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AUTOMOVE SERIES 100, 200, 300 and 400

OPERATION MANUAL

ASYMTEK

1949 Palomar Oaks Way
Carlsbad CA 92009

(619) 431-1919

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CAUTION

For continued protection against fire, replace existing fuse only with like fuse of specified current and voltage rating.

BE SURE TO FOLLOW THE DIRECTIONS GIVEN IN THIS MANUAL.

DO NOT TOUCH THE HOME SWITCHES IN THE LOWER CORNER OF AN AUTOMOVE X-Y TABLE. THIS WILL CHANGE THE POSITION REFERENCE. WHEN YOU MOVE THE X-Y TABLE BACK AND FORTH BY HAND, DO SO SLOWLY. IF YOU MOVE THE TABLE TOO FAST, YOU WILL DAMAGE THE INSTRUMENT. THIS WILL CHANGE THE X-Y TABLE'S ACCURACY AND THE CALIBRATION FACTORS MEASURED AT THE FACTORY.

BE SURE TO USE ONLY MOTORS AND CABLES MANUFACTURED BY ASYMTEK WITH THE AUTOMOVE 201 CONTROLLER. THESE COMPONENTS HAVE BEEN THOROUGHLY TESTED AND ARE DESIGNED TO GIVE OPTIMUM PERFORMANCE. THE CORRECT SHIELDED CABLES WILL PROTECT THE SYSTEM FROM ELECTROSTATIC DISCHARGES. NEVER USE THE SYSTEM WITHOUT THE PROPER SHIELDED CABLES IN AN ELECTRICALLY NOISY ENVIRONMENT. PERMANENT DAMAGE WILL OCCUR IF ANY OF THE MOTOR DRIVER OUTPUTS ARE SHORTED TO GROUND. DO NOT MANUALLY MOVE ANY MECHANISM CONTROLLED BY THE AUTOMOVE 201 WHILE IT IS CONNECTED.

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INTRODUCTION

This manual presents the basics you need to get your Automove system into production. Our tutorials will help you develop of your first program.

The Automove systems are microprocessor based products with "on-board" intelligent firmware addressable through an RS-232C interface. Any computer or terminal with an RS-232C interface can control the Automove products. The host computer is an integral part of the Automove system and is needed during programming.

The Automove systems are based on a common internal electronics and programming language. The series 100 X-Y tables and 400 dispensing system are integrated units and are set at the factory for optimum performance. The Automove 201 X-Y controller, however, usually require integration with other manufacturer's components. This manual describes the front and rear panels of the Automove systems and some useful information on connecting the Automove systems to other components.

The Automove systems are intelligent three axis positioning devices with powerful input/output controls. The three axes are divided so that two axes, X-Y, move simultaneously and the Z moves sequentially. The X-Y axes have programmable microstepping which allows the user to choose from 200-6400 steps per revolution. Programmable microstepping allows you to electronically change the resolution of a mechanical system. The z axis is a full/half step driver.

Figure 1 shows the typical configurations for an Automove 201 based system. The Automove 201 can drive an Automove series 300 X-Y table, a leadscrew X-Y table, or a custom set of mechanics. Personality parameters determine default values such as resolution, speed, acceleration, travel limits and calibration factors. The Automove 201 is set at the factory for optimum performance with an Automove Series 300 X-Y table. If you are using the 201 with a leadscrew table or a custom system, it will be necessary to change some of the personality values. The ACL manual has a chapter on changing the personality of the Automove system. It is recommended that you familiarize yourself with these parameters. In order to permanently change the parameters in the non-volatile EEPROM, it will be necessary to read the section on EEPROM in this manual. Experimentation is often needed to determine the optimum values for each system.

Should you have any questions or problems concerning your system, ASYMTEK can provide support and assistance. **TO REACH A CUSTOMER SUPPORT TECHNICIAN** CALL (619)431-1919, AND ASK FOR TECHNICAL SUPPORT.

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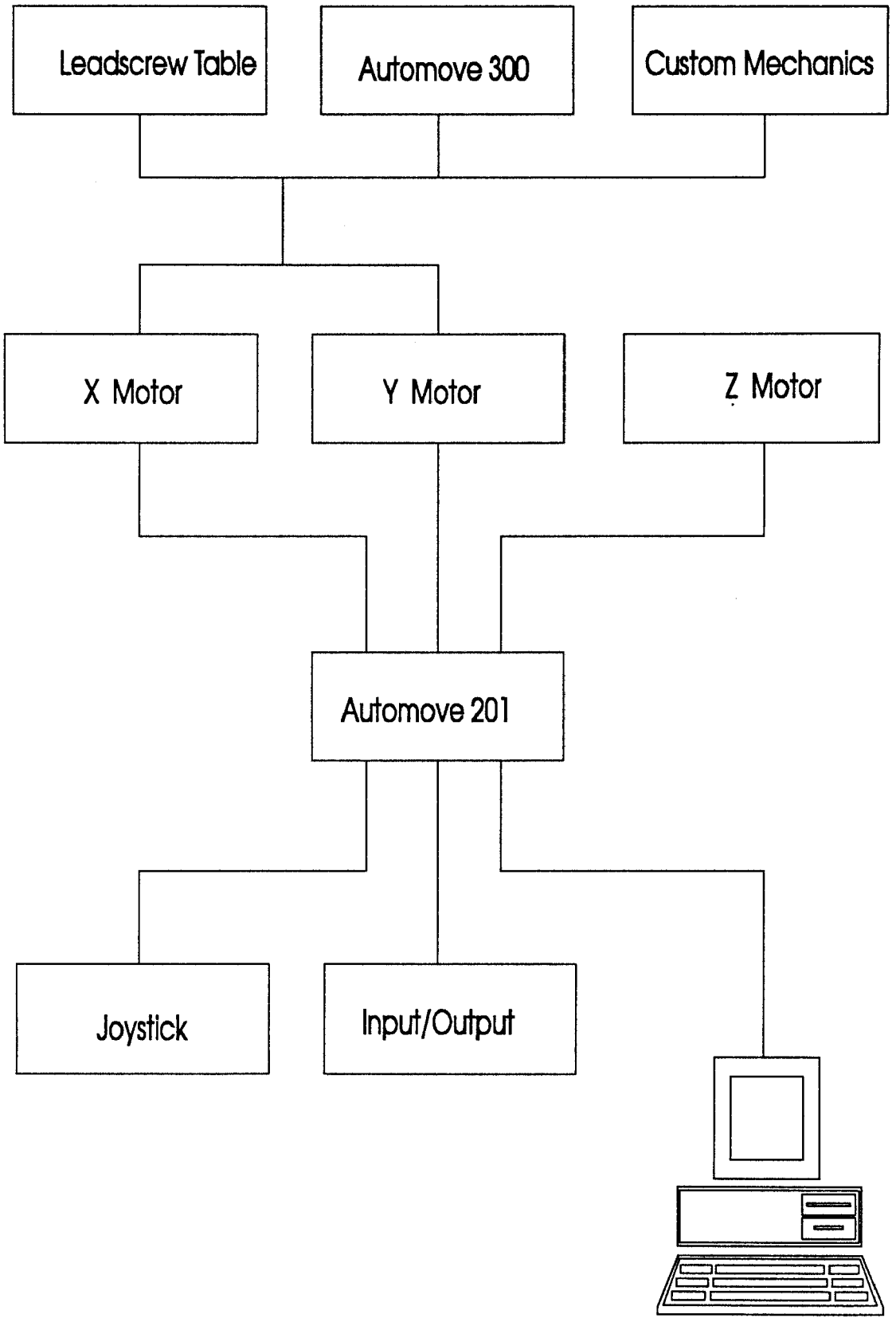


