

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

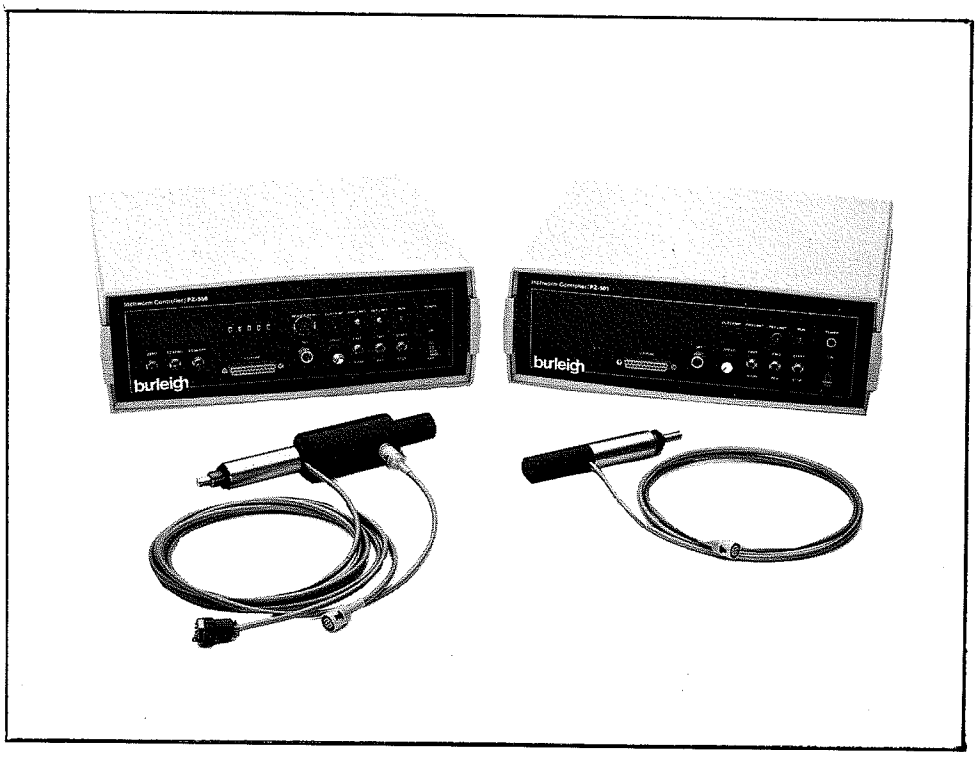
- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *Thorlabs / Exfo / Burleigh PZ-500* at our website: *Click HERE*

INCHWORM SYSTEMS



Instruction Manual for Inchworm Systems: PZ·505, PZ·555

burleigh

Burleigh Instruments, Inc.
Burleigh Park
Fishers, New York 14453
(716) 924-9355 Telex 97-8379

No. 198 1278

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CONTENTS

		PAGE
1.	Incoming Inspection	1
2.	Introduction	2
3.	Inchworm Translators	3
	A. Description	3
	B. How It Works	3
	C. Operation	5
	1) Mounting	5
	2) Coupling	6
	3) Clearance Compensation	6
	4) Loading	6
	5) Life Expectancy	8
	6) Motion Characteristics	8
	7) Vibration	10
	8) Temperature Range	10
	9) Vacuum Operation	10
	10) Disassembly	10
	11) Alignment of the Optical Measuring Head	11
	12) Electrical Calibration of Readout	11
4.	Inchworm Controllers	12
	A. Description	12
	B. Operation	13
	1) Manual Control	13
	2) Remote Control	14
	3) Monitor Outputs	14
	4) Protective Circuitry	15
5.	Optical Measurement System	15
6.	Warranty	16
7.	Outline Dimensions	16
8.	Specifications	17
9.	Wiring Codes	18

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

NOTE:

The power switch/circuit breaker used in the Inchworm Controller can be prematurely tripped when initially turned on due to current surges in the power supplies. This can lock-up the clearance compensation shut-down circuit. To avoid this condition follow one of the two procedures below.

