ET24 Pattern Controller

Manual Number: 19600-84

Revision: D

1-800-642-7876

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1 Safety Precautions for Hotmelt Applicator Equipment

This manual contains important safety information and instructions. Failure to comply with these instructions can result in death, injury or permanent damage to this equipment and will void the warranty.

1.1 Intended Use

This equipment is designed for use with standard adhesive and sealant materials with flash points above 232 °C (450 °F). Use of flammable material or material not compatible with the specifications of this equipment can cause injury to operator and damage to equipment.

The manufacturer has designed this equipment for safe operation. Specified models are in compliance with EN 60204-1:1993. However, heated thermoplastics and other hotmelt materials are dangerous and care must be exercised to ensure operational safety. Handling must be in accordance with hotmelt manufacturer specifications. Never exceed the maximum application temperature recommended by the adhesive manufacturer.

Dispose of hotmelt properly. Refer to the Materials Safety Data Sheet (MSDS) of the hotmelt for recommended disposal methods.

1.2 Personal Safety

Wear the following protection when working on or around this equipment:

Wear Safety Goggles

Always wear heat resistant gloves rated to 205 °C (400 °F) and allow all system temperatures to stabilize below 193 °C (380 °F) before servicing. Properly ventilate equipment according to MSDS of the material used. Do not store combustible materials in vicinity of equipment.

Wear Heat-Resistant Safety Gloves

Trained operators and service technicians should be aware of exposed surfaces of the unit which cannot be practically safeguarded. These exposed surfaces may be hot and take time to cool after the unit has been operating.

Keep parts of the body away from rotating parts. Do not wear loose articles of clothing when operating or servicing units with rotating parts. Remove wristwatches, rings, necklaces, or other jewelry and cover or pin up long hair before performing any work on or with the unit.

Wear Protective Clothing

Trained operators may perform only external equipment adjustments. Internal adjustments and service must be performed by trained service technicians.

1.3 Electrical Safety

Determine voltage of this equipment before installation and confirm compatibility with available power. Equipment must be connected to a properly grounded circuit and installed in accordance with all applicable electrical codes. Ground fault protection must be provided in supply circuitry at site installation.

Models designed to EN60204-1:1993 require power cords be approved to a harmonized (HAR) standard and rated for 70 °C (158 °F). A HAR approved Type B plug and strain relief for power cord are required to meet standard IEC 309. Power conducting wires must be nominal 4 mm^2 (12 AWG) maximum and nominal 1.3 mm^2 (16 AWG) minimum.

1.4 Emergency Power Disconnect

In the event of a malfunction, turn off power to the equipment at the power off switch and remove source power to the system at the nearest main disconnect.

1.5 Follow Directions

Read the product manual thoroughly before installation, operation or maintenance. Failure to do so can result in a serious accident or equipment malfunction. **The manufacturer will not be held liable for injuries or damage caused by misuse of this equipment.**

1.6 Safety Symbols and Signal Words

The following safety symbols and signal words are used throughout the manual and on the product to alert the reader and operator to personal safety hazards or to identify conditions that may result in equipment or property damage.

General Safety Symbols

DANGER Indicates a hazard which, if not avoided, will result in serious injury, including death, or equipment and property damage.

WARNING Indicates a hazard which, if not avoided, can result in serious injury, or equipment and property damage.

CAUTION Indicates a hazard which, if not avoided, can result in minor injury, or equipment and property damage.

Specific Symbols and Signal Words

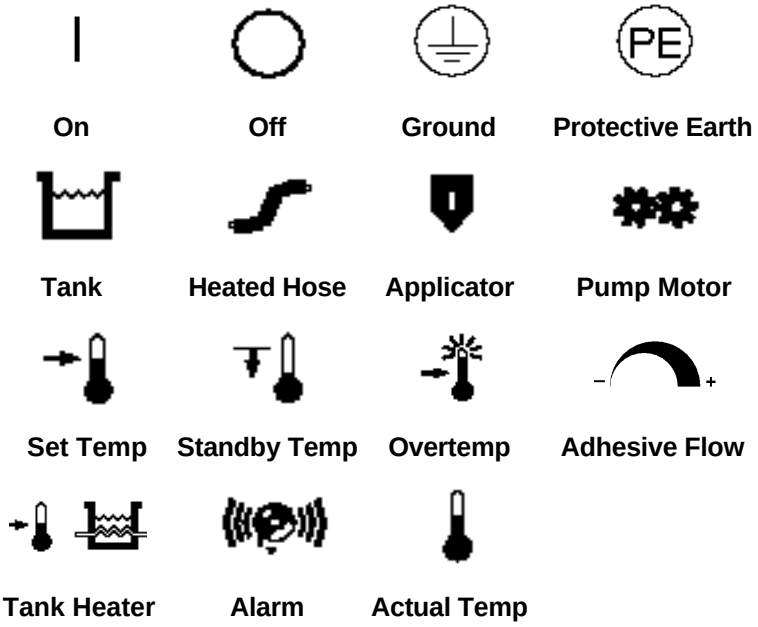
DANGER High Voltage. Can cause serious injury, including death. Disconnect electrical power at external source before servicing.

WARNING Hot Surface. Can cause serious injury and burns. Wear heat resistant clothing, gloves and safety goggles.

WARNING Disconnect electrical power at external source. Failure to do so can cause electrical shock.

WARNING High Pressure. System contents under pressure. Can cause serious injury and burns or equipment and property damage. Relieve pressure before servicing.

Other Product Symbols



The manufacturer reserves the right to make design changes for product improvement. This manual may not reflect all details of these improvements.

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2 Introduction

2.1 Description

ET24 is a solid-state timer/tracker pattern controller that controls glue, gap or stitch adhesive patterns at fixed or variable line speeds. 24 sequential pattern events can be programmed in units of time (time resolution is one millisecond) or length (length resolutions are .01 in., .02 in., .05 in., or .10 in.; metric unit length resolutions are .5 mm, l mm, 2 mm or 3 mm). These events are automatically adjusted to line speed in variable line speed applications.

ET24 accepts 4 input triggers and provides power output simultaneously to 4 independent valve groups. A valve group consists of one to four E100 style applicators, or up to sixteen E900 style valve modules. 20 pattern setups can be stored in memory when power is off. Precise adhesive patterns are programmed in time mode for fixed line speed applications with glue and gap events up to 9.999 seconds at 1 millisecond resolution. Glue events may be stitched.

ET24 has a built-in Time-to-Length Converter (TLC) that allows programming of adhesive patterns in units of length with resolution as low as 0.5 mm (0.01 in.) in both fixed line speed and line speed tracking modes. With line speed input from a Tach Generator, ET24 has line speed tracking capability that automatically maintains constant pattern length at varying line speeds. Memory for 20 multi-valve, multi-event programs allows quick selection of pre-stored patterns.

Note:12 VDC, 200 mA or 24 VDC, 200mA power is provided for photoeye triggers and to signal head drivers. Additional power source for triggering devices may be required in some applications.

2.2 Features

Simple toggle switch programming

4 independent trigger inputs

Independent event programming in time or length for 4 valve groups

Program and configuration lock

Digital readout and LED indicators

Metric or English scale

Displays product count and line speeds

Stores 20 pattern setups

Controls deposition on fixed or variable line speeds

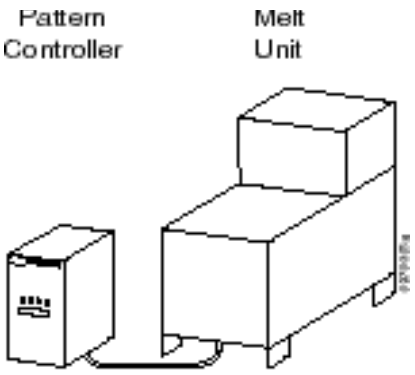
Controls parent machine time-dependent functions

Adjustable low line speed drop out

3 Installation

WARNING ET24 must be connected to a properly grounded circuit and installed in accordance with appropriate local electrical codes. Incorrectly connected equipment can result in personal injury or damage to the equipment. Astro Packaging will not be held liable for injuries or damage, whether directly or indirectly caused by use or misuse of this equipment.

WARNING *INPUT TRIGGERS:* ET24's power supply only supports 3 Astro Packaging photoeye sensors, due to current power requirements. If an additional power supply is needed, contact your factory representative.



Astro Packaging Pattern Controllers are shipped in 1 of the following configurations:

1. Controller factory wired to a melt unit; no installation required. Wires are terminated in both controller and melt unit with a flexible conduit connecting cable. The length of the cable is selected at the time of purchase. Photoeye trigger devices are also factory wired when ordered as a part of the system. There is no installation required when a controller is factory wired to a melt unit.

2. Controller factory wired to a flexible conduit connecting cable only; some installation required. Controller is wired with a connecting cable but is not connected to a melt unit. A controller with wired-in conduit cable is shipped either because it was ordered in that configuration or for convenience of packing and shipping. Installation requires connecting numbered wires in the cable to the corresponding numbers on the melt unit terminal strip.

3. Controller with no factory wiring; complete installation required. Installation requires making all connections within the controller as well as the melt unit. Instructions in this section must be followed as well as those in the melt unit service manual and wiring schematic diagram.

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3.1 Setup

Factory Configuration

The ET24 can be configured to meet the user's needs. These parameters are controlled by the functions explained in Section 4.2: Startup.

ET24 is shipped from the factory configured as follows:

1. Programmable Memory is set to zero. No program or test pattern is previously stored.
2. Trigger Mode is set to Single Shot. An input trigger voltage of +5 to 24 VDC initiates a program sequence. The program sequence continues even if the trigger voltage is removed, unless power is removed from ET24.
3. Trigger Type is set to activate signal OFF to ON. An incoming voltage transition from ground/neutral or zero potential to the trigger voltage initiates a program sequence.
4. Metric/English is set in inches for U.S. shipments.
5. Program Lock is OFF.
6. Line Speed Track Resolution is set to 0.01 inches.
7. Head ON/OFF Delay Compensation is set to zero.
8. Slow line speed drop out default is set to 10 feet per minute.
9. Function Lock is unlocked.