Figure 1

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THE REAR PANEL

Be sure to fasten all cables to the rear panel connectors. The cables supplied by ASYMTEK have screws which should be fastened to make sure that the cables do not vibrate loose during operation. Each connector is clearly labeled.

LINE VOLTAGE

The Automove products support 100, 120, 220 and 240 Volts AC, 50 or 60 Hz. The operating voltage of your Automove is set at the factory to 120 volts. To change the voltage setting, slide open the plastic safety panel on the line input module. Remove the fuse and the small printed circuit board with needle-nose pliers. Rotate the printed circuit board so that the desired voltage setting is facing outward. Replace the printed circuit board and the fuse into the module. Close the plastic panel. A power cord is supplied with the Automove. CONNECT THE POWER CORD TO THREE-WIRE SAFETY GROUNDED POWER OUTLETS ONLY. A 2A fuse should be used with a line voltage of 100-120 V and a lA fuse should be used with 220-240 V. **REMEMBER** gantry systems will be upside down from the benchtop configuration. When selecting 120vac on a gantry, the 100vac pads will be facing you.

X-Y-Z MOTORS

The motor drive electronics have been optimally designed to work with ASYMTEK motors. Only motors supplied by ASYMTEK should be connected to the Automove systems. These motors are supplied with a standard 10 foot cable and a separate Home switch cable. The cables and connectors are properly shielded to isolate the system from external noise inputs. NEVER INSTALL OR REMOVE THE MOTORS WITH THE POWER ON.

The Home switches are used to establish the Home reference position. The Automove 100 , 300 and 400 series have the Home switches installed in the machine. No installation or wiring is required.

When using ASYMTEK motors with an Automove 201, the Home switches must be installed. The Home switch cable is a two conductor cable surrounded by a braided shield. To connect the limit switches, attach the WHITE wire to the normally open connection on the limit switch, and the BLACK wire to the common or ground pin. Be sure to connect the braided shield to chassis ground.

The Home switches are not limit switches. The Home switches are active only when a Find Home command is given. They do not limit motor travel under normal operation. Refer to the ACL manual, or your software Programming Manual for the Find Home command. When mechanical microswitches are used, the input signal can be wired directly to the switch. The input signal is debounced by the Automove, so no additional circuitry is required. When optical sensors are used, be sure to supply a low level switch closure. The Automove does not provide the circuitry to drive the optical switches.

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JOYSTICK

A joystick can be used to Move or Teach the Automove systems. The joystick acts in the same fashion as the Automove front panel Arrow buttons and the Teach button. The joystick supplied by ASYMTEK has two Fast buttons and a Teach button. The fast buttons are orange and the Teach button is brown. The Teach button is used when manually programming the Automove.

You can make a single step move by pushing the joystick in the direction desired and returning it to the center position. If you hold the joystick in any direction for a few seconds, the Automove will start to move at a slow speed. The Fast button will increase the move speed as long as you press the button. Both the speed and the delay are set with a personality parameter (Refer to ACL section).

The Automove joystick may need slight adjustment in order to achieve independent X-Y motion. When the joystick is not in proper adjustment, the X-Y Table may move slowly when you turn on the power. If both axes move when only one button is pressed, the joystick needs adjustment. To adjust the joystick, start with the trim pots in the center and adjust the sliding trim pots until each axis moves independently. Although internal circuitry "senses" when a joystick is installed, the joystick should not be installed or removed with the power on.

THE CURRENT ADJUSTMENT

The current adjustment should never have to be changed. The current is set to the proper value for the Smoothmove motors supplied with the Automove 201 when shipped from the factory. Only when different size motors are used will the current need adjustment.

RS-232C SERIAL INTERFACE

Due to the variety of computers, it is often difficult to ensure proper interconnection between the host computer and the Automove without knowing information about the computer serial interface card. ASYMTEK can provide interface cables for many of the more popular computers. Should you have problems getting your computer to "talk" to the Automove, contact ASYMTEK for assistance. Also, refer to the Appendix for pin assignments and other technical information.