1. Wait 20 seconds between any attempts to turn on

2. Turn unit on and rotate clearance compensation pot (front panel) fully ccw and then clockwise till the Inchworm Translator will run with load (nominally fully clockwise)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1. INCOMING INSPECTION

The Inchworm^{tm} System components have been packaged in a special carton designed to give maximum protection during shipment. If the outside of a shipping carton is damaged, notify your shipping department immediately. The shipping department may wish to notify the carrier at this point.

If the shipping carton is undamaged externally, the instrument should be removed from the carton. If any damage is evident visually or if any rattling can be heard when the part is shaken lightly, notify your shipping department and Burleigh Instruments, Inc. immediately. It is advisable to save the special cartons for future storage or transportation.

It should be noted that the Inchworm Systems undergo several stages of inspection, test and calibration before shipment, including a burn-in of the electronics at elevated temperatures for 5 to 7 days, (minimum) and a lengthy run-in for the Inchworm Translators. These instruments have undergone an exhaustive final test and calibration process prior to shipment. Problems can occur, however, and should a problem arise during the warranty period, Burleigh's policy is to repair any instrument within one week of receipt at the factory. During this time the instrument will be run-in or the electronics burned-in again before rechecking and returning.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2. INTRODUCTION

Each Inchworm System includes an Inchworm Translator and an Inchworm Controller. The PZ-555 Inchworm System comprises a PZ-551 Inchworm Translator with an optical measuring head and a PZ-550 Inchworm Controller with a digital display and other features of the optical measuring system. The PZ-505 Inchworm System comprises a PZ-500 Inchworm Translator and a PZ-501 Inchworm Controller.



The characteristics of both Inchworm Translators are identical except for the added size from the optical measuring head. Both Controllers have all the same features for driving the Translators, with the digital measurement features being added to the basic control functions.

The Inchworm Translators, Inchworm Controllers and optical measurement system will be described separately in this manual.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3. INCHWORM TRANSLATORS

A. Description

The Inchworm Translator is an electro-mechanical actuator about the size and configuration of a standard micrometer head. A spindle, which is keyed to prevent rotation, moves relative to the housing. The motion is completely piezoelectrically (PZT) actuated. There are no threads or gears. Construction is of non-magnetic materials. Vacuum operation is permitted if the special vacuum option is ordered and the instrument is turned off in the corona region.

The Inchworm Translator mounts easily in a 1/2" clearance hole and can be used for many remote positioning and alignment applications. It's easy to align interferometers, implant electrodes or position elements in spacecraft or in vacuum chambers. Resolution is $\leq$20nm and the speed is variable from .6mm/sec. to $\leq$.01µm/sec. Loads of up to 1.5 kilograms can be pushed with the Inchworm Translator. Total travel of the Inchworm Translator is 25mm. It dissipates no heat or vibration when stopped and very little while running.

A Clearance Compensation feature in the Controllers allows the fit between the PZT elements and the shaft to be adjusted to compensate for dimensional changes due to large temperature variations.

All major functions can be controlled either from the front panel of the Inchworm Controllers or from a remote programming source. Simple TTL logic inputs to the Controller will govern running, direction and speed.

The PZ-505 Inchworm System includes a PZ-500 Inchworm Translator and a PZ-501 Inchworm Controller. The PZ-555 Inchworm System includes a PZ-551 Inchworm Translator with optical measuring head and a PZ-550 Inchworm Controller with digital display for the optical measuring head.

B. How It Works

Three PZT cylinders are fitted to a shaft which translates the spindle. The contacting surfaces are highly polished and there is essentially a zero fit between the outer PZT cylinders and the shaft.

The outer PZT cylinders clamp the shaft. The center section provides the motion. When a voltage is applied to the first PZT cylinder, it changes dimension slightly and clamps the shaft. Next, a voltage is applied to the center PZT to change its length and move the second outer cylinder with respect to the first. When the center voltage reaches its upper limit, the logic commands the second outer PZT cylinder to clamp the shaft, releases the first, and reduces the center PZT voltage. This draws the first end PZT toward the second and thus the shaft with spindle is "inched" along. See Figure 1.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