3.2 Electrical Circuits and Wiring

The ET24 provides 24 different patterns and can operate 4 independent heads or valve groups simultaneously. The duration of these events can be defined in terms of Time or Length. Time resolution is one millisecond. Length resolutions are .01 in., .02 in., .05 in., or .10 in. Metric unit length resolutions are .5 mm, l mm, 2 mm or 3 mm. Length measurements are accomplished by the integrated, on-board Time-to Length Converter (TLC) in both fixed line speed and line speed tracking modes.

There are 2 types of event sequences: Typical or From Start:

- Typical: prior event end defines following event start point, or
- From Start: each event referenced to start trigger (user can change any event without affecting adjacent pattern placement).

The string of event sequences can be initiated by a single input trigger. The trigger can be generated by a contact closure or an optional photo switch. The 4 valve groups are preselected as either AC or DC outputs. Any one of 4 input sensors can be assigned to trigger a program sequence for any combination of the 4 outputs. Each of the 4 outputs provides the ability to switch up to 4 Astro Packaging valves (a Valve Group), providing control for a total of 16 valves.

Sensor input can be triggered from a wide variety of sources: switch closure, semi-conductor switches, optical detectors or proximity detectors. With the installation of one jumper wire on the terminal strip, the ET24 can provide an internal trigger voltage of 5, 12 or 24 VDC to an external switch. If the external sensor generates its own voltage, the ET24 can accept trigger voltages of ±5 to 24 VDC.

3.2 Electrical Circuits and Wiring (Continued)

The ET24 is configured for length mode using the internal Time to Length Converter (TLC). The ET24 is triggered by a case sensor switch. The valve group outputs are wired directly to the melt unit 115 V~ valve coil circuit. The melt unit is configured for an internal wired HAT (Head/Activated/Test) switch.

Any output can be used to control other equipment such as electric motors or air solenoids. The outputs are optically isolated from the timer to prevent electrical noise problems. AC or DC output relays are available.

Trigger source can be a simple switch closure, sensor or semiconductor switch as used in optical or proximity detectors. Any trigger source can be program-assigned to initiate an event sequence for any valve group. The assignment is made using the front panel switch. No rewiring is required to change the trigger source for a valve group.

The term valve group is used because each output provides a sufficient voltage and current capacity to activate 4 heads from the same program control relay. These four heads are activated in parallel, running the same program event setup. The valve group output can be operated with any mix of AC or DC program output relays, specified at the time of the order. Each valve group event sequence is programmed independently and the program is permanently stored in memory. Up to four valve groups can be programmed, each with its own 24 event sequence. When the input is triggered, all valve group program setups are initiated simultaneously.

Selecting Duration Mode determines the units used (see #16). Set the duration of the event either in seconds or inches. Full scale is 9.999 seconds, 99.99 inches or 999.9 inches. When Line Speed Mode is selected, the display shows the line speed in feet or meters per minute (requires tachometer or TLC). When Count Mode is selected, the number of times the ET24 was triggered is displayed. This count can be zeroed or preset using the toggle switches under each digit. In Count Mode the event display is also used to display the 2 most significant digits of the count. ET24 can maintain counts for up to four separate triggers.

When internal wiring is required, proceed as follows:

a. Strip wires 8 mm (0.30 in.).

b. Unplug the connector from its receptacle. If removing more than one connector, note each connector's proper location.

c. Retract terminal spring by holding the orange connector [1] in one hand and firmly inserting a screwdriver with a 3 mm (5/32 in.) blade into terminal slot [4]. When screwdriver is fully inserted, the terminal spring is held open.

d. Insert correctly stripped wire into terminal [3]. Only two wires of the same gauge may be inserted into the same terminal slot.
   For 1 wire: 12 AWG maximum, 28 AWG minimum
   For 2 wires: 16 AWG maximum, 28 AWG minimum

e. Remove screwdriver releasing spring.

f. Tug on wires to ensure the connection is secure.

g. Plug connector(s) into receptacle(s).

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Power for the ET24 internal functions is 200 mA at 115 VAC or 230 VAC, 50/60 Hz. The diagram below is a guide to the electrical connections within the ET24. Following are examples of different types of trigger configurations.

Program Lock (with power on)

Configuration Lock

Head Group - Hold down

Hold switches H and E UP during power-up to toggle between lock and unlock mode.

Trigger common terminals 20, 22, 24 and 26 are connected together internally. The ET24 accommodates only one sinking type trigger. Sourcing triggers are required when multiple triggers are needed.

Interconnect Wiring Example # I
TA - Designates terminal point found within the melt unit.

Interconnect Wiring Example # 2
The ET24 is configured for line speed tracking using the tachometer generator. A 24 VDC Photoeye powered by the ET24 senses a carton and triggers the ET24 with a +24 VDC signal. The 24 VDC output of the ET24 sequences an Astro Packaging DC Driver for valve # 1.
TA - Designates terminal point found within the melt unit.

Interconnect Wiring Example # 3
The ET24 is configured for line speed tracking using the tachometer generator. A 12 VDC signal from a Programmable Controller triggers the ET24. The ET24 activates an output signal to the valve group relays which in turn activates the DC Driver to fire a valve solenoid.

Wiring Diagram - ET24 to Tachometer

Note: When viewing face of tachometer, rotation should be clockwise. To reverse rotation, interchange the red and black wires located under the tachometer's rubber boot system functions and programming.

3.3 Component Installation

Tachometer

Line speed tracking is accomplished by a linear Tachometer device that must be coupled to a non-slip rotating shaft of the parent. Tachometer generator installation is a simple connection to any rotary shaft via a direct coupling, then adjusting the calibration to display the machine line speed. Once adjusted for one line speed, it is correct for all line speeds. The entire calibration operation is completed in seconds.

- The Tachometer should be mounted so that the shaft is rotating in a clockwise direction. If this is not possible, the tachometer leads should be reversed at Terminals 34 and 35.
- The shaft must rotate (at full line speeds) at least 300 RPM but not greater than 3000 RPM. The RPM of the tach generator must be directly proportional with the movement of the product receiving the adhesive.

4 Operation

4.1 Controls and Indicators

Control Panel with
Callouts Here

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[1] SETUP: Selector Switch, Display, and Indicators

Switch selects TIME Mode, LENGTH Mode, or FROM START Mode when in DURATION Mode. Displays one of 20 stored setups. Simultaneously, time or length values are displayed in the Duration window. Indicators illuminate according to unit of measure selected.

[2,3] SETUP Switches

Select setup number to be run.

[4] DURATION: Selector Switch, Display, and Indicators

Switch selects Duration Mode, Line Speed Mode, or Count Mode. Display shows value for Duration Mode, Line Speed Mode, or Count Mode. Indicators illuminate when particular mode selected.

[5,6,7,8] DURATION Switches

Toggle up to increase or down to decrease displayed event duration. DURATION Mode is defined in units of TIME (seconds) or LENGTH (inches/ meters). In LINE SPEED Mode, switches are inactive. In COUNT Mode, switches reset count to zero at start of production run.

[9] EVENT: Selector Switch, Display, and Indicators

Switch: Selects STITCH, GLUE, or GAP event types: stitch event is chosen, the overall stitch time, the stitch gap time, and the stitch glue time must be defined. Select an event number starting with Number 1 and increase sequentially to create a pattern string.
Display: EVENT numbers. Up to 24 sequential events can be programmed for each valve group setup. If the duration selected is From Start (trigger point), the 24 events are arranged as 12 gap-glue event pairs. In Count Mode, displays represent two most significant digits of six-digit count.
Indicators: Illuminates type of event selected.

[10,11] EVENT Number Switches

Selects event numbers. Odd-numbered events are gaps (no glue); even-numbered events are glue or stitch. Also resets counter digits in Count Mode.

[12] VALVE GROUP: Selector Switch, Display, and Indicator

Selects 1 of 4 valve groups. The valve group number displayed is the group being programmed or monitored. Select 1 of 4 possible relay outputs normally used to control an applicator valve (valve groups of up to 4 valves each). This LED illuminates each time a glue or glue-stitch event occurs for the valve group displayed.

[13] SENSOR INPUT: Selector Switch, Display, and Indicator

Assigns a selected trigger number to the valve group displayed in the valve group window. The number displayed is the Input Sensor Trigger, which activates any valve group once the ET24 is programmed. Select 1 of 4 sensor (trigger) sources. The selected sensor (trigger) input is assigned to initiate the event sequence for the displayed valve group.This LED illuminates with each trigger input event.

[14] TEST Switch: Sensor Input or Valve Group

Pushing the TEST switch to the left simulates a trigger sensor input. The valve timing sequence begins for the valve group displayed in the valve group window and continues as long as the switch is held in this position. Pushing the TEST switch to the right activates the valve group displayed and illuminates the LED as long as the switch is held in this position.

Note: This switch can also be used as an emergency STOP switch. If it is pushed to the left and released during the running of a program setup it stops the program.

Note: Indicators, displays, Selector, TEST, and ON/OFF switches are green.

Control Panel with Callouts Here

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All other switches are black.

4.2 Startup

Self-Test

Before the user can program or use the system, ET24 self-checks the input, output and memory devices. During self-test, the Number 8 appears in every display and all LEDs illuminate. Successful self-test shows a normal system display [looks like??]. Unsuccessful self-test shows blank display.

Memory Clear

*** CAUTION ***
This procedure removes all loaded programs.

Clearing memory should be the last resort if a problem has been encountered in loading or modifying a program. A sequence log should be kept of timer's programs, in the event of a failure. All program setups are cleared to zero by holding the Test Switch to the LEFT during the configuration procedure found in Section 4.