BAUD/PARITY SETTINGS & EEPROM

In general, you should use as high a baud rate as possible for increased communication speed. The parity should be enabled for error checking. If you have special requirements, see Chapter 5 of the ACL Programming Manual. The Automove is set at the factory to 9600 baud and even parity. Refer to Table 1 when setting the parity. Refer to Table 2 when changing the baud rate. The eight position DIP package is numbered 1 through 8 from left to right. The baud switches, the first three on the right, are SW6-SW8. The parity switches are SW4-SW5.

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SWl, the first switch on the left, is used to write protect the non-volatile EEPROM memory. The switch must be in the down position in order to download or change programs in the memory or change the personality parameters. The switch should be in the up position under normal use. This protects the memory from being changed accidentally. The up position is defined as the position closest to the Baud/Parity, EEProm label.

SW4	SW5	PARITY
UP	UP	No Parity
UP	DN	No Parity
DN	UP	Odd Parity
DN	DN	Even Parity

TABLE 1

SW6	SW7	SW8	BAUD RATE
UP	UP	UP	300
UP	UP	DN	600
UP	DN	UP	1200
UP	DN	DN	2400
DN	UP	UP	4800
DN	UP	DN	9600

TABLE 2

I/O

The optically coupled inputs and outputs option consists of 8 independent inputs, 8 independent outputs and STOP. The option has its own isolated power supply so that no external power supply is needed for utilizing the inputs and STOP. The 8 inputs and STOP can be activated by simple switch closures to the isolated ground. The outputs present 8 opto-transistors with both emitter and collector available. This allows the logic sense to be determined by the user. The inputs can be used to invoke download sequences, change outputs, signal external devices for a complete automation systems (For more on the commands utilizing the inputs, STOP and the outputs see the ACL Manual or your software programming manual). The STOP input operates exactly as the STOP button on the front panel. Isolation is greater than 2500 volts between the inputs/outputs and the Automove allowing for excellent noise immunity.

DRIVER

Another option, the 24V coil driver, provides either 2 or 4 outputs capable of handling 24V coils, relays, solenoids, etc. The outputs D-O through D-O3 are connections to a switch-mode unipolar output driver. The drive is an open collector transistor with a supply voltage of 38 volts. A 5/8 duty cycle switched at 19.2 KHz produces 24 volts DC average. Since this is a switch mode driver, proper cable shielding is required. The 38 volt supply is fused with a 2A fuse. At no time should coils with less resistance than 65 ohms be connected to the drivers. Connecting the 38V to ground, will "blow" the fuse. The fuse is a 5mm X 2Omm type readily available at local electronics stores. If the drivers are shorted together, solid state protection will prevent permanent damage to the instrument. Press the reset button to reactivate the drivers.

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ENCODERS

The step verify special option is available only on the Automove 201. The option verifies that the X-Y stepping motors have not slipped or skipped steps. The step verify circuitry checks every l/2OOth of a motor revolution to confirm that the motor shaft has actually moved to the correct position. The verification is done by monitoring the motor shaft with an optical encoder. A slip of l/5Oth of a motor revolution can be detected. Upon detection of a slip, two basic actions can occur:

1. The Stopped state is entered where both the Stop and Reset lamps on the front panel blink.
2. An Automatic response can be programmed to invoke a download sequence. (For more details see ACL Manual Sections 7-16 and 7-17). For complete understanding of the step verify commands see ACL MANUAL under commands: "CS,OS,FP,PM,ESC.0:,ESC.!2:"

Automatic response to a slip is "tricky" and should be used with caution. For example, if too high a payload or excessive acceleration caused the slip, then any further attempted motion will cause another slip. Clearing the slip can be achieved by a clear STOP (CS), RESET or an automatic response.

The encoders direction relative to the quadrature signals can be changed by the two DIP switches next to the encoder connectors. The X-axis switch is on the right, the Y axis on the left as one faces the rear of the instrument. To determine the correct position of the switch, the following procedure should be employed:

1. Disable the automatic response to step verify (set personality parameters #49 to "O" and #50 to "-l").
2. Connect the encoders, one axis at a time, to the appropriate encoder connector.
3. Depress the appropriate Arrow key in fast mode.
4. If a slip occurs in a few seconds, change the DIP switch position and repeat to check if it is okay.

The step verify is automatically disabled if the encoder corresponding to that axis is disconnected. This is done so the system can be used if an encoder proves faulty for any reason.

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FRONT PANEL FUNCTIONS

THE ARROW BUTTON

There are five buttons associated with the arrow functions. These are distinguished by the "arrows" opposite the buttons. The single button in the center is the Fast button. Each button controls the direction as shown by the arrow. There are three operating modes for these buttons: microstep, slow and fast motions. If the button is pressed and released, the motor will move one microstep (.001 mm for the Automove series 100 and 300) in the appropriate direction. If the button is held down for more than a few seconds, the axis will move at a slow speed. If the fast button is pressed simultaneously with an arrow button, the axis will move at a faster speed. These operating modes allow the user to locate any position both quickly and accurately. In addition, both axes can be moved simultaneously for ease of operation. The speed of the arrow modes as well as the direction is programmable using personality parameters. (See the ACL section)

The Z axis can be controlled from these same arrow buttons. To convert the Y axis arrow keys into Z axis arrow keys, simply press the Z axis button until the green lamp above the Y arrows lights. The Z axis can now be moved up and down with the arrow keys. The Find Home described above will now be Find Z Home, the Go to Origin will be Go to Z Home. To return to the X-Y control, simply press the Z axis button until the green lamp is extinguished.

TEACH

The button marked Teach is used in programming the Automove point-to-point (see ACL or your software Programming Manuals). When a desired position has been reached by use of the arrow buttons and the Teach button is pressed, the Automove will send the coordinates back to the host computer. The host computer will receive the output coordinate when your software is in TEACH mode. The taught position is then stored into a move sequence program. The ability to Teach X-Y or Z moves makes creating a move sequence easy when the coordinates are not known.