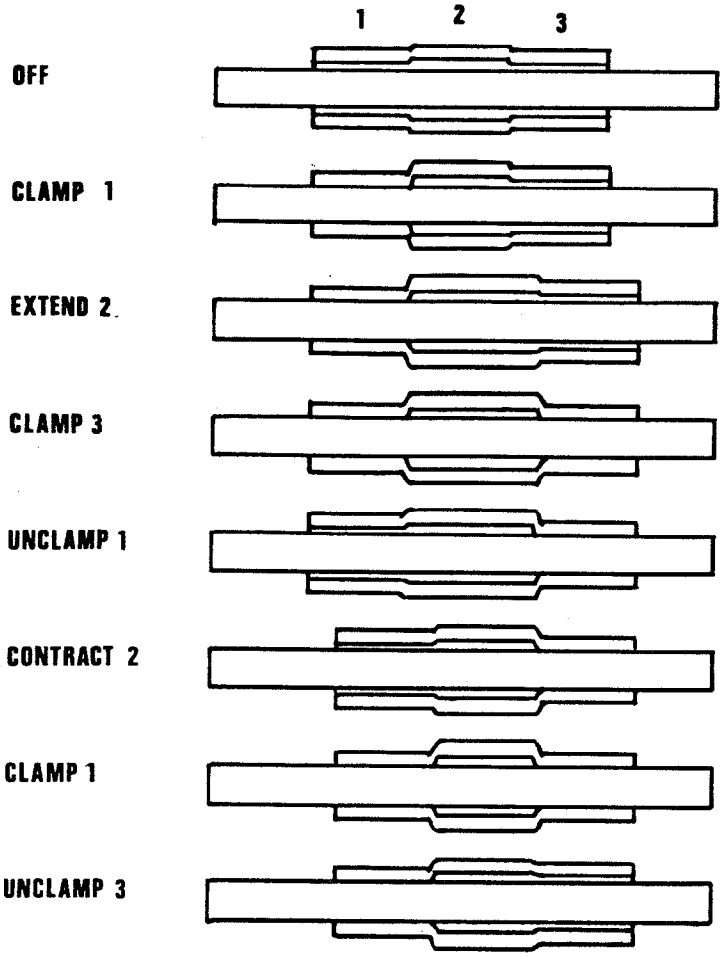


Figure 1

The center PZT voltage is a 225 step staircase and the resultant travel is a sequential motion in very small increments, stopping for a brief time, then moving incrementally again. The staircase drive voltage on the center PZT section can be stopped at any step, or count, so positioning resolution as small as a single step is possible. A single step is approximately 6nm. See Figure 2.