Test Pattern

A factory defined test pattern can be loaded and run to determine if the ET24 is operating properly. To install the test pattern, hold the valve Group Selector Switch (L) UP while following the configuration procedure. The test pattern is automatically loaded into setup number 20. Select setup number 9 and the test pattern is as follows:

Head Group	Pattern
I	Alternating 0.5 sec. gap and stitch (25 ms-cycle)

4.2 Power-On Switch Selections – Customizing ET24

Powering-on ET24 while holding the switches listed below for 2 seconds causes the following changes.

Function	Switch	Action
Clear Memory	TEST	Push and hold green TEST switch to left.
Resolution Display (Current Length)	SETUP	Push and hold green SETUP switch up or down.
Trigger Mode Selection	DURATION	Push and hold green DURATION switch down for Duration Mode and up for Single Shot Mode.
Trigger Signal	Black switches under SET VALUE window	Hold hundreds' switch up or down during Power-On. Continue holding this switch; toggle black switches up to increase and down to decrease Auto Standby time.
Set Alarm Time to Auto Shut-off	CLOCK ON/OFF	Hold switch up for 300-second setting or down for 90-second setting.
Change All Zones STANDBY Temperature Offset Simultaneously	ZONE NUMBER Black switches under SET VALUE window	Hold ZONE NUMBER switch up or down during Power-On. Continue holding this switch, while toggling black switches under SET VALUE window.
Change All Zones HIGH/LOW Temperature Limits Simultaneously	ZONE NUMBER Black switches under ACTUAL window	Hold ZONE NUMBER switch up or down during Power-On. Toggle black switches under ACTUAL window.
Sequential System Heat-Up	TIME SET/CLEAR	Hold switch up for On and down for Off.
Enable Auxiliary Features	ZONE and ZONE NUMBER	Hold switches up together.
I/O Configuration Program Code	MINUTE	Hold down ones' minute switch (under ACTUAL window). Select I/O Configuration Program Code using ZONE NUMBER switch.
Forced Learn	MODE	Hold switch up or down.
Configuration Lock/Unlock	Black switches under SET VALUE (HOURS) window	To lock configuration, hold up hundreds' and ones' switches (under SET VALUE window) simultaneously. To unlock configuration, hold down hundreds' and ones' switches (under SET VALUE window) simultaneously.

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2 Alternating gap and glue of 0.5 sec. duration
3 Alternating gap and glue of 0.5 sec. duration
4 Alternating 0.5 sec. gap and stitch (25 ms.cycle)

Trigger Modes

The ET24 can be configured so that the event sequence continues only as long as the photo eye trigger signal is active. This Mode, called Duration, is selected by holding switch B DOWN during the configuration procedure. To re-initiate the event sequence, the trigger signal must be deactivated and then activated again.

In Single Shot Mode the ET24 initiates a sequence once the photo eye is triggered. The sequence continues to run until completion even if the trigger signal is terminated. This trigger mode is selected by holding switch B UP during configuration procedure. The ET24 triggers when the sensor changes state, high to low or low to high.

Trigger Signal OFF to ON is selected by holding switch J UP during the configuration procedure. A rise type trigger is activated when the incoming signal goes from OFF to ON.

By holding switch J DOWN during the configuration procedure, the ET24 input trigger can be configured to activate when the incoming signal is falling. This trigger signal is known as ON to OFF. This trigger type is inactive when voltage is applied and is activated by opening or grounding the incoming signal.

Metric or English Function

English or Metric display is for Length or Resolution values. Metric is selected by holding the Sensor Input, switch M, in the DOWN position during the configuration procedure. English is selected by holding switch M in the UP position during the configuration procedure.

Program Lock

Program Lock is used to protect stored values. To toggle between locked and unlocked mode, hold switch L DOWN while pushing Trigger Test, switch N, to the right. This is not a power on procedure.

Configuration Lock/Unlock

Configuration lock is used to prevent access into any unused valve Groups and to protect programmed configurations from being changed. To toggle between lock and unlock modes, hold switches E and H UP to lock and DOWN to unlock while powering up timer.

Line Speed Tracking Resolution

The Length Resolution function is the number of valve groups and the systems ability to track line speed of the parent machine. As the line speed of the parent machine increases, the resolution decreases. Switch A is held up or down during power-up, to display the current length resolution.

The Resolution is displayed in the Duration Display window. The possible resolutions are: 0.01 inches (l mm), 0.02 inches (2mm), 0.05 inches (3mm), or 0.10 inches. To modify the current resolution, hold switch A UP and toggle switch E UP for larger resolution or DOWN for smaller resolution.

The resolution must be set for the number of heads on the system and the maximum system line speed. If the resolution is set too fine for the maximum line speed, the ET24 may misread the tach generator and generate a glue stripe that is twice as long as called for at high line speed. For more information on Line Speed Tracking, reference Section I in this manual.

Head ON/OFF Delay Compensation

Head Open Response is an electromechanical delay time phenomenon. The delay is the amount of time that transpires after the ET24 commands the valve to open and the adhesive actually reaches the product. At relatively slow production line speeds or production line speeds that do not vary more than 10 feet per minute, valve On Response Compensation is not necessary. However, where line speeds are varying over more than 10 feet per minute, valve Response Compensation must be adjusted for accurate adhesive placement. (See Section H, Line Speed Compensation.)

Head Closing Response is a similar phenomenon with the opposite cause and effect standpoint. valve Closing Response is a result of the amount of time delay after a glue event is commanded to stop by ET24 and the actual end of the adhesive stripe on the product. The effect is a lengthening of the glue stripe related to increased line speed of the product. With line speed changes of 10 feet per minute or less, the valve Closing Lag can be ignored.

Correcting for valve opening and closing response is an easy procedure with ET24. First determine the valve open response time. Deposit adhesive on the product at the slowest line speed. Speed up the machine to its highest pace and deposit adhesive a second time. The stripe will have shifted its starting point from the original slow line speed position to a new position and length at the highest line speed. Now measure the difference using a hundredth of an inch or millimeter scale. Next, determine the lowest and highest line speed that the parent machine will operate using the Line Speed Mode of ET24. Now determine the valve open response time using the following calculation:

4.2 Startup (Continued)

Head ON/OFF Delay Compensation continued

ENGLISH valve Open = Pattern Shift in .001 Inch Increments
Response (Highest Line speed - Lowest Line speed) x 0.2

METRIC Head = Pattern Shift in Millimeters Increments
Response (Highest Line speed - Lowest Line speed) x 16.66

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Head On Responses have been calculated and can be programmed into the ET24 using the following procedure.

When the Mode Switch is held during power-up, the-ET24 displays the valve number (starting with valve 1), the type of compensation (ON indicated by the Glue LED, or OFF indicated by the Gap LED), and the currently-programmed compensation in milliseconds (from 0 to 99). During the configuration procedure (sect.D.2) hold switch D down, while specifying the valve compensation. To modify the duration, toggle the Duration Switch under the digit to be changed. To select On or Off Compensation, toggle switch I. To select a different valve number, toggle switch L.

When correcting the valve Response, the ON DELAY compensation must be set first. The product must run at the lowest and highest line speeds with the ON compensation adjusted to the valve Open Response Time calculated. The adhesive starting point should not shift more than ± the resolution setting. Note that the adhesive stripe is longer at the high line speed than at the lower line speed. Measure the difference again and use this measurement in the valve Response calculation. Using the set valve compensation procedure, set the OFF DELAY Compensation. This completes the valve Response Compensation procedure.

Configuration Procedure

All configuration functions on the ET24 remain as set until changed by the following procedure. To change a function:

1. Turn the power off for at least two seconds.
2. Place the control switch, associated with the function, in the desired position. (Control Switches are defined below.
3. While holding the switch in this position, turn the power ON.
4. Hold the control switch for at least one second and then release.

Programming (Reference illustration on Page)

1. Turn power ON to initiate a self test. All LEDs illuminate and all windows display the number 8.

2. Push the Program setup Switch (B), until the readout displays the desired program setup number. The event sequence is stored in this location. The unit is now ready to accept and store the program setup. A full set of multi-head, multi-event patterns can be stored in each Setup. A different setup can be stored for each different package type or configuration. Package types can be changed in seconds by selecting stored setup. Any setup timing parameter can be modified when system active. Modifications are immediate and permanently stored in memory.

3. Set the mode option to Duration using the Mode Selector Switch (D).

4. Set the Duration to Time, Length or Time/Length From Start (both LEDs on) using the Duration Type Selector Switch (A). Selecting Length VE Length From Start requires that a TLC or Line speed Tracker Fl option is set and properly adjusted. See Section I.I.

5. Select the appropriate valve group to be programmed by pushing the valve Group Number Select Switch (L), until the desired digit is displayed.

6. Select the desired input trigger to initiate the event sequence with the Input Trigger Selector Switch (M).

   Steps 5 and 6 assign the selected valve Group/Sensor combination. Any sensor trigger can be assigned to any valve group.

7. Now select the Event Number (J,K), starting with event 1. An event sequence must-st always start with event I and progress in sequence.

8. Select the type of event to be programmed for this event number by pushing the Event Type Selector Switch (I). The odd numbered events (1, 3, 5, etc.) are always GAP. A Glue or Stitch may be selected for even events. A Gap must always precede a Glue event to accommodate on delay compensation.(Refer to Section H).

9. Set the event Duration in seconds, using the selector switches and watching the display.

10 If the Event Type is a gap or glue, programming of that event is complete and is stored in memory upon selecting the next event number. If the event type is a Stitch, three aspects of the pattern must be defined: the overall stitch Duration, the stitch gap time and the stitch glue time. Step 9 programs the overall Duration. Toggling the Event Type Switch,(D) UP illuminates both the stitch and gap LEDs. The stitch gap time can now be entered with the Duration switches. Toggling this switch UP again illuminates the stitch and glue LEDs. The stitch glue Duration can now be entered. Programming of the stitch event is complete when the next event number is selected. An event gap, glue, or stitch can be defined in terms of TIME (seconds), LENGTH (inches/meters), or FROM START (duration of events from point trigger first activated).

