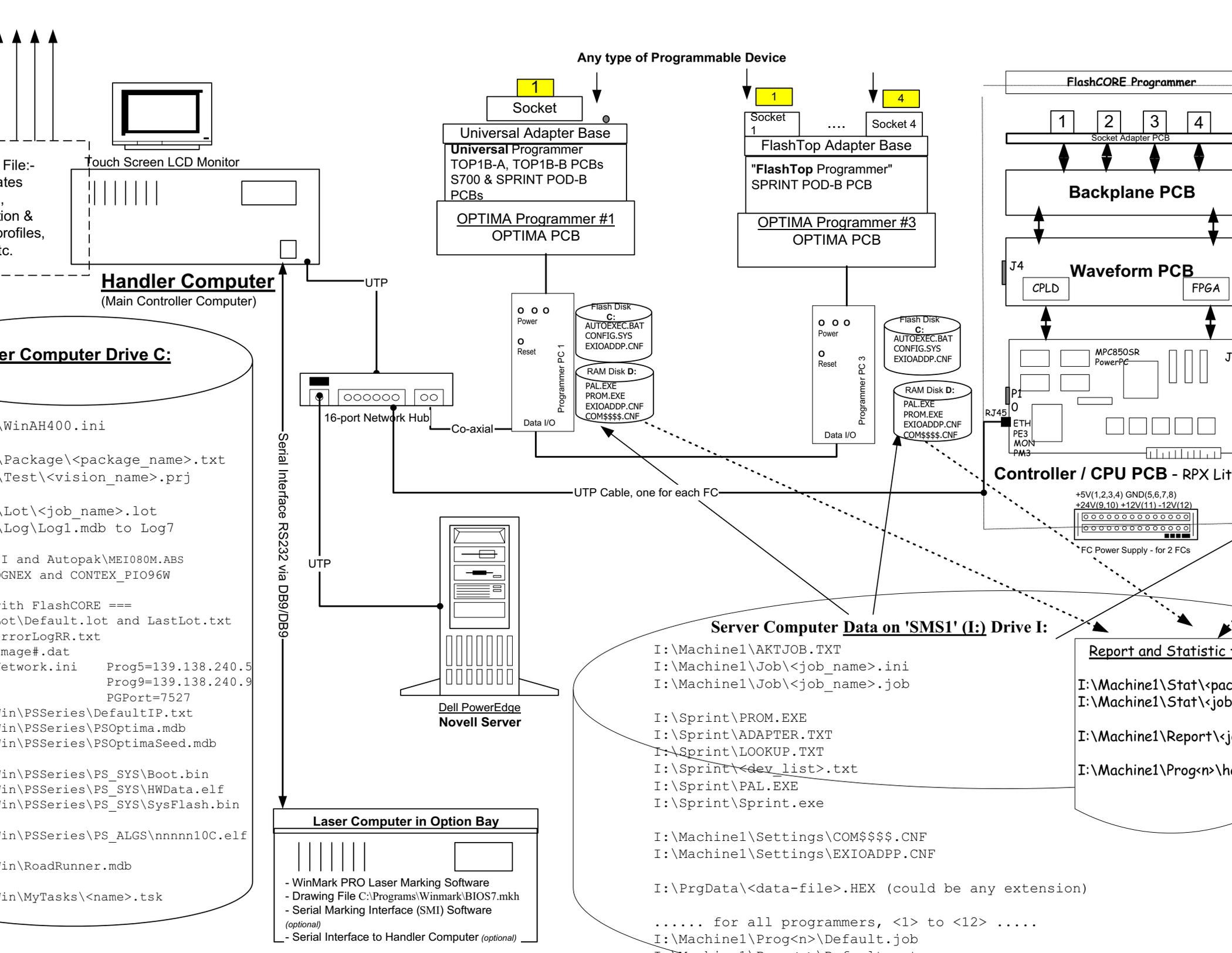
Touch Screen LCD Monitor

Handler Computer
(Main Controller Computer)

File:-
ates
,
ion &
rofiles,
tc.

...er Computer Drive C:

..WinAH400.ini

..\Package\<package_name>.txt
..\Test\<vision_name>.prj

..\Lot\<job_name>.lot
..\Log\Log1.mdb to Log7

...I and Autopak\MEI080M.ABS
..GNEX and CONTEX_PIO96W

...ith FlashCORE ===
...ot\Default.lot and LastLot.txt
...rrorLogRR.txt
...mage#.dat
...etwork.ini   Prog5=139.138.240.5
                Prog9=139.138.240.9
                PGPort=7527
..in\PSSeries\DefaultIP.txt
..in\PSSeries\PSOptima.mdb
..in\PSSeries\PSOptimaSeed.mdb

..in\PSSeries\PS_SYS\Boot.bin
..in\PSSeries\PS_SYS\HWData.elf
..in\PSSeries\PS_SYS\SysFlash.bin