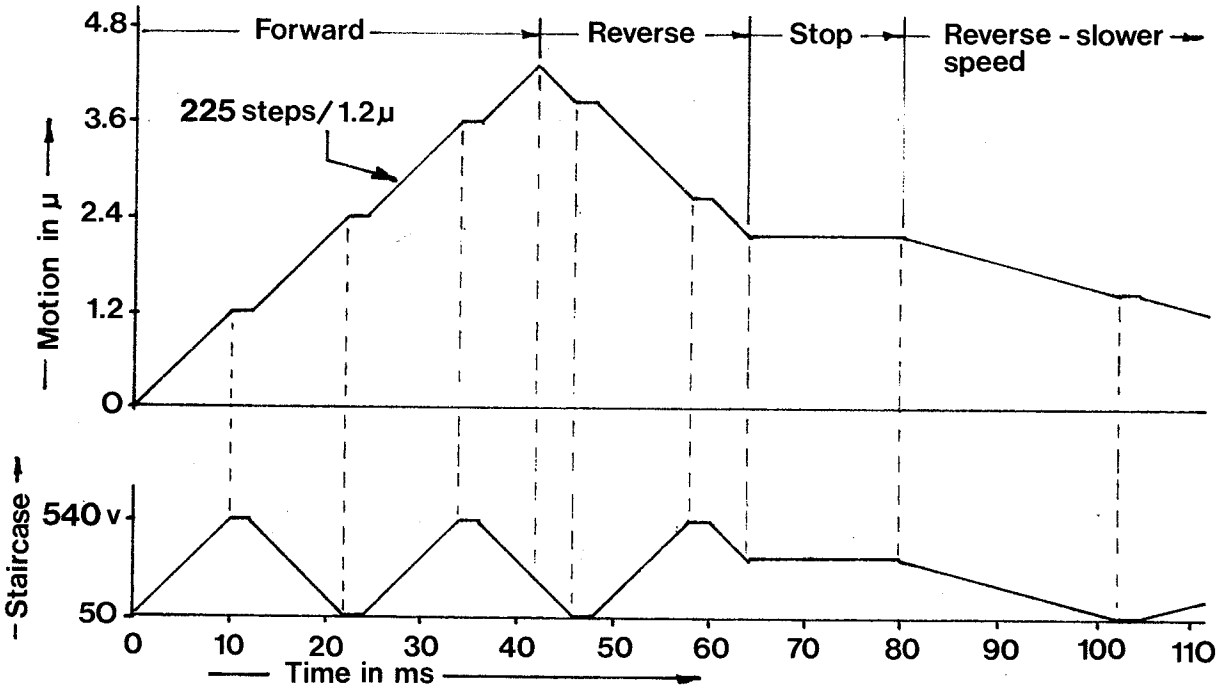


Figure 2

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Some change in speed occurs just after the PZT clamps switch, so the precise form of the motion must be carefully analyzed if the user's resolution requirement is less than about 1/4µm. Section 3.C.6 contains further information on this characteristic.

Figure 3 shows actual measured Inchworm Translator motion when driven with an Inchworm Controller. In this plot the Inchworm is run forward at a slow speed, stopped, run in reverse, stopped, and run forward at a slower speed. The staircase drive to the center PZT is shown in the bottom trace.

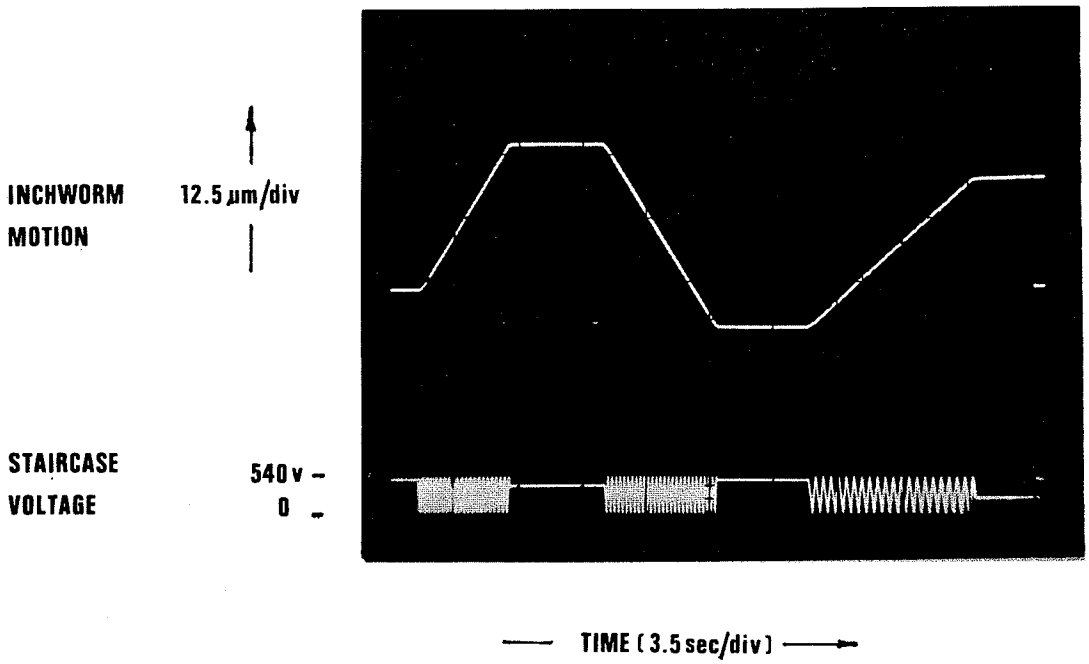


Figure 3

C. Operation

1) Mounting

Use of the Inchworm Translators is straightforward. They mount in a 1/2" clearance hole with a retaining nut. The stainless steel spindle moves relative to the housing and is keyed to prevent rotation. A removable spherical tip is used when pushing against a spring load. With the tip off, elements can be mounted directly into the 6-32 tapped hole in the end of the spindle. A magnetic coupling can be used if a magnetic tip is substituted for the standard non-magnetic stainless steel tip. CAUTION: NEVER TIGHTEN THE TIP ON THE SPINDLE WHILE HOLDING THE HOUSING. CAREFULLY HOLD THE SPINDLE WITH THE SPINDLE WRENCH WHEN SECURING THE TIP WITH THE TIP WRENCH. See Figure 4.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