SET ORIGIN

The set Origin button is used to set a reference point for an arbitrary Origin. The Origin position can be different from the Home position. The Home position is determined by the Home switches and does not change once established. The Origin can be set either using the front panel buttons or through the host computer.

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The Origin is an arbitrary position set by the user to define a geometric coordinate system. The Origin can be set anywhere within the mechanical travel limits of the system. The Set Origin button allows the user to set (0,0) relative to any point in the system. For example, the Origin function can be used to set the Automove Origin at a reference point on a tooling fixture. Then, all motion can be programmed relative to a tooling fixture. Refer to the ACL or your software Programming Manuals for definition of Origin. Be sure that the Home reference is found before setting the Origin.

The Go to Origin button moves the X-Y motors to the position of the current Set Origin. This is a straight line path from the current position to the origin position. Once at the origin, the Automove is ready to process the next command.

FIND HOME

If the Go to Origin button is pressed while pressing the center button of the arrow keys, the Automove will find its Home position. If the Automove has just been powered up and the Home keys are pressed, the X-Y mechanism will find the Home limit switches. This will become the default Origin position. A manual Find Home or a programmed Find Home should be performed prior to pressing the arrow keys or setting an origin.

If the Find Home keys are pressed any other time, the Automove will perform a re-reference. The motors will find the Home switches, reset the Home position, and move back to the last commanded position. This allows the user to check and reset the global reference anytime during the program. The Find Home command will not reset the travel limits, the origin, the calibration factors or lose position in the program.

The Automove systems support a Z axis along with the X-Y axis. A personality parameter can be set which requires that a Find Z Home be performed prior to the X-Y Find Home. Each time a Find Home is done, the Z axis will automatically move first. All Automove systems which have been purchased with an ASYMTEK Z stage will be set in this mode at the factory. Refer to the ACL Programming Manual section on personality parameters.

PAUSE

The Pause button is used to pause all motion of the Automove. The motion will stop after the present move command has completed. This Pause is not an instant stop, but rather a controlled stop. When Pause is pressed, the Pause light will blink signifying that the Automove is in the paused state. You can resume motion by clearing the Pause from the Automove front panel or the host computer (see ACL Programming Manual). If you press the Pause button again, the move sequence will continue from the present point. No re-referencing is necessary, and no computer commands are lost. In the Paused state no commands from the host computer will be accepted. The arrow keys will still be active in order to move the position of the system.

STOP

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The Stop button is used to instantly abort a move. When Stop is pressed, the Stop light will blink and all motion will cease instantly. The Stop button is a "panic" button. You must clear the Stop from the host computer, use the Reset button, or cycle the power. Since Stop causes the position reference to be lost, the move sequence must be reinitiated.

The Automove system performs a memory check upon power up. If the stop light starts blinking immediately after turning on the power, an error has been detected in the non-volatile memory. If this occurs, refer to the ACL Manual on EEPROM memory, Section 6.

RESET

The Reset button is identical to quickly turning off the power then turning it back on.

PROGRAM 0, PROGRAM 1

The Automove products come standard with 8K EEPROM non-volatile memory. Refer to the ACL commands BD,ED,XD and PE for instructions on downloading programs into the memory. Two separate downloaded programs can be accessed from the Automove front panel. These two programs are labeled PRGM 0 and PRGM 1. By pressing the Fast button (center button of the arrow keys) and at the same time pressing the Pause button, program 0 will start. The program will begin with the first command in the sequence. By pressing the Fast button and the Teach button at the same time, program 1 will begin. It is best to press the Fast button first and hold it down and then press either Pause or Teach.

Access to downloaded programs from the front panel eliminates the need for a computer to be dedicated to the system. Downloaded programs are useful when repeated patterns are performed often. Once a program has been downloaded into memory, it will remain unchanged, even if the power is turned off, until a new program has been downloaded into that slot, overwriting the previous program.

PS-10

The PS-10 is the 10 position download selector. It is 10 position switch that provides access to 10 separate programs from the front panel. To activate a program, dial the desired program 0-9 and press the large button located next to the selector switch.

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SELF TEST

The Automove systems have a built-in self test which moves the X-Y-Z motors and toggles the outputs. This test can be used at anytime to check if the Automove is operational. To activate the self test, press both the Right and Left Arrow keys and simultaneously press the Reset button. The self test pattern will repeat indefinitely. To exit the Self Test, press Reset or cycle the power off.

STEP VERIFY

When an Automove system is supplied with the step verify option, the Reset button is used to indicate a motor slip. If both the Reset and Stop lights are blinking, a slip has occurred.

RS-232C SERIAL INTERFACE

The Automove has a 25 pin "D" subminiature connector. Table 3 below describes the functions supported by the Automove products. The wiring of the interface cable from the Automove to the host computer is dependent upon many things. The information supplied in Table 3 and in chapter 5 of the ACL Programming Manual should be sufficient for you to make the Automove end of the RS-232C cable. The host computer end is dependent upon the specific computer. For more information contact ASYMTEK.

PIN	FUNCTION	INPUT/OUTPUT
1	Chassis (safety ground)	--
2	Transmit data	Automove output
3	Receive data	Automove input
4	Request to send	Automove output
5	Clear to send	Internally enabled
6	Data set ready	Automove input
7	Signal ground	--
20	Data terminal ready	Automove output
All others	No connection	--

TABLE 3

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COIL DRIVER

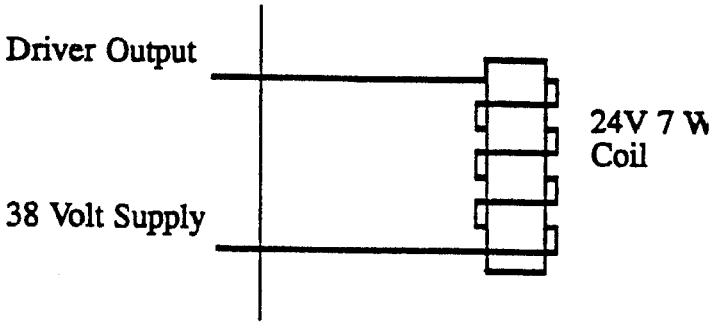
The coil driver cable is supplied with the solenoid driver option. The pin assignments are given in Table 4. The cable from the actual solenoids into the DE-9 connector should be properly shielded as in other Automove connectors. Care must be taken to use a separate shielded cable for each driver so interference between drivers is minimized. Remember to use the cable supplied by ASYMTEK! This cable uses a braided wire shield for ESD safety. Pin 8 and Pin 9 are shorted in the cable and not at the Automove system.