    Note: Do not toggle the Event Type Switch until the Event Number is toggled or timer will revert to a glue event.

II. Repeat Steps 5 thru 10 until the desired event sequence is completed. An event sequence can be terminated by either programming all 24 events or programming an event with a Duration of 0.000. In the normal event sequence whenever the ET24 see an event with the Duration set at 0.000, the timer assumes this to be the last event in the sequence.

4.2 Startup (Continued)

12. Repeat steps 3 thru 11 for each valve group. Once all valve groups have been programmed, the programming for the setup selected in step 2, is

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complete. Repeat steps 2 thru 13 for each additional setup.

14 The From Start Duration display continues to add each new event to previous gap/glue event pairs. It also displays the accumulated time or distance for all previous gap/glue event pairs. To stop the From Start, the glue portion of the event pair is set to 0000. The gap event must not be set to 0 or a failure indication (blinking digits) occurs. An event sequence can be programmed in normal sequential mode and switched to From Start to allow moving an event without effecting adjacent event positions.

*** NOTE ***

ANY EVENT CAN BE REPROGRAMMED OR MODIFIED DURING OPERATION, HOWEVER THE PROGRAM CHANGES DO NOT TAKE EFFECT UNTIL THE NEXT TRIGGER SEQUENCE.

Sample Program - Two valve system with different patterns

1. Assume the ET24 is being used with a KB 20 on a top and bottom case sealer. The top and bottom glue stripes are different. The top has a 100 ms gap, 300 ms of glue, a 500 ms gap and a second glue stripe 300 ms long. The bottom valve has a 50 ms gap, 400 ms of glue, a 400 ms gap and a second 400 ms glue stripe. The sensor input is on input Val.

Sample Program - A stitch pattern

2. Assume that valve group 2, event number 4 is a stitch pattern. The total stitch Duration is 500 ms, with a stitch gap of 25 ms and a stitch glue of 75 ms. Event I is a 250 ms. gap. The sequence is initiated from trigger 1.

4.3 Adjustments

Applicator valve response time creates problems with adhesive placement during varying line speeds. The ET24 can be adjusted to compensate for the response time so that the adhesive is deposited at the same place on the product, regardless of the line speed.

Time to Length Converter (TLC)

The Time to Length Converter (TLC) is an integral feature of the ET24. The TLC generates an adjustable digital signal that makes the ET24 believe it is looking at a constant line speed tracking device. The TLC allows programming of the ET24 in length increments rather than time. The adjustment is made using the line speed Calibration Potentiometer. Prior to setting the TLC the Programmable Length Resolution must be set, refer to pages 1-1 and I-2 for the procedure.

There are two methods for setting the TLC adjustment:

Method One: If you already know your line speed or you have an accurate tachometer available for measuring line speed, simply set ET24 to this line speed. This is done by selecting the Line Speed mode on the ET24 front panel and adjusting the line speed Calibration Potentiometer (POT) from it's full counter-clockwise (lowest line speed indication) position so that the displayed reading is the same as the actual line speed in feet per minute (Meters per minute in metric mode).

*** NOTE ***

The last digit displayed may change plus or minus one digit due to adjustment sensitivity. This is normal and does not affect subsequent length settings.

Method Two: Eliminates the need for prior knowledge of line speed. Simply set ET24 so that a one inch glue stripe would be generated by one of the heads. Now run the machine with the line speed POT in the full counter-clockwise position and measure the actual length of the glue stripe. If it is shorter than one inch, adjust the line speed POT in a clockwise direction about one quarter turn. Re-run the machine and measure the stripe again. The stripe will be longer by an increment. This helps estimate how many more quarter turns of the potentiometer that must be made to lengthen the stripe to one inch.

Example e: If on the first run the stripe was one half inch and a one quarter turn lengthened the stripe by one eighth inch, it takes three more quarter turns to get the stripe to be one inch long. Fine tuning can be accomplished with on or two more runs. Once the stripe length is displayed on ET24, no further adjusting is necessary. Now programming in length is possible, eliminating the problem of converting line speed to time of event. (Note: always turn the POT to it's full counter-clockwise lowest reading position before calibration.)

After adjusting the TLC for a given glue event, the adjacent gap event is inaccurate. This is due to valve open and close response. An explanation of this response is found in Section H. Correcting for valve response is simple with ET24, the procedure is found on page 1-4 and 5. Adjust ON compensation and check the pattern for glue gap accuracy. The event will be shorter, now adjust the OFF compensation and check pattern for accuracy.

4.3 Adjustments (Continued)

Line Speed Compensation

In adhesive applications there are many situations where the production line speed varies from time to time and yet the length of the adhesive bead pattern must remain the same. To accomplish this constant pattern length with varying line speeds, the amount of time the adhesive valve is dispensing must be continuously adjusted to the proper time intervals. Those time intervals must change linearly with the line speed changes.

In addition to the timing issues related to varying conveyor line speed, all dispensing devices have measurable response times which must be taken into consideration. There is a certain amount of delay or lag between the time that the applicator is given a signal to turn on or off and the time when the adhesive actually starts or stops on the product. This aspect of applicator behavior becomes extremely critical in maintaining performance standards as line speeds increase and pattern specifications tighten. With a high line speed Astro Packaging valve a 25 fpm change in line speed results in a 0.05 inch pattern shift.

LINE SPEED COMPENSATION is the term used to describe what a timing device must do to properly control an adhesive applicator system in a variable line speed production situation. Generally, variable line speed timing controls accurately account for the changes in the line speed of the parent machine. However, they may not automatically compensate for the electromechanical response characteristics of the hot melt applicator valve or gun.

Hot melt equipment users may be confused about how line speed compensation pattern timing controllers should work based on prior experience with inadequate systems. In particular, the user should

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understand how two important calculations and corrections are made to achieve the desired pattern lengths with correct registration at varying line speeds. The purpose of this section of the manual is to provide a basic understanding of how line speed compensation is accomplished and how the delay characteristics of dispensing devices can be controlled when using the Astro Packaging ET24 Event Timer.

A Line Speed Compensating System dispenses the glue pattern of a specific length, regardless of how fast the substrate is moving. The glue bead always starts and stops at the correct locations.

Understanding Line Speed Compensation
First imagine a simple applicator device (EIOO valve with single orifice button nozzle) which must apply a strip of adhesive to a series of 26 in. long boards. The adhesive bead length is 24 in. with a space of 1 in. on each end of each board.

As a board moves toward the applicator valve it trips a limit switch arm which activates a timer. The limit switch is up-stream from the applicator and hence there must be a time delay between the time that the switch is activated and the applicator device is actually turned ON.

The simple timer device consist of only two adjustments for two time events. Event One is the delay time between activation of the limit switch and the applicator head. This is called a Gap Time Setting or, GAP. Event two is the Glue Time Setting or, simply GLUE; the amount of time the applicator is ON dispensing the 24 in. long bead of glue.

4.3 Adjustments (Continued)

Next, assume that the applicator system is perfect, there is no delay between the instant the timer sends the signal for the applicator to turn ON and when the adhesive actually hits the board to start the pattern. Also there is no delay between the timer signal and applicator shut OFF; the adhesive bead stops on the board at the same instant as OFF.

The line speed of the traveling board must be known before the time settings for the two events can be calculated.

If the board is traveling at 50 fpm or 15 mpm, GAP time setting is as follows - at a line speed of 10 ips we must wait for the 36 in. of board travel to occur before we fire the applicator. Divide 36 in. by the line speed of 10 ips and the answer is 3.6 seconds for the GAP setting. (Reference Table I in Appendix)

The 24 in. glue application should stay ON 2.4 seconds at 50 fpm if an ideal situation existed where: o there are no time delays between the time the valve is turned ON and the time the adhesive appears on the substrate and/or o no delays between the time the valve is turned OFF and the time the adhesive stops then these timer settings would place the adhesive bead exactly where it needs to be on the boards for the two different line speeds.

ON and OFF DELAY TIMES

ON Delay Time
With an actual applicator system, the ideal situation presented above never

exists. When the first Time Event setting, the GAP is completed and the second Time Event, the GLUE, is activated, there is a slight delay or pause before the adhesive actually appears. This delay affects the location of the beginning point of the bead by moving it further back from the leading edge of the board.

The following example is exaggerated for illustrative purposes! If the delay from signal to actual deposition was 2 seconds, at 50 fpm it would take 5.6 seconds before the adhesive actually started on the board. (The timer GAP of 3.6 seconds calculated earlier plus the additional built in response delay of the dispensing device of 2 seconds). Consequently the pattern shifts another 20 inches further from the edge of the board at 50 fpm, and now starts 21 in. from the edge instead of I in..This delay in response time, present in all dispensing devices, is called the ON DELAY TIME.

ON Delay Time is caused by many factors, all of which are independent of line speed or, in the example used, the line speed the board is traveling. Some of those factors are:

1. The time from timer signal to full energizing of solenoid magnet.
2. The time for energized solenoid to lift armature from valve seat.
3. The time for adhesive to travel from nozzle tip to the substrate.

The further the nozzle is from the substrate the longer the travel time. This time for adhesive travel depends on the force of gravity and the adhesive pressure in the system.

4.3 Adjustments (Continued)

An analysis of On Delay Time shows two important events.

1. The bead is not deposited at the correct place 1 in. (25 mm) from the edge of the board. It has shifted downstream 0.1 second's worth of travel. At 10 ips (250 mmps) the board travels 1 inch (25 mm) in 0.1 second and the pattern shifts I in. (25 mm) from the required spot on the board.