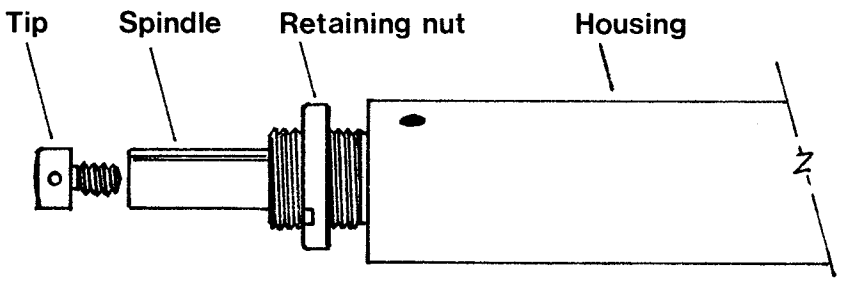


Figure 4

2) Coupling

It is desirable to operate the Inchworm Translator with as light a load as possible, although the Inchworm Translator can push or pull against an axial force of up to 1.5 kilograms. The motion will be smoother with less of a difference in forward and reverse speeds. Also, since the Inchworm Translator is only clamped when the Controller is on, there is less danger of slippage during a power loss. (It should be noted that the Inchworm Translator normally has a friction fit, and will not slip with loads on the order of .1 kilogram to 1 kilogram with no power applied). There is nothing to be gained in terms of stability of the Inchworm Translator with a spring load, unlike most mechanical devices. The Inchworm Translator is extremely rigid and stable when stopped, with typical thermal stability of the spindle tip relative to the mounting shoulder of about 1/10μm/^{o}C. No creep is observable on this scale.

Coupling directly between the spindle and object being positioned is best accomplished as shown schematically in Figures 5-8.

3) Clearance Compensation

After a long period of use, clearance may result between the cylinder and shaft. The unique Clearance Compensation feature in the Inchworm Controller can be used to compensate for this wear. This feature may also be used to adjust running speeds when driving various loads. The adjustment is located on the front panel of the controller.

4) Loading

The Inchworm Translator can push or pull against an axial force of up to 1.5 kilograms. As the force is increased, forward speed will be decreased and reverse speed increased, and vice-versa. Increasing the tightness of the cylinder on the shaft by using the Clearance Compensation feature may improve slightly the ability to push against a load.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

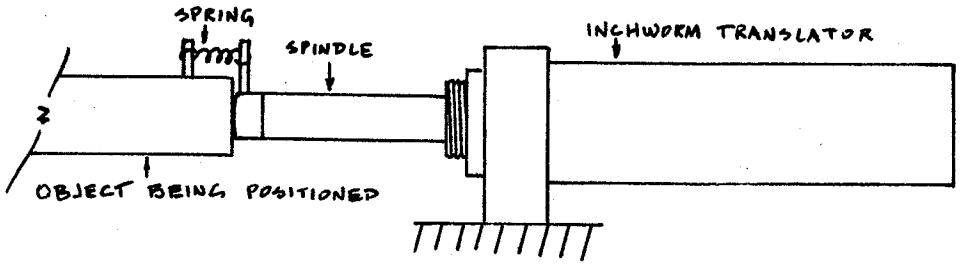


Figure 5

A magnet may also be used to couple light loads. See figure 6.

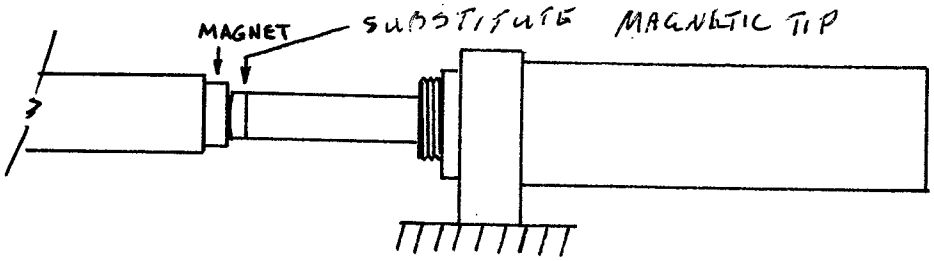


Figure 6

Small objects can be attached directly to the spindle as shown in figure 7.