PIN	DESIGNATOR	FUNCTION
4	DO	DRIVER OUTPUT 0
5	D1	DRIVER OUTPUT 1
6	D3	DRIVER OUTPUT 3
7	D2	DRIVER OUTPUT 2
8-9	38V	38 VOLTS
1-3	--	NO CONNECTION

TABLE 4

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COIL DRIVER OUTPUTS



The Driver output is the collector of an NPN-transistor. To activate the external device, the transistor is turned on providing a ground to the driver output side of the coil.

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OPTICALLY COUPLED INPUTS AND OUTPUTS

The electrical specifications for the inputs and Stop are as follows:

Maximum voltage from any input or STOP to isolated ground is +7 volts.

Minimum voltage from any input or STOP to isolated ground is -1 volt.

Sink current is 2.5 ma. at .4 volts maximum.

The electrical specifications for the outputs are as follows:

Maximum voltage from Collector to Emitter is 30 volts.

Minimum voltage from Emitter to Collector is 7 volts.

Maximum sink or source current is 14 ma. at .5 volts.

Some hints and precautions:

Do not exceed ANY electrical specifications as the ENTIRE I/O can be affected: specifically watch current loads!

An output can directly activate up to 4 input.

Never connect the Automove ground to the Isolated Ground.

Care should be taken to not interchange the Emitter and Collector of the output opto-transistors.

The outputs have NO power supply available: they can, however directly SINK current as specified.

The inputs are directly TTL compatible.

The outputs are directly TTL compatible if pull-up resistors are used or if a positive power supply is provided referenced to the TTL logic supply.

The mating connector is a "parallel printer" type connector which is 36 pin female; the connector is available at commercial electronic supply stores.

The cable for the above mating connector need not be shielded but shielding always helps immunity.

See Table 5 for pin assignments on the I/O Cable.

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I/O CABLE WIRING DIAGRAM

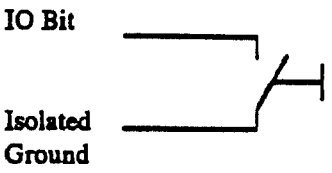
AUTOMOVE	COLOR	FUNCTION	36 PIN CONNECTOR
1	Black	IO	1
2	White	I1	2
3	Red	I2	3
4	Green	I3	4
5	Orange	I4	5
6	Blue	I5	6
7	Wht/Blk	I6	7
8	Red/Blk	I7	8
9	Grn/Blk	STOP	9
10	Org/Blk	O0-collector	10
11	Blu/Blk	Ol-collector	11
12	Blk/Wht	O2-collector	12
13	Red/Wht	03-collector	13
14	Grn/Wht	04-collector	14
15	Blu/Wht	05-collector	15
16	Blk/Red	06-collector	16
17	Wht/Red	07-collector	17
18	Org/Red	Isolated Ground	18, 30-36
19	Blu/Red	O0-emitter	19
20	Red/Grn	Ol-emitter	20
21	Org/Grn	O2-emitter	21
22	Blk/Wht/Red	O3-emitter	22
23	Wht/Blk/Red	O4-emitter	23
24	Red/Blk/Wht	O5-emitter	24
25	Grn/Blk/Wht	O6-emitter	25
26	Org/Blk/Wht	07-emitter	26

TABLE 5

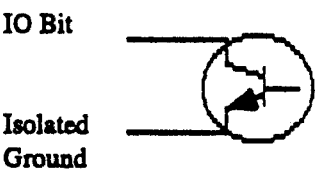
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Illustrated are schematic diagrams for connecting the I/O and driver features. Component specifications and Automove wiring diagrams are documented in the *Operations Manual* of the User's Manual.