2. The actual bead length is shortened by the amount of shift as well! (Assume that there is no OFF DELAY TIME involved in this situation.) The second event, the GLUE time was set for 2.4 seconds. After the first GAP event of 3.6 seconds occurred, the second event, GLUE, activated as planned, but nothing happened on the board for the 0.1 second of ON DELAY. After the ON DELAY TIME, the pattern appears and the GLUE event is completed in 2.3 seconds (i.e., the 2.4 second GLUE time minus the 0.1 second ON DELAY TIME). So the actual bead length is 23 in. (575 mm) at a 50 fpm (15 mpm) line speed.

Important Technicality

There is an important technicality regarding ON DELAY TIME and its effect on pattern shift which should be understood. Although it was stated above that the factors contributing to the ON DELAY TIME were summed together and called ON DELAY TIME, the effects of this composite delay value on pattern drift and shortening of the bead length were introduced.

However, only those factors associated with the response time of the valving

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device itself affect the total glue pattern length by shortening it. The distance of the nozzle from the substrate has no effect on the actual length of the glue bead. Compensating for the time it takes the adhesive to travel from the nozzle to the substrate by adding this amount of time to the GLUE in.on time in. produces a longer pattern length than desired. This in.delivery time in. factor is not covered in this presentation. Timing adjustments do have to be made where high line speed or distance to substrate make it a significant factor in pattern accuracy.

To correct for the ON DELAY factor the timer can be equipped with On Delay Compensation or ON COMPENSATION. To move the adhesive forward to the correct starting point the ON DELAY TIME should be subtracted from the GAP time. This places the start of the adhesive bead exactly where it should be. In other words, the GAP must be shortened and the valve fired sooner to hit the proper registration mark on the substrate.

On Compensation shows the effect of subtracting the ON DELAY value from the GAP preceding the GLUE setting. The bead is adjusted by anticipating the ON DELAY and starting the GLUE sooner.

It is important to note, however, that although the start point has now been corrected, the actual length of the bead pattern is still shorter than desired because the total GLUE time was fixed for a specific amount, 2.4 seconds. When the GLUE event starts (no matter when it starts) nothing happens for the amount of ON DELAY present in the applicator system - in this case 0.1 second of glue time is lost.

4.3 Adjustments (Continued)

Thus, adjustment of starting point by compensation for ON DELAY shortens the length of the glue bead by the amount of ON DELAY TIME. In the example, if no correction in bead length were made, the bead would be shortened by I in. (25 mm). To obtain the desired bead length, the ET24 ON DELAY TIME is automatically added to the GLUE on time where multiple GAP -GLUE and even STITCH GAP - STITCH GLUE events are present.

For line speed compensation to be effective, there must be a GAP Event or a space before the GLUE Event if there was no GAP event. If the limit switch was positioned right underneath the valve so that as soon as the board hit the switch, adhesive is expected to appear on the board. As just discussed, nothing happens for 0.1 second and the glue actually appears on the board 0.1 second's worth of travel later. Since the limit switch is under the valve there is no GAP Event Time to move the glue event into, and therefore can not provide for ON DELAY Compensation.

OFF Delay Time

The next aspect of applicator behavior which must be taken into account in a line speed compensation situation is the time between the turn off signal to the applicator valve and the moment the adhesive flow actually stops. This is called OFF DELAY and is a condition, like ON DELAY, caused by factors in the applicator itself and is

unrelated to the line speed of the substrate or line speed. In the case of the Astro Packaging electric heads, the OFF DELAY is related to the movement of the armature in the guide tube, the collapse of the magnetic field, spring force in the valving assembly and so forth. To simplify the concept, one single time value, OFF DELAY TIME is used to represent the total effect of all

contributing factors.

To understand OFF DELAY we return to the same example used before and assume that there is a 0.1 second OFF DELAY TIME. Also, for simplicity at this point, assume that there is no ON DELAY TIME.

Only one dimension changes with OFF DELAY TIME, the length of the glue bead increases. At 50 fpm (15 mpm) the glue Timer setting was 2.4 seconds and switched off at that time setting. The actual valve valve did not stop precisely at that point but continued for another 0.1 second. At this line speed, the glue bead is extended, 0.1 seconds x 10 ips (250 mmps) = I inch (25 mm).

Thus it can be seen that the presence of OFF DELAY causes a longer glue pattern. This extended length can be corrected with OFF Compensation.

OFF COMPENSATION only works with GLUE Events if shortening the glue bead length by the OFF DELAY TIME. If, at a given line speed, the amount of time needed to produce the required glue bead length is equal to or less than the OFF DELAY TIME, the calculation produces a zero or negative value and a correct compensation cannot be made. For example, attempting a 0.5 in. bead at 50 fpm requires only 0.05 second On Time. That On Time is less than the 0.1 second OFF DELAY TIME used in the example. This factor defines a limit on bead length for purposes of OFF COMPENSATION for a particular OFF DELAY TIME at a given line speed which is stated in H.3 Rules for ON and OFF Delay.

4.3 Adjustments (Continued)

Rules for ON and OFF DELAY Line Speed Compensation

Rule I

There must always be a GAP event first, after the input trigger, before the GLUE event. (ET24 does not allow Event Number I to be a GLUE event, the program does not permit it.)

Rule 2

a. The trigger point (sensor eye) placement must be physically placed up stream of the valve a sufficient distance.

b. The minimum distance between the trigger point and the valve must be longer than the distance travelled by the product at the maximum line speed during the ON DELAY TIME.

In the example, with 0.1 second ON DELAY and assuming a maximum line speed of 30 ips, (750 mmps) the trigger point must be as least 3.0 inches (75 mm) upstream from the Head. In fact, the trigger is located 36 in. (900 mm) upstream, so the time it takes the board to travel from the trigger point to the dispense point at 30 ips (750 mm) is 1.2 seconds. The compensating timer is subtracting the 0.1 second ON DELAY value from the GAP value. If the shortest GAP is 1.2 seconds, at maximum line speed, the difference is always positive (1.1 seconds in the maximum line speed situation).

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Rule 3

The minimum possible GAP length (any GAP in a multiple GAP pattern) can be no shorter than the distance traveled during the ON DELAY of the applicator system at the maximum line speed (Reference Table 2 in Appendix).

Rule 4
The shortest possible bead length in a line speed compensation timer is the length of bead produced in a time equal to the OFF DELAY TIME at the fastest line speed. Note: it is possible to get short stripes at high line speeds using very small glue in.on times in.. In this situation the valve is not necessarily pulled up completely to the end stop position. A partially opened valve has a different off time delay than a fully opened one. The ET24 is not programmed to account for this behavior. To handle the full line speed range of tracking and compensation with single ON and OFF TIME DELAY values, the ET24 is programmed to assume these values are fixed for the valving head. Although one could adjust the off time to achieve a bead stripe shorter than the minimum OFF DELAY at maximum line speed calculation, the bead length will not be correct at slower line speed conditions.

Rule 5
ON DELAY and OFF DELAY values are inherent behavior characteristics for a given applicator system as installed on a specific parent machine. Once determined for a given installation, the ON and OFF values do not change except for factors such as component wear.

4.3 Adjustments (Continued)

ON and OFF COMPENSATION - as in actual production.
Keep in mind that ET24 is only working with the GLUE events, not the GAPS. It is designed to put the GLUE patterns in the correct locations, not the GAPS. If the GLUES are correct the GAPS are correct.

Calculating ON and OFF Delay Time Method

a. Set the ET24 ON and OFF DELAY value settings to zero.
b. Enter the desired adhesive pattern length into the ET24 display.
c. Run the machine at two different line speeds and compare the actual deposition patterns. (Reference Table 4 in Appendix.)

Always measure and set the ON Delay first. After setting ON Delay run the system at low and high line speeds again and check that there is no shift in the pattern start. Now measure the OFF Delay shift (change in length) at the two line speeds and perform the calculation found in Table 5 of the Appendix.

Method 2 - The Empirical Method using Astro Packaging high line speed valve,

I. Input ON DELAY values keep the start of the first glue bead in correct position regardless of line speed.(Try 8-12 ms.)
2. Input OFF DELAY values until the total length of the glue bead is constant regardless of line speed.(Try 8-12 ms.)

Line Speed Compensation Brief Review
A line speed compensation system is required to make accurate calculation of ON DELAY TIME and OFF DELAY TIME values. These two values are the key operating elements to the system. Without them, accurate line speed compensation cannot be accomplished and patterns are out of registration and the glue lengths are not correct.

Remember, ON DELAY and OFF DELAY are totally independent of each other. Both values must be set for accurate adhesive deposition.

It is important to note that the ET24 line speed compensation device is

designed to correctly apply adhesive to a given substrate when the substrate is moving at varying line speeds within a given range of acceleration and deceleration. If the acceleration or deceleration is excessive an improper pattern may result.

There are two types of production situations where a changing velocity is encountered:

I. The machine line speed gradually accelerates and slows down with the line production.

Here the pattern may shift slightly because the ET24 computer is working with old line speed input data. The ET24 recalculates ON and OFF compensation every 0.1 seconds. If the line speed changed dramatically during this 1/10 of a second the deposited pattern would be incorrect (reference Table 3 in Appendix).

2. The product moves in an intermittent motion under the glue head.

Each product piece moves in a cyclic pattern from stop, accelerating to maximum line speed, maintaining maximum line speed for a short period and then, decelerating to a stop again. This type of movement may be too rapid to be handled by the ET24.

(Arranging two photo-optic eye sensors so that both must see the substrate to trigger the ET24, provides accurate start/stop edges control. This triggering method has proven to be effective handling excessive acceleration/deceleration rates.)

4.3 Adjustments (Continued)

Line Speed Compensation Conclusion

This presentation has discussed the basics of Line Speed Compensation for variable line speed adhesive applications. ON and OFF COMPENSATION is required for accurate pattern control when line speeds vary more than 10 feet per minute and becomes more critical the higher the line speed. The need for the Compensation is based on the inherent Response Time of the applicator

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Head.