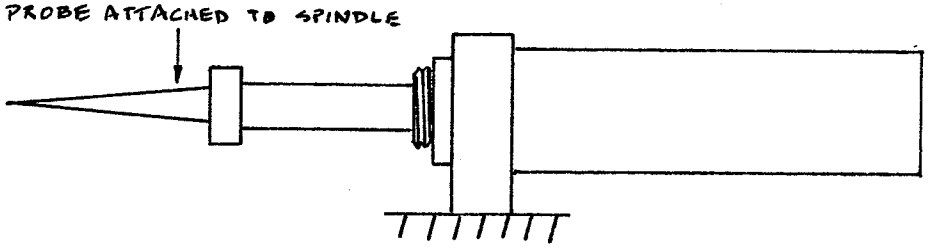


Figure 7

The easiest method is to couple directly with a spring load against the Inchworm Translator as in Figure 8. For spring loads of $\leq$1.5Kgm, this is acceptable.

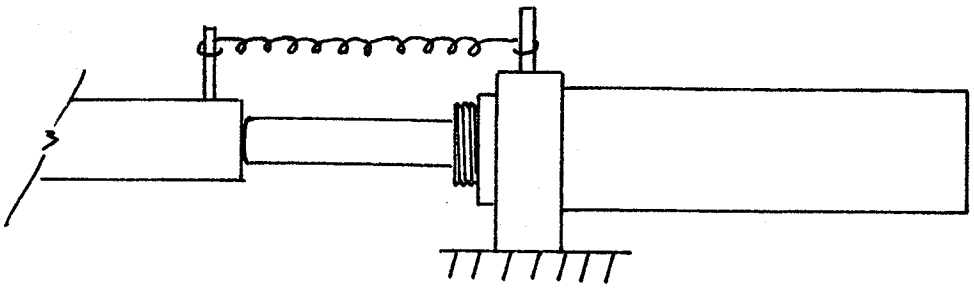


Figure 8

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5) Life Expectancy

Life expectancy is somewhat dependent on load. For loads of ≤1 kilogram, the life appears to be indefinite. For loads of 1.0 to 1.5 kilogram, the Inchworm Translator will operate for approximately 25,000 cycles, then lose some push force and reduction in top speed. Cleaning the slight deposits which build up on the shaft and cause the deterioration in performance will restore original performance. Cleaning can only be done at the factory or by a trained and authorized representative. The cleaning charge is $85.

After cleaning, the holding force with the power off may be reduced. The power-on specifications will be met. NOTE: a Clearance Compensation adjustment may be required after cleaning.

Each Inchworm Translator is run-in for several hours at top speed prior to shipment. After run-in the Inchworm Translator is disassembled, the shaft cleaned to remove any material deposits accumulated, and then reassembled.

6) Motion Characteristics

Shown below are actual measured motion vs. time plots for typical Inchworm Translators driven with either a PZ-501 or PZ-550 Inchworm Controller. Typical measured linearity (at constant speed) for 10% to 90% of the full 25mm stroke is ≤2% and for motions of a few mm or less, the linearity is typically ≤.1%. See Figure 9.