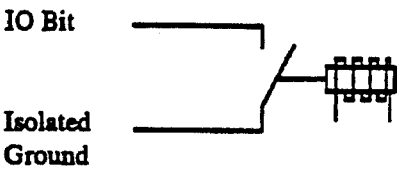
Digital Inputs and Emergency Stop



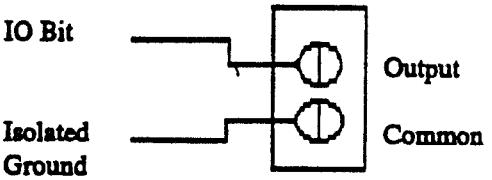
Dry Contact Switch



Transistor Switch

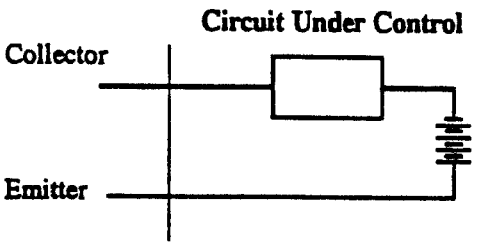


Interposing Relay

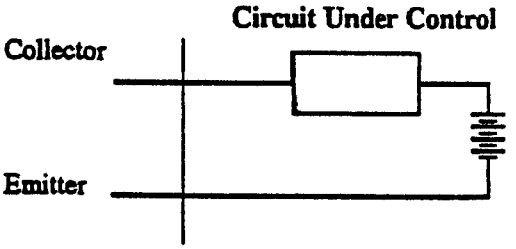


Programmable Logic Control

Digital Outputs



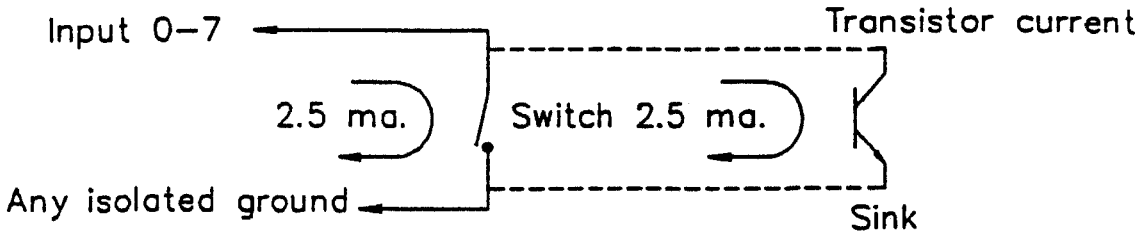
As a Current Source



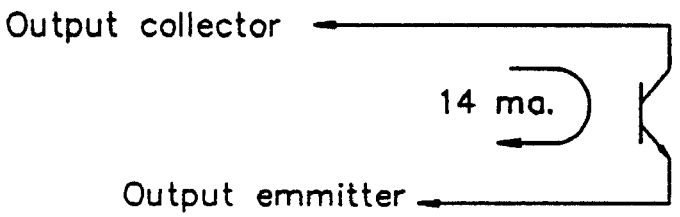
As a Current Sink

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The I/O is very simple to use. Since all of the functions are optically isolated, it is very difficult to get into too much trouble. As stated in the manual, inputs are simply switch closures or current sinks to isolated ground. The following drawing illustrates this:



Outputs are simply uncommitted floating transistors. Each output is capable of sourcing or sinking approximately 14 ma. It is advised that no more than 5V exists across an output transistor when the output supply is l4 ma. (This is for power restrictions). The diagram will show a typical output:

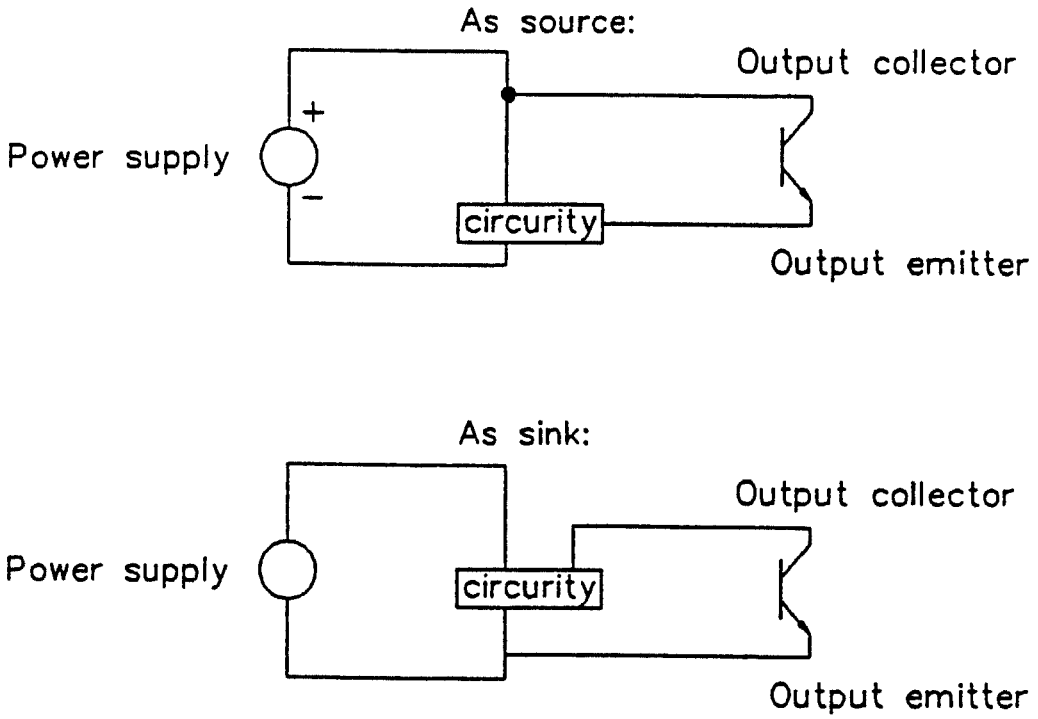


To connect an output to any input simply place the output transistor where the transistor current sink is shown on the input connection.

Since the transistor is a "floating" element, it needs an external power supply referenced to whatever interfacing you are implementing in order to supply appropriate voltage and or current. In the simplest sense, the output is a switch which allows current to flow in one direction only. i.e. into collector out of emitter.

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A typical connection with external power supply:



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Z STAGE

The current Asymtek Z stage (1 mil Z head) has two new features.

1. The Z stage uses vee-bearing guide rails instead of a cross-roller ball slide. The guide rails minimize the amount of lateral movement.

2. The Z stage assembly includes an internal solenoid brake. This brake is activated when you turn the Automove off or when you push RESET. This prevents the Z slide from dropping onto the work surface and damaging your equipment.

If you want to move the Z stage while power is off, there is a manual release lever on the rear of the Z stage. By pressing and holding in the lever, you manually unlock the Z brake allowing you to move the Z stage.

Note: Remember this manual release lever can only be used when the machine is turned off. Be sure to support your valve or other fixture mounted to the Z slide. Otherwise, if you use the manual release, your valve or other fixture will drop.

The microstep amplifying PCA (printed circuit assembly) and the 65 in-oz. motor in this Z stage assembly allow more power and 0.001" (0.025mm) resolution at programmable velocities and accelerations. These factors enhance the ability of the Z stage to achieve a more efficient payload (mass to be moved).