This Response Time has been analyzed in two main components, ON DELAY TIME, as the valve turns on or opens, and OFF DELAY TIME, as the valve turns off or closes. Examples have illustrated what happens to pattern location and length with each of these delays between timer signal and actual completion of the appropriate valve Response. Methods for calculating the applicator response delays have been provided and are the basis for making the COMPENSATION adjustments to the original timing.

LINE SPEED TRACKING

Line speed tracking is accomplished by a linear Tachometer device. Maximum flexibility is maintained by allowing the duration of each event to be separately set. Duration (Varying Line Speed), in inches, requires the use of either the tach generator to monitor the variation in line speed of the production line (this option must have the jumper in Figure B as shown). Duration (Fixed Line Speed) mode requires that the jumper in Figure A be installed as illustrated.

FUSE 7PIN CONNECTOR
Fixed Line Speed
Figure A

FUSE 7PIN CONNECTOR
Varying Line Speed
Figure B

4.3 Adjustments (Continued)

Once the Tach Generator is coupled to the parent machine, it must be calibrated to coincide with the parent machine actual line speed. This calibration is accomplished by first setting the Length Resolution and then by adjusting of the line speed Calibration Pot as described on the following page. Note: Prior to adjusting the tach generator, always turn the line speed potentiometer to its full counter-clockwise position.

1.1 Length Resolution

Length Resolution is a function of the number of valve groups and the systems ability to track line speed of the parent machine. As the line speed of the parent machine increases, the resolution decreases.

The Duration Type switch is held (up or down) during power-up, to display the current length resolution.

The Resolution is displayed in the Durations' three least-significant digits. The possible resolutions are: 0.01 in., 0.02 in., 0.05 in., and 0.1 in.(1, 2, 3 mm). To modify the current resolution, toggle the least-significant Duration Switch while the Duration Type switch is being held up for a larger resolution or down for a smaller resolution.

The resolution must be set for the number of heads on the system and the maximum system line speed. If the resolution is set too fine for the maximum line speed, the ET24 may misread the tach and generate a glue stripe that is twice as long as called for at high line speed.

Number of Heads
Resolution

Setting	1 Head	2 Head	3 Heads	4 Head
0.01 inch	180 ft/min		90 ft/min	60 ft/min 4 5 ft/min
0.02 inch	260 ft/min		180 ft/min	120 ft/min 9 0 ft/min
0.05 inch	900 ft/min	300 ft/min	225 ft/min	450 ft/min
0.10 inch	1800 ft/min	600 ft/min	450 ft/min	900 ft/min
.5mm	110 m/min	55 m/min	37.5 m/min	27.5 m/min
1 mm	220 m/min	110 m/min	75 m/min	55 m/min
2 mm	440 m/min	220 m/min	150 m/min	110 m/min
3 mm	660 m/min	330 m/min	225 m/min	165 m/min

4.3 Adjustments (Continued)

Line Speed Calibration

There are two methods of line speed calibration.

Method One

After measuring the line speed of product movement, place the ET24 into line speed mode and adjust the Line Speed Rate POT fully counter-clockwise and then clockwise until the line speed reading on the ET24 is the same as the line speed being measured.

Slight changes in the ET24 readout may be encountered. Changes of 1 or 2 digits is normal and do not effect performance. If the readout is fluctuating greater than 1 or 2 digits check the Tach Generator coupling for excessive physical bounce or misalignment. Align the tach generator so that it is as close to the axis of the rotating coupling shaft as possible. When using a gear belt and pulley, set it tight and as near perpendicular to the moving surface

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as possible.

It is recommended an idler gear be used to prevent exceeding the one pound over hung load rating of the Tach Generator.

EXAMPLE OF SHAFT COUPLING:

EXAMPLE OF FRICTION WHEEL:

EXAMPLE OF GEAR BELT AND PULLEY

Once ET24 is adjusted to the proper line speed, no further adjustment is required: it tracks line speed changes accurately.

Method Two
This method is used when there is no way of pre-determining the line speed of product movement. setup ET24 so that one valve group can be triggered. Select the glue event and length mode and length mode of operation. Set the four length digits to a predetermined number such as 1.000 inch (the longer the better). Once set, run the line at the slowest line speed. With the product in place deposit adhesive on the product. Next, remove the product from the machine and measure the actual length of the adhesive stripe. If length is incorrect, adjust the POT from its full counter-clockwise position. This operation may have to be repeated three or four times to dial in the exact length desired. Once accurately adjusted, the Tach Generator tracks varying line speeds.

4.3 Adjustments (Continued)

Head open and Closing Responses

Head Open Response
Head Open Response is an electromechanical delay time phenomenon. The delay is the amount of time that transpires after the ET24 commands the valve to open and the adhesive actually reaches the product. At relatively slow production line speeds or production line speeds that do not vary more than 10 feet per minute, valve On Response Compensation is not necessary. However, where line speeds are varying over more than 10 feet per minute, valve Response Compensation must be adjusted for accurate adhesive placement. (See Section H, Line Speed Compensation)

*** NOTE ***
The minimum possible GAP length (any GAP in a multiple GAP pattern) can

be no shorter than the amount of inherent ON DELAY found in the applicator system at the maximum line speed. ET24 automatically subtracts the ON DELAY TIME value from all GAP Events present. Failure to allow for this results in undesirable outputs or adhesive patterns.

Example: A machine using ET24 varies in production line speed from 100 feet per minute up to 500 feet per minute. At 100 feet per minute, the adhesive stripe is positioned exactly as desired. However, it takes 10 msec. for the adhesive to reach the product surface after triggering. If machine line speed is increased to 500 feet per minute, the product is moving 400 feet per minute faster. In the 10 msec. it takes to deposit the adhesive to the product, the product has moved .8 inches further than at 100 feet per minute and the adhesive is deposited .8 inches from the desired position.

Head Closing Response
This phenomenon is similar to valve Open Response with the opposite cause and effect standpoint. valve Closing Response is a result of the amount of time delay after a glue event is commanded to stop by ET24 and the actual end of the adhesive stripe on the product. The effect is a lengthening of the glue stripe related to increased line speed o+f the product. With line speed changes of 10 feet per minute or less, the valve Closing lag can be ignored.

Example: Using the previous example with line speed changes 100-500 ft/min., assume the closing lag to be 15 ms, the adhesive stripe grows 1.2 inches in length. This is a very serious problem if the desired stripe is 1.25 inches, it ends up being almost twice as long at 500 ft/min.

4.3 Adjustments (Continued)

Correcting valve Opening and Closing Response
To correct valve opening and closing responses first determine the valve open response time. Deposit adhesive on the product at the slowest line speed. Speed up the machine to its highest line speed and deposit adhesive a second time. The stripe shifts its starting point from the original slow line speed position to a new position and length at the highest line speed. Now measure the difference using a hundredth of an inch or millimeter scale. Next, determine the lowest and highest line speed that the parent machine operates using the Line Speed Mode of ET24. Now determine the valve open response time using the following calculation:

English: Head Open = Pattern Shift in .001 Inch Increments
Response (Highest Line speed - Lowest Line speed) X .02

Metric: Head Open = Pattern Shift in Millimeters Increments
Response (Highest Line speed - Lowest Line speed) x 16.66

Example:

valve .400 in. = 0.010 sec.
Response (500 fpm - 300 fpm) x 0.2

Setting valve Compensation
After the valve On Responses have been calculated they can be

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programmed into the ET24 using the following procedure.

First turn ET24 power OFF for 2 seconds, turn power ON while hold the Mode Switch down, continue holding this switch while specifying the valve compensation. When the Mode Switch is held during power-up, the ET24 displays the valve number (starting with valve number 1), the type of compensation (either On, indicated by the Glue LED, or Off, indicated by the Gap LED), and the currently programmed compensation in milliseconds (from 0 to 99). To modify the Duration, toggle the Duration Switch under the digit you wish to change.

Always measure and set ON DELAY compensation first. When the pattern start point is not shifting with changing line speed, measure the change in patter length caused by the OFF DELAY. Determine and set the OFF DELAY using the same procedure and formula used for ON Delay. To select ON or OFF

Compensation, toggle the Event Type Switch. To select a different valve number, toggle the valve Group Switch.

Note: Make certain the ON/OFF compensation does not interfere with the glue pattern at high line speeds.

Example: At 250 feet per minute, a 0.5 inch glue stripe is laid down in 10 milliseconds. If the off compensation is 15 milliseconds, there is virtually no time for the valve to open.

Head Response Compensation Procedure
ON DELAY Compensation Must be set first, and the product run at the lowest and highest line speed with the on compensation adjusted to the valve Open Response Time calculated above. The adhesive starting point should not shift more than the resolution setting. Note that the adhesive stripe is longer at the high line speed than at the lower line speed. Measure the difference again and use this measurement in the in.Head Response in. calculation. Using the set valve compensation procedure, set the OFF DELAY Compensation. This completes the valve Response Compensation procedure.

Rate or Count Mode / Switch & Display Interaction
Inline line speed and Count Modes the display and switches take on new functions. The matrix below shows Switch and Display actions.

Rate Mode Switch and Display

	Switch	Display
Sensor	Inactive	Inactive
Head Group	Inactive	Inactive
Event Number	Inactive	Inactive

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Event Type	Inactive	Inactive	
Duration	Inactive	Last 3 digits of Duration Display Rate	
Duration Type	Inactive	Inactive	
Set Up	Inactive	Inactive	

Count Mode - Switch and Display

	Switch	Display	Function
Sensor	Active	Active	Indicate Sensor Associated with count
Head Group	Inactive	Inactive	
Most significant Event Number	Active	Active	digits of Count - Switch used to reset
Event Type	Inactive	Inactive	
Most significant Duration	Active	Active	digits of Count- Switch used to reset
Duration Type	Inactive	Inactive	
Indicates setup Set Up	Active	Active	associated with count

5 Maintenance

No maintenance required on ET4.