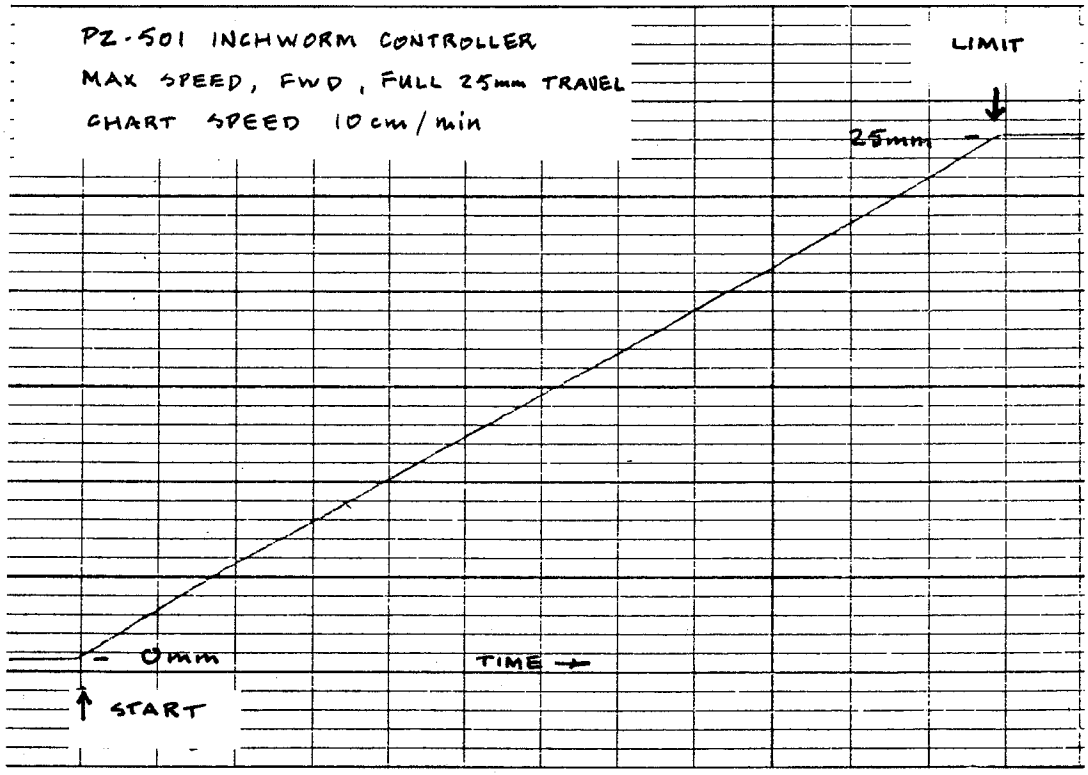


Figure 9

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The Inchworm Translator is designed to operate as smoothly as possible. However, there are two second order phenomena which may occur, and therefore should be carefully considered in extremely high resolution applications. Just after the clamps switch, the speed is decreased momentarily for the first 1/10 to 1/5μm of motion. If a constant speed is very important to a particular application, this characteristic must be carefully examined. This decrease can sometimes be minimized by experimenting with the Clearance Compensation adjustment to select an optimum setting.

The second phenomena occurs at the instant the second clamp is released. Due to micro-inch tapers, slight differences in fit, and to epoxy materials having some compliance, a slight unwanted motion may occur as the second clamp releases. This small motion, on the order of 0 to 0.2μm, is most noticable when the Inchworm Translator is operating under load. See Figure 10. The spindle tends to move back slightly running against the load, and forward slightly with the load.