****

Easymove users: When the machine is turned on or RESET, you must have the Z stage FIND HOME as the first motion in the Easymove program or by the front panel controls. This action releases the Z brake. After the brake is released, you can execute other programs.

****

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MZ-HV OPERATION NOTES

The MZ-HV contains a "brake" that is activated when the "Reset" button is pushed or when power is turned off. The distance that valve (Z payload) may fall under these two conditions could be as much as .5 inches (12.5 mm). To prevent damage to substrates, perform a "Find Z Home" function before power off (or before "Reset", if possible).

After a "Reset" (or power off) is done, perform a "Find Z Home" function before moving the Z axis. This will establish proper travel limits for the Z axis. If Home is not established, moving the Z axis to its upper mechanical limit will cause the valve to fall to its lowest mechanical stop. If buzzing and vibration in the Z axis occurs while performing a "Find Z Home" function, then press "Reset", gently push down on the valve with the brake engaged, and do another "Find Z Home"> (This condition can be caused by pushing up on the valve after the brake has been engaged.)

If you encounter problems with the MZ-HV, please contact Asymtek or a qualified service representative. Disassembly and re-assembly by non-Asymtek approved service representatives are not recommended, and could result in further problems.

NOTE: MZ-HV collectively represents MZ-12HV, MZ-18-HV, MZ-12HVG, and MZ-18HVG.

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APPENDIX - ACCELERATION VERSUS PAYLOAD

The Automove systems use stepper motors, Stepper motors are "open loop" devices, that is, there is no position feedback in the system. The Automove control system assumes that the motors never slip or lose position. The Automove can slip or lose position for a variety of reasons. Some of the more common causes are:

1. Running into a fixed object or the side of the instrument.
2. Physically moving the X-Y table when power is applied.
3. Setting the acceleration too high for the payload applied.
4. Pressing the Stop button on the Automove front panel.

Most of these reasons are pretty obvious and occur when something "goes wrong." However, setting the motor acceleration may not be obvious and a short description of acceleration versus payload will help in choosing the correct acceleration for your system. The Automove systems allows you to program the acceleration values, see ACL or your software Programming Manual.

For the Automove Series 100 and 300 instruments, if the payload stays within the recommended acceleration values given in Table 6, the Automove system will not lose its position. The acceleration is given in two different units. The ACL command for acceleration uses thousands of motor steps/sec/sec (refer to the ACL manual). Refer to your individual software programming manual for more information about units.

PAYLOAD	Steps/sec2	Inches/sec2
10 lbs.	39,000	39
5 lbs.	78,000	78
2 lbs.	193,000	193

TABLE 6

When using leadscrew X-Y tables or custom mechanical systems, the maximum acceleration is difficult to determine a priori. The acceleration is dependent upon the system inertia, the motor torque and the payload. The best way to determine the acceleration is to experiment with the system. Start with the lowest value of acceleration and increase the value until the motors slip. Always reduce the acceleration so the system runs with some safety factor.

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ASYMTEK GLOSSARY

ABSOLUTE ACCURACY
The accuracy of a move to a point using the MOVE command.

ABSOLUTE MOVE
A positioning mode in which all moves are referenced to a fixed origin position.

ACCURACY
To what proximity an automated move rests compared to a physically measured point.

ACL AUTOMOVE CONTROL LANGUAGE.

ADHESIVES
A fluid or paste capable of joining materials.

ANTI-BACKLASH
Any move path can be approached from any random direction to a given point. However, the mechanism is commanded to approach a given point from the same direction thus eliminating backlash.

APPLICATION
The manner in which a mechanism is used.

AXIS X, Y or Z.

BACKLASH
Mechanical looseness, slop, or deadband.

BRAZING
Low temperature welding with brass.

CALIBRATION
Measurement with a universal standard instrument.

CARRIAGE PLATE
The plate on the X axis that the Z-head mounts to, or the plate on the Y axis that the Y-adjust pulleys mount on.

CIRCULAR INTERPOLATION
Continuous motion in an arc.

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COMPOUNDS

A combination of two or more elements or parts.

CONFORMAL COATINGS

A coating that has constant thickness. In electronics manufacturing a coating that is a moisture seal.

CONNECTOR

A device that couples two lines.

CONTINUOUS PATH

Constant velocity motion along any path of connected lines and arcs. Look-Ahead.

C to C

Center to center (CTC) distance.

CURE

The process of drying a fluid. For example, a UV cured epoxy is dried by ultra violet rays.

CYANOACRYLATE

Super glue.

DAMPERS

A device that eliminates or progressively diminishes vibrations and oscillations.

DIE ATTACHMENT

An integrated circuit at the chip level is the "DIE". When the die is placed on a substrate with adhesive, it is attached.

EEPROM

Electronic Erasable Programmable Read Only Memory - When the power is off, the memory remains.

ENCAPSULATE

To enclose, contain. In fluid dispensing, to seal with sealant or to cover with glue.

ENCODER

A device that goes on a shaft and produces pulses with rotation.

END-EFFECTORS

Devices that are attached to an X-Y or Z axis and perform various applications (pick and place, dispensing, routing).

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ENVIRONMENT RANGE
The environmental conditions an object can work under.

EPOXIES
Glue (1, 2, or 3 part).

FIXTURING
Attaching something as a permanent appendage, apparatus, or appliance. Tooling.

FLEX MASKS
Masks capable of variation or modification, adaptable, able to bend.

FLUX
A flow of matter or energy as a fluid, or regarded as a fluid. A substance that aids, induces, or otherwise actively participates in a flowing, particularly the flowing of solder.

GANTRY
(Webster: A bridge-like frame over which a traveling crane moves.) Describes Asymtek's AUTOMOVE Systems that are inverted, creating a bridge-like effect.

GASKET
Mechanical seal between two parts.