6 Troubleshooting

1. Setup display flashing

The Duration type, Time From Start or Length From Start, has been improperly programmed. Check data entry for over Lapping errors.

2. Glue or Gap suddenly doubles in Length while parent machine is accelerating.

The resolution is set at a tolerance that is too fine for the line speed of the tracker. Adjust ET24 resolution to a Lower tolerance. Ref. D.1.8.

3. No line speed reading in Line Speed mode.

Check original setup to insure the tachometer shaft rotates in the clockwise direction. if the shaft is required to rotate in a counterclockwise direction, rewire the tach generator. (reference C.1.4)

Check to see if the Duration is set in Length or Length From Start. (In Time Mode the line speed will read a fixed value.)

Check voltage from Tach Generator at Terminals 34 and 35 (tach output is 45 volts/1000 r;pm). Terminal 34 is (+) with respect to terminal 35.

Examine the jumper under the connector to insure it is in the proper position.

Make sure resolution is not set too low for number of heads and line speed.

4. Trigger Input LED not blinking when sensor is activated.

Check polarity of trigger output and determine if it is wired property.

5. Trigger Input LED on continuously. ET24 not being triggered.

Photo switch is in normally closed or ON mode. Et-24 can be triggered by an ON to OFF transition by reconfiguring input trigger sense. Reference D.1.3.

6. D.C. output Modules are always ON.

Trigger has no effect and no adhesive pattern is being generated.

DC output switches DC voltage up to 60 VDC up to 3 amps, in one direction only (polarized output). If pattern polarity is inverted, output remains on.

7. The E-100 valve does not activate from the D.C. output of ET24.

DC Driver needs to be placed between the ET DC output the head.

If Driver is connected, check that the trigger Light on the Driver is illuminated when the ET24 valve Group LED (red) illuminates.

8. E-100 valve does not activate even though there is output from ET24.

Check all wiring.

Tighten at[terminal strip screws in Melt Unit.

Check valve coil electrical resistance with an ohm meter. A 115 volt coil should read 52 - 55 ohms and a 230 volt coil should read 212 -214 ohms. Check if the valve and Hose are at application temperature.

9. The output is erratic or inoperative.

10. DispLay and/or switches Lock up.

Check Line Speed indicator. The dropout value is set at 10 FPM. There is no output from the timer if the line speed in Length Mode drops below 10 FPM.

Turn the power OFF for at least five seconds. Turn the power ON.

Clear memory.

7 Repair and Replacement

E.2 Servicing ET24

*** WARNING ***
YOUR ET TIMER SHOULD NEVER BE POWERED WITH THE WIRING COVER REMOVED. BEFORE COMMENCING WITH ANY ELECTRICAL REPAIRS DISCONNECT THE POWER. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD CAUSE PERSONAL INJURY OR PERMANENT DAMAGE TO THE TIMER.

Servicing the ET24 is accomplished via the Astro Packaging Exchange Program. Contact the Technical Services Department for more details. To remove the ET24, simply remove the screws that hold the unit in place and return it to Astro Packaging for repair. The ET24 fuses are located behind the wiring cover. The cover is removed by simply pulling it off of the two friction pins which exposes the fuses and connectors. The main power fuse is a 10 amp, 115 volts or 5 amp, 230 volt buss type and the output fuses are 5 amp, 230 volt buss type.

The wiring connector terminal strip is a two-piece removable type to accommodate interconnect wiring. Pull out the removable portion of the connector and the spring loaded wiring holes are exposed.

Should ET24 require service, the entire unit should be returned to Astro Packaging for repair. Contact the Technical Services Department for additional assistance.

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*** NOTE ***
In the event of a short term power loss (e.g. during an electrical storm or during an extreme brown-out condition where line voltage drops below 70% of normal operation voltage), ET24 may halt operation. Should this occur, reset ET24 by turning power off for 2 seconds then turn power on to restart normal operations.

PROM Replacement

Replacement of the PROM (Programmable Read Only Memory) is necessary when the software has been upgraded. When replacing, it is extremely important to have all power OFF from the Melt Unit and the ET24.

1. Remove the 4 Button valve Screws from the timer.

2. Gently pull out timer module; remove module from front panel by unscrewing knurled screw. Locate the ET24 PROM, it should be labeled with the current revision status of ET24.Bxx (ex. ET24.B06).

3. On the Circuit Board is a U-Shaped indicator which should be lined up with the index, located on the PROM. Extreme care must be taken when replacing the PROM into the socket to insure all pins have been properly aligned.

7.1 ET24 PROM Replacement and Special Remote Setup

1. Disconnect incoming power 2. Disconnect incoming power and remove melt unit from service.

2. Remove ET24 from enclosure.

3. Locate existing PROM [1] on rear of ET24.

4. Carefully remove and discard existing PROM [1] by inserting small flat blade screwdriver between PROM and socket.

5. Install new PROM [1], taking care to observe general handling limitations of static-sensitive devices. Ensure locator key on module is as shown, and that pins are aligned and are not bent during plugging of module.

6. Reinstall ET24 in enclosure, return power to melt unit and test.

Remote Setup Selection Instructions

7. Determine that ET24 has proper software, Revision K00. This new revision displays as in.1100 in. during power-on self-test.

8. Trigger 4 input has been reserved for remote selection of setup as follows:

   a. A series of pulses, as shown, must be sent to ET24 from the PLC, etc. Note that ET24 requires at least 130ms as a recognizable stop bit.

   b. Input signal ranges: 0 VDC = OFF/O; 5 - 24 VDC = ON/I.

   c. Start pulse of at least 200ms in Duration to begin sequence.

   d. OFF/O and ON/I pulses at 100ms (±10ms) with the number of on pulses indicating the requested setup.

   e. The stop pulse must be greater than 130ms.

   f. This remote selection of setup overrides a portion of the Configuration Lock feature.

   g. ET24 completes any patterns in progress before triggering patterns for newly selected setup.

9. To ensure reliable performance, installer must follow the wiring guidelines, such as using shielded twisted pairs for signal wiring, adequate separation from high-current lines, etc.

8 Parts List

8.1 Accessories and Spares

Tach Generator for Line Speed Tracking

Item	Description (Quantity)	Part Number
	Tach Generator with 5 ft Cable Assembly	73780-105
	Tach Generator with 10 ft Cable Assembly	73780-110
	Tach Generator with 15 ft Cable Assembly	73780-115
	Tach Generator with 20 ft Cable Assembly	73780-120
	Tach Generator with 25 ft Cable Assembly	73780-125
	Mounting Kit, Tach Generator (includes pulleys, gear belts and brackets)	79184-1

Miscellaneous

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Item	Description (Quantity)	Part Number
	Kit, ET24 Replacement Module (includes power supply; does not include output module, power switch, enclosure or fuses)	79195-02
	Module, AC Output, 24–280 V~ @ 5 A	12047A-3
	Module, DC Output, 5–60 VDC @ 3 A	12047A-2
	Fuse, 4 AMP, 115/230 V~ for Output Relays	12014-4B
	Fuse, 5 AMP, 230 V~	12014-5B
	Fuse, 10 AMP, 115 V~	12014-10B
	Power Supply, Universal Voltage	12091-1
	Enclosure, ET24, 11 in. X 9 in. X 6 in.	73858
	Screwdriver, pocket	11065-3
	Kit, PROM, ET24	79181-02
	Kit, PROM, ET24, Remote Settings	79181-13
	Kit, RAM, Battery backup replacement	11081-2
	7-Wire Terminal Block Connector	12299-7
	8-Wire Terminal Block Connector	12299-8
	12-Wire Terminal Block Connector	12299-12
	Terminal Strip Labels, #1 - 12	12298-1
	Terminal Strip Labels, #13 - 24	12298-2
	Terminal Strip Labels, #17 - 32	12298-3
	Terminal Strip Labels, #33 - 48	12298-4

Appendix A: Specifications

Electrical: ET24

Power Requirements	100–115 V~, 20 W, 50/60 Hz or 200–230 V~, 20 W, 50/60 Hz
Line Speed Input	1 Astro Packaging Tach Generator must generate 50–300 VDC at maximum line speed
Four Triggers Inputs	
Voltage:	5–24 VDC, 4–25 mA
Type:	Astro Packaging Mini or Data Beam Photoeye Sensors recommended
Mode:	One Shot–sequence initiates and completes with one trigger input Duration–sequence initiates and continues while trigger signal is engaged
Power Output Switching Relays	5–60 VDC, 3 A 60–240 V~, 5 A
Head Group Capacity	1–4 head groups
Number of Head Coils in Head Group	E100 Style–up to 4 E900®–up to 8 with 115 V~ power or up to 16 with 230 V~ power or DC power

Power Supply Output	12 VDC, 200 mA or 24 VDC, 200 mA Power provided for photoeye triggers and to signal head drivers

Electrical: ET24 and Tachometer

Supply Power	200 mA @ 115 V~ ±20%, 50/60 Hz or 100 mA @ 230 V~ ±20%, 50/60 Hz
Input Trigger	
Voltage:	5–24 VDC, 4–25 mA
Type:	Rise or Falling Type Signal Selectable Switch closure, semi-conductor switch, optical detectors or proximity detectors
Mode:	One Shot–sequence initiates and completes with one trigger input Duration–sequence initiates and continues while trigger signal is engaged
Program Outputs; Switch Capacity Quantity	5–60 VDC, 3 A or 60–240 V~, 3 A (0 crossing switch) 4 Head groups of up to 4 heads each
Power Supply Outputs	+5 VDC, 1.0 A ±12 VDC, 0.5 A +24 VDC, 0.5
Tachometer Output	33 VDC per 1000 rpm

Appendix A: Specifications (Continued)