..in\PSSeries\PS_ALGS\nnnnn10C.elf

..in\RoadRunner.mdb

..in\MyTasks\<name>.tsk

UTP

16-port Network Hub

Co-axial

Serial Interface RS232 via DB9/DB9

UTP

Dell PowerEdge
Novell Server

Laser Computer in Option Bay

- WinMark PRO Laser Marking Software
- Drawing File C:\Programs\Winmark\BIOS7.mkh
- Serial Marking Interface (SMI) Software
(optional)
- Serial Interface to Handler Computer *(optional)*

Any type of Programmable Device

`1`
Socket

Universal Adapter Base

Universal Programmer
TOP1B-A, TOP1B-B PCBs
S700 & SPRINT POD-B
PCBs

OPTIMA Programmer #1
OPTIMA PCB

Power
Reset
Programmer PC 1
Data I/O

Flash Disk
C:
AUTOEXEC.BAT
CONFIG.SYS
EXIOADDP.CNF

RAM Disk **D:**
PAL.EXE
PROM.EXE
EXIOADDP.CNF
COM$$$$.CNF

`1`
Socket 1   ....

`4`
Socket 4

FlashTop Adapter Base

"FlashTop Programmer"
SPRINT POD-B PCB

OPTIMA Programmer #3
OPTIMA PCB

Power
Reset
Programmer PC 3
Data I/O

Flash Disk
C:
AUTOEXEC.BAT
CONFIG.SYS
EXIOADDP.CNF

RAM Disk **D:**
PAL.EXE
PROM.EXE
EXIOADDP.CNF
COM$$$$.CNF

FlashCORE Programmer

`1` `2` `3` `4`
Socket Adapter PCB

Backplane PCB

J4
CPLD   FPGA

Waveform PCB

MPC850SR
PowerPC

P1
0
RJ45   ETH
        PE3
        MON
        PM3

Controller / CPU PCB - RPX Lit...

+5V(1,2,3,4) GND(5,6,7,8)
+24V(9,10) +12V(11) -12V(12)

FC Power Supply - for 2 FCs

UTP Cable, one for each FC

Server Computer Data on 'SMS1' (I:) Drive I:

I:\Machine1\AKTJOB.TXT
I:\Machine1\Job\<job_name>.ini
I:\Machine1\Job\<job_name>.job

I:\Sprint\PROM.EXE
I:\Sprint\ADAPTER.TXT
I:\Sprint\LOOKUP.TXT
I:\Sprint\<dev_list>.txt
I:\Sprint\PAL.EXE
I:\Sprint\Sprint.exe

I:\Machine1\Settings\COM$$$$.CNF
I:\Machine1\Settings\EXIOADPP.CNF

I:\PrgData\<data-file>.HEX (could be any extension)

...... for all programmers, <1> to <12> .....
I:\Machine1\Prog<n>\Default.job

Report and Statistic...

I:\Machine1\Stat\<pac...
I:\Machine1\Stat\<job...

I:\Machine1\Report\<j...

I:\Machine1\Prog<n>\h...

(_, Ymax)
Y=24"
_, #15

QUAD

L3

Socket 2	Socket 3	Socket 4

Programmer-1 FlashTop

Socket 1	Socket 2	Socket 3	Socket 4

Programmer-3 FlashTop
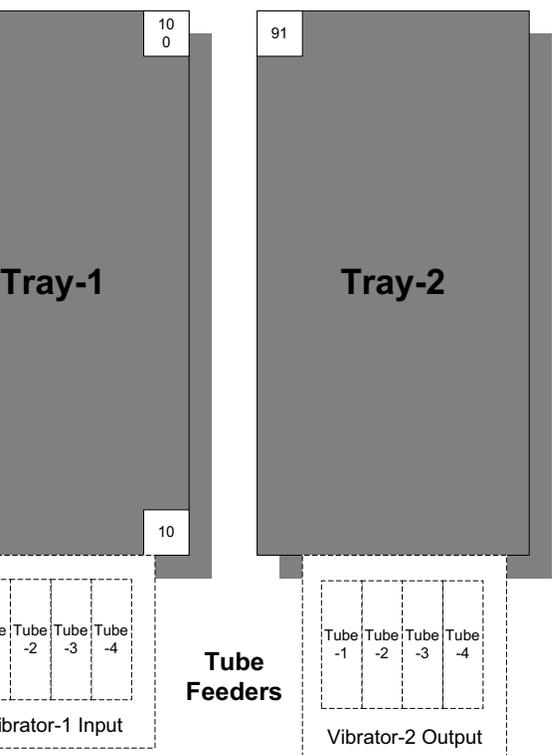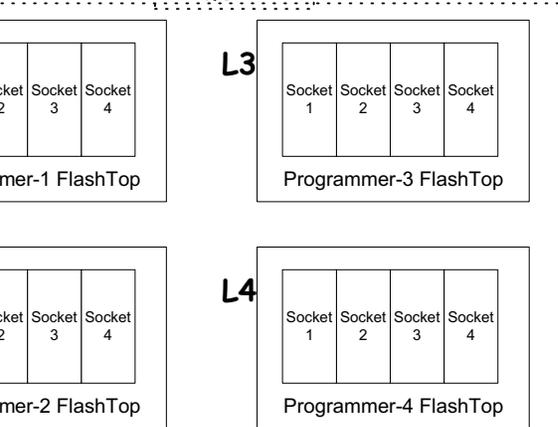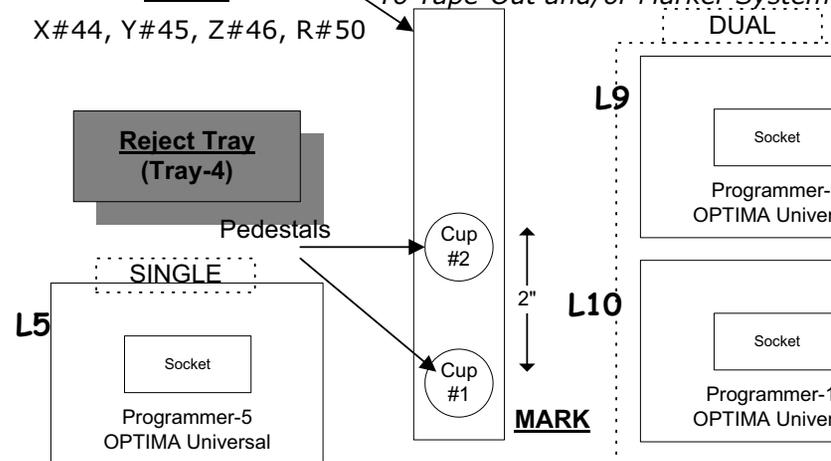
Shuttle Transfer Assembly
To Tape-Out and/or Marker System