GAUGE
A standard devised for measuring dimensions, capacity, thickness, etc. In this instance, the measurement of the needle size (circumference of the needle hole.)

GLOB-TOP ENCAPSULANT
Enclosing a die with glue or other sealants.

HARD-STOPS
A mechanical limit.

HOME SWITCHES
The switches at one corner of the platen that allow the Automove to define its position.

I/O Input/Output.

INK-JET PRINTER
Drops of ink squirted onto a substrate, in order to create a printed pattern. Could be letters, numbers or symbols.

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IN-LINE
Linear arrangement of equipment, i.e. an automated manufacturing line.

INTERFACE
Communication, to merge one operation with another; a means of connecting one device to another; connector definition and signal levels.

INTERPOLATE
To estimate the value of a function between two known values.

LEADSCREW PITCH
The number of full rotations required to advance a nut one inch. Lead is the reciprocal of pitch.

LEADSCREW TABLES
A milling machine type table using screws as a rotation to translation device.

LUER-LOCK
A type of fitting with locking ears for fluid transmission.

MASK Cover.

MEMORY CHIP
Stores electronic data.

METER MIX SYSTEMS
Equipment that mixes two or three part adhesives and displays the result.

MICRO-PROCESSOR
The "traffic director" chip, i.e. How to, where to, what to. A computer on the chip level.

MICROSTEPPING
A technique which, instead of switching phase currents in a stepping motor on and off, slightly decreases the current in one winding while slightly increasing it in another at the same time. The result is more "steps" per revolution.

MIL One thousandth of an inch.

MOUNTING PLATE
A plate to connect mechanical devices.

OEM Original Equipment Manufacturer.

OHMS
A measure of electrical resistance.

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OPEN LOOP POSITIONING
A positioning technique in which the controller issues a sequence of commands to the motor without any absolute means of detection if the move has, in fact, been made.

OPTICAL ENCODER
A position or angular feedback device providing directional information.

OPTO-COUPLED
An electrical device that uses light to transmit information rather than electricity. Typically immune to noise.

OUTPUT DRIVERS
Solenoid - 24 vdc coil drivers.

OUTPUTS
An electrical signal that turns on/off upon command and with which the Automove system can control external devices.

PAIL PUMP
A pump that allows material to be pumped directly from 5 to 55 gallon pails.

PARALLEL PORT
A type of computer interface usually used for printers.

PATTERN
Same as a PROCEDURE except that when the program is executed a new Origin is set at the current location. When the program is exited (with end pattern command) the old Origin is restored.

PAYLOAD
The mass to be moved.

PCB Printed Circuit Board.

PERIPHERAL
An external device, i.e. the Automove system is a peripheral to the host computer.

PERISTALTIC PUMP
A pump that employs a plastic tube which is squeezed by rollers.

PLATEN
Flat plate of metal. For example, the topcover surface of an Automove system.

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PNEUMATICS
Air or fluid used to transmit information.

POTTING
Filling a cavity.

POTENTIOMETERS
An adjustable resistor.

PROCEDURE
A group commands, referenced from the main origin, that can be executed multiple times.

PSI Air pressure lbs. per square inch; lbs./in^2.

PULLEY
A wheel or drum around which the drive cables are wrapped.

RACK AND PINION
A device for the conversion of rotary to linear motion, consisting of a pinion (small gear) and a mated rack (toothed gear).

RAM Random access memory; temporary memory (forgets after power is turned off.)

RELAY
An electromechanical switch; a low voltage or current can control a high voltage or current.

REPEATABILITY
How close the mechanism moves to the same program point again and again.

RESOLUTION
Smallest step size, smallest possible movement.

ROM Read Only Memory; the permanent memory which contains the Automove system "intelligence".

RTV Room temperature vulcanizing.

SERIAL PORT
A type of computer interface usually used for modems, printers, and other peripheral devices. The Automove systems connects to the computer through a serial interface.

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SILICONES

Any of a group of semi-inorganic polymers based on the structural unit R2SIO, where R is an organic group. These polymers are characterized by wide-range thermal stability, high lubricity, extreme water repellency, and physiochemical inertness, used in adhesives, lubricants, protective coatings, paints, electrical insulation, synthetic rubber, and prosthetic replacements for bodily parts.

SILKSCREEN

(Webster's) A stencil method of printing a flat color design through a piece of silk or other fine cloth on which all parts of the design not to be printed have been stopped by an impermeable film.

SOLDER

Any of various fusible alloys, usually tin and lead, used to join metallic parts when applied in the melted state to the solid metal.

SOLDER FLUX

A material that deoxidizes a surface when heated.

SOLDER PASTE

Small balls of solder suspended in flux.

SOLENOID

A typical solenoid is a cylindrical coil of insulated wire with a movable metal plunger. When current flows through the coil, a magnetic force acts on the iron plunger.

SOLUBLE

Capable of being dissolved (in liquid).

STEP SIZE

The fundamental unit of stepper motor motion; the smallest motion possible in one step.

SUBSTRATE

Any surface, part, substrate, or element used for mounting.

TEACH ACCURACY

When a point is taught, the AUTOMOVE will move to that point again within the repeatability of the AUTOMOVE.

TEACH MODE

Learning XYZ locations.

THIXOTROPIC

Describes material that changes its viscosity under pressure. It starts out thick and becomes thin under pressure.

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THROUGHPUT
The amount of material per unit time due to implementation of certain process.

TOOLING
A fixture.

TORQUE
A rotationally directed force, typically measured in inch-ounces, foot-lbs. or Newton-centimeters.

VELOCITY
Speed/Distance traveled in unit time.

VIAS Holes through a PCB or substrate.

VISCOSITY
The degree to which a fluid resists flow under an applied pressure.

VISCOUS MATERIAL
A fluid with a cohesive and sticky consistency.

VOLATILE
Evaporating readily at normal temperatures and pressures; changeable.

Z-AXIS
An up/down axis, a third axis.

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