Physical

Enclosure	Gasket sealed, water resistant metal with transparent window that meets NEMA 4 specifications
Operating Temperature	0–66 °C (32–150 °F)
Storage Temperature	-30–70 °C (-22–158 °F)

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Universal Box Dimensions Illustration Here

Performance

Event Length Range	0.5 mm–9.999 m (0.01–999.9 in.
Low Rate Drop Out	2–99 mpm (5–99 fpm)
Head Compensation Setting Range	0–99 ms

Line Speed Tracking

Maximum Line Speed

Head Group	*Resolution Setting - English* 0.01 in.	0.02 in.	0.05 in	0.1 in.
	feet per minute			
1	180 fpm	360	900	1800
2	90	180	450	900
3	60	120	300	600
4	45	90	200	450

Head Group	*Resolution Setting - Metric* 0.5 mm	1.0 mm	2.0 mm	3.0 mm
	meters per minute			
1	100 mpm	200	400	600
2	50	100	200	300
3	35	75	150	200
4	25	50	200	150

Dimensions

Appendix B: Conversion Factors

English gravitational unit system to International System of units (S1)

Quantity	English Unit	S1 Unit		Symbol	Equivalent units
Length	1 foot (ft)	0.3048	meter	m	
Mass	1 slug	14.59	kilogram	kg	
Time	1 second	1.0	second	s	
Force	1 pound (lb)	4.448	newton	N	kg m/s^2
Pressure	1 Lb/in^2	6859	pascal	Pa	N/m^2 or kg/m$^-$s^2
Energy	1 ft-Lb	1.356	joule	J	N$^-$m or kg$^-$m^2/s^2
Power	1 ft-Lb/s	1.356	watt	w	J/s

Other convenient conversion factors

Length

l ft	=	0.3048 m	1 km	=	1000 m
1 in	=	25.4 mm	1 cm	=	10 m

Area

1 ft^2	=	0.0929 m^2

Units of Measure

ft	=	foot
in	=	inch
mm	=	millimeters
s	=	second
ms	=	millisecond
m	=	meter

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1 in^2	=	645.2 mm^2				fpm	=	feet per minute
						mpm	=	meters per minute
VoLume						ips	=	inches per second
1 ft^3	=	7.48 gal	1 gal	=	0.003 79 m^3	mmps	=	millimeters per second
1 ft^3	=	1728 in^3	1 gal	=	3.785 L			
1 ft^3	=	0.0283 m^3	1 m^3	=	1000 L			

Volume flow rate

1 ft^3/s = 449 gal/min 1 gal/min = 3.785 L/min

1 ft^3/s = 0.0283 m^3/s 1 L/min = 16.67 x $10^{-6} m^3/s$

1 gal/min = 6.309 x $10^{-5} m^3/s$

Temperature

T(° C) = [T(° F) - 32] 5/9

T(°.F) = 9/5[T(° C)] + 32

Density		Energy
1 $slug/ft^3$	= 515.4 kg/m^3	1 ft-Lb = 1.356 J
Specific Weight		1 Btu = 1.055kJ
1 lb/ft^3	= 157.1 N/m^3	1 W-h = 3.600kJ

Power

1 hp = 550 ft-Lb/s 1 ft-lb/s = 1.356 W

1 hp = 745.7 W 1 Btu/h = 0.293 W

Viscosity

1 $lb\text{-}s/ft^2$ = 2.089 x 10^{-5} centipoise

Traveling 50 fpm or 15 mpm is the same as 10 ips or 250 mmps.

- To convert fpm to ips multiply fpm by 0.2.
- To convert mpm to mmps multiply mpm by 16.66.

Table 1

The formula for determining the duration time for any type of event is to divide the distance to be traveled by the line speed of the product.

English Formula: Time (s) = Distance (in) / Speed (fpm) x .2

Metric Formula: Time (s = Distance (mm) / Speed (mpm) x 16.66

Table 2

ET24 automatically subtracts the ON DELAY TIME value from all GAP events present.

Formula:	English MinGAP	=	ON-D	x	MLS	x	0.0002
	Metric MinGap	=	ON-D	x	MLS	x	0.0166

Where:	MinGAP	=	Minimum acceptable GAP Setting (in)
	ON-D	=	ON DELAY TIME (ms)
	MLS	=	Maximum Line Speed (fpm)(mpm)
	0.0002	=	Conversion Factor from fpm to in/ms
	0.0166	=	Conversion Factor from mpm to mm/ms

Example: ON DELAY = 10 ms; Maximum Speed = 300 fpm (100 mpm)

English MinGAP	=	ON-D	X	MLS	X	0.0002		
	=	10 ms	X	300 fpm	X	.0002	=	0.6 in.
Metric MinGAP	=	10 ms	X	100 mpm	X	.0166	=	16.6 mm

Table 3

A reasonable approximation of acceleration related pattern shift can be calculated using the following formula:

Highest Speed (fpm) - Lowest Speed (fpm)

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Pattern Shift (in) X 0.00033

Time Required To Change Speed (Min.)

Highest Speed(mpm) - Lowest Speed (mpm)

Pattern Shift (mm) X 0.0277

Time Required To Change Seed (Min.)

Appendix B: Conversion Factors (Continued)

Table 4

English

ON DELAY (ms) = $\frac{D_2 - D_1 \text{ (in).}}{(ips_2 - ips_1)}$ X 1000

Metric

ON DELAY (ms) = $\frac{D_2 - D_1 \text{ (mm)}}{(mmps_2 - mmps_1)}$ X 1000

Table 5

English

OFF DELAY (ms) = $\frac{D_4 - D_3 \text{ (in).}}{(ips_2 - ips_2)}$ X 1000

Metric

OFF DELAY (ms) = $\frac{D_4 - D_3 \text{ (mm)}}{(mmps_2 - mmps_1)}$ X 1000

PROGRAMMING SEQUENCE LOG

PROGRAM SETUP _____

Valve Group 1	Event	Type	Duration	Valve Group 2	Event	Type	Duration
	1				1		
	2				2		
	3				3		
	4				4		
	5				5		
	6				6		
	7				7		
	8				8		
	9				9		

PROGRAMMING SEQUENCE LOG
PROGRAM SETUP _____

Valve Group 3	Event	Type	Duration	Valve Group 4	Event	Type	Duration
	1				1		
	2				2		
	3				3		
	4				4		
	5				5		
	6				6		
	7				7		
	8				8		
	9				9		
	10				10		
	11				11		
	12				12		
	13				13		
	14				14		
	15				15		
	16				16		
	17				17		
	18				18		
	19				19		
	20				20		
	21				21		
	22				22		
	23				23		
	24				24		

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Warranty

A. Astro Packaging warrants its products, when operated and maintained in accordance with Astro Packaging recommended procedures, are free of defects in material and workmanship during the periods indicated below commencing with the date the product is placed in service.

Product	Warranty Period
1. Tank heater (including entire tank when heater is cast into tank)	5 years or 10,000 hours of use, whichever occurs first
2. Melt unit (unless specified below); pattern controller; head driver	2 years or 2,000 hours of use, whichever occurs first
3. Stationary hose; automatic electric head; JR™ Series Hotmelt System or melt unit; standard pail unloader; standard accessory purchased with a system	1 year or 2,000 hours of use, whichever occurs first
4. Manual hose; handgun; Mini Squirt III; any butyl system; any PUR system (including hose, gun or head used with PUR); any spare or replacement component; pneumatic head; industrial heated hose; T100 Temperature Controller; nozzle; nozzle bar	6 months or 1,000 hours of use, whichever occurs first
5. Rebuilt equipment	90 days or 500 hours of use, whichever occurs first

B. The sole liability of Astro Packaging and exclusive remedy extended to any Astro Packaging customer shall be limited to replacing or repairing, at the option of Astro Packaging, any product returned under the terms of this warranty. Labor and related expenses incurred to install replacement or repaired parts are not covered by this warranty.

C. Astro Packaging is not responsible for repair or replacement of any product that has been subject to abuse, misuse, alteration, accident, or negligent use, nor for repairs made by an unauthorized person or with parts other than those provided by Astro Packaging.

D. Astro Packaging assumes no responsibility for the performance of adhesives or other materials used with its products.

E. The warranty for a product repaired or replaced under this warranty shall continue in effect for the remainder of the original warranty period, or for ninety (90) days following the day of shipment by Astro Packaging of the repaired or replaced product, whichever period is longer.

F. No warranty is made with respect to custom products or products developed, designed and manufactured to customer specifications, except as specifically stated in writing by Astro Packaging.

G. Astro Packaging is responsible only for payment of shipping charges for delivery of a repaired or replaced product, via the least expensive means of transport, to customer or an authorized Sales and Service Center in the Continental United States only. Payment for shipment to Astro Packaging or an authorized Sales and Service Center for evaluation, repair or replacement is the responsibility of the customer.

H. For service under this warranty contact the factory authorized representative from which the product was purchased.

THIS WARRANTY IS IN LIEU OF ANY OTHER WARRANTY EXPRESSED OR IMPLIED, INCLUDING THE WARRANTY OF MERCHANTABILITY AND FITNESS FOR THE PARTICULAR PURPOSE.

Equipment Record

Record the information below on all equipment received and retain for your record.
(Systems, melt units, hoses, guns, heads, pattern controllers, drivers, etc.)

Products were purchased from:____
Astro Packaging

Product Model/Description____________________________ Serial No.______________
Product Part Number________________________________ Order No.______________
Date Received_____________ Start-Up Date_____________ Invoice No._____________

Product Model/Description____________________________ Serial No.______________
Product Part Number________________________________ Order No.______________
Date Received_____________ Start-Up Date_____________ Invoice No._____________

Product Model/Description____________________________ Serial No.______________
Product Part Number________________________________ Order No.______________
Date Received_____________ Start-Up Date_____________ Invoice No._____________

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