(Xmax, Ymax)
X=37", Y= 24"
● Line #7, #15
HOME Position

Cup-2 Send
Under Tape-

Within the

DUAL

L9

Socket

Programmer-9
OPTIMA Universal

Cup-2 Mark Po
Under Laser Ma

**Reject Tray
(Tray-4)**

Pedestals

Cup #2

2"

SINGLE

L5

Socket

Programmer-5
OPTIMA Universal

Cup #1

MARK

L10

Socket

Programmer-10
OPTIMA Universal

Cup-1 Mark Po
Under Laser Ma

Socket 2	Socket 3	Socket 4

Programmer-2 FlashTop

L4

Socket 1	Socket 2	Socket 3	Socket 4

Programmer-4 FlashTop

QUAD

L6

Socket 1	Socket 2	Socket 3	Socket 4

Programmer-6 FlashTop

L11

Socket 1	Socket 2	Socket 3	Socket 4

Programmer-11 FlashTop

Each point in the Work envelope
has 5 position coordinates
associated with it:-
X, Y, Zdrop, **Z**pickup
and **R** (rotation)
Example VISION (X,Y,Zd,Zp,R).
These are saved in related
Package File at various Line#s,
along with:-
Motion Parameters (Velocity,
Acceleration), Pick-up & Drop
Timings, Vacuum & Blow-off
duration etc.

10 0

91

Tray-1

Tray-2

L7

Socket 1	Socket 2	Socket 3	Socket 4

Programmer-7 FlashTop

L12

Socket 1	Socket 2	Socket 3	Socket 4

Programmer-12 FlashTop

0.250

Rotation
on R-axis   +ve

0.500   0.00

-0.500

-ve

-0.250

SINGLE

L8

Socket 1	Socket 2	Socket 3	Socket 4

Programmer-8
OPTIMA FlashTop or FlashCORE
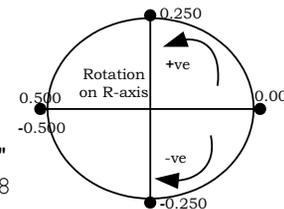
TAPE
Typical X=36", Y=5"
Line #147, 148

10

VISION
●

Device

Tube -2	Tube -3	Tube -4

brator-1 Input

**Tube
Feeders**

Tube -1	Tube -2	Tube -3	Tube -4

Vibrator-2 Output
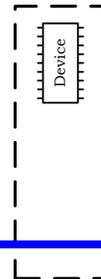
X=29", Y=4", Zd & Zp= -0.250", R=0
Line #192, #193, #194, #195, #196

(Xmax, Ymin)
X=37", Y=3"
●
Line #7,#16

**X
Axis 0**

(_, Ymin)
3"
#16

Appendix C

Handler Computer Interface to AutoPak and Signal Conditioning Example

Handler Computer Interface to AutoPak and Signal Conditioning Example

PNP Head

Socket Opener Ribs

Socket Opener

Up Sensor

Up

Air Hose

Solenoid 1SV1 (Coil)

Hose

Down Sensor

Down

Socket Opener **UP** Signal

Socket Opener **DOWN** Signal

Output Command

AutoPak Input Ports (Port-1 to Port-4)

AutoPak

AutoPak Output Ports (Port-5 to Port-9)

Opto Isolator

Opto Isolator

Fuse

Opto Isolator Solid State Relay

Socket Sensed **UP**

Port-1 Bit-1

Socket Sensed **DOWN**

Port-1 Bit-2

Socket **UP** Command

Port-5 bit-0

Inputs from Sensors

Outputs to Coils / Solenoids

PIO-96W
Bi-Directional Digital I/O Board
in Handler Computer

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