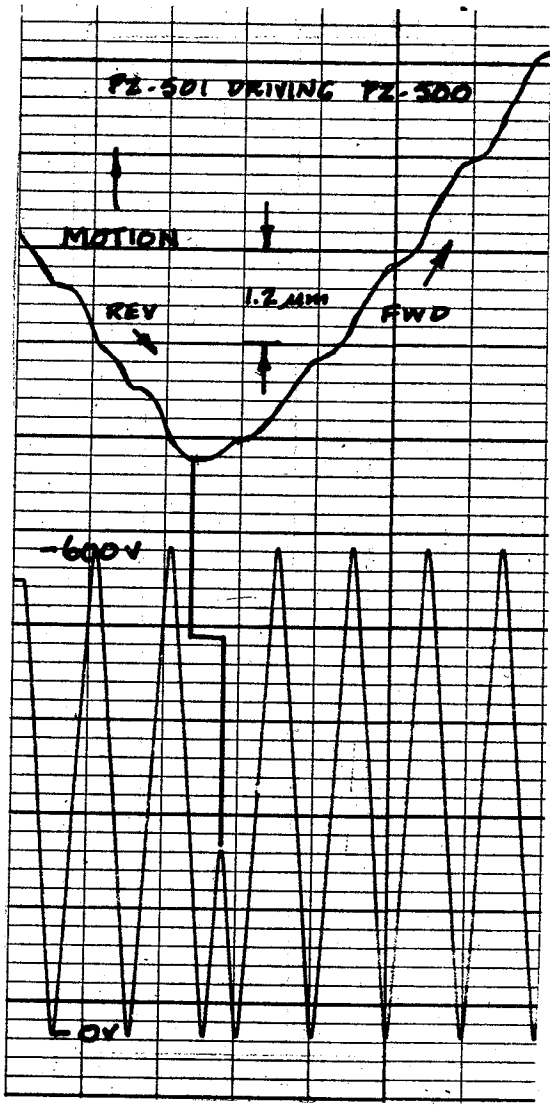


Figure 10

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7) Vibration

Some vibration occurs in the Inchworm Translator during operation due to the rapid acceleration and deceleration of the piezoelectric elements. A slight buzzing at high speeds and clicking at low speeds can also be heard and is quite normal. Experimental reports to date indicate that this vibration will not be detrimental, even in very sensitive environments.

Some lateral motion usually occurs in the spindle when the clamps switch, and this motion can be disturbing if a probe is attached directly to the spindle. This motion is typically $\leq 1/3\mu m$. If this is likely to be a problem, it is recommended that the probe be mounted to a separate guide, with this guide being pushed by the Inchworm Translator spindle. In some neurophysiology experiments with very small cells, for instance, this precaution is advisable.

8) Temperature Range

The Inchworm Translators will operate between $-20^{o}C$ and $+70^{o}C$. Below the dew point, and particularly below freezing, a good vacuum environment is required to remove water vapor which could condense and lead to electrical breakdown or freezing which can prevent motion.

It may be necessary to adjust the Clearance Compensation for a loose fit at the low temperature extremes, and for a tight fit at the high temperature extreme.

9) Vacuum Operation

The Inchworm Translator is warranted for operation in a normal laboratory environment. However, it is designed to operate in vacuum and over a wide temperature range. If vacuum operation is required the PZ-590 Vacuum Operation Option must be ordered. This includes special handling and cleaning during assembly, vacuum feed through, mating connectors and special venting of the cables. This option will warrant the Inchworm Translator for use between 10^{-6} Torr and 10^{-7} Torr. Operation between 10^{-1} Torr and 100 Torr is not permitted due to possible corona arcing. Only low vapor pressure materials are used in the construction of the Inchworm Translator; stainless steel, aluminum, ceramic, silver, PVC or Teflon insulated wires and low vapor pressure epoxy. Two small holes in the rear dust cover provide adequate ventilation to all internal parts.

10) Disassembly

The Inchworm Translator is not designed to be disassembled. Burleigh's warranty will be invalid if the factory seals on the instrument are broken without permission from Burleigh.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

11) Alignment of Optical Measuring Head

The optical measuring head in the PZ-555 Systems is prealigned and totally maintenance free. Should problems occur in the digital readout, contact Burleigh Instruments after making the following alignment check. Unscrew the rear cap of the Inchworm Translator (no screws need be removed). There are two glass scales, a large one attached to the Inchworm shaft and a smaller one attached to the reader head assembly, which set up a Moire pattern when juxtaposed. The fringes seen on the glass scales should be perpendicular ($\pm 20^{o}$) to the long axis of the larger scale. To re-align the glass scales the two screws holding the reader head tension springs should be loosened through the access holes in the case. Move the reader head assembly so that the fringes are perpendicular to the long axis of the glass scale. It is best to make the adjustments in the middle of the Inchworm's travel and with the Inchworm running at a slow speed so that the fringes which sweep by the field of view aid in the alignment procedure.

12) Electrical Calibration of Readout

Each PZ-505 Inchworm is matched to a PZ-550 Controller. If an Inchworm other than the matched unit is to be driven it might be necessary to recalibrate the readout signals. (Inchworms are identical and totally interchangeable). This can be done with the following procedure.

1. Remove the controller cover by unscrewing the four legs. The cover will then pull off.

2. Locate pins 7 & 8 of U22, a LM324N on the front panel circuit board.

3. Locate R80, R81, R84, R85 which are 10K trim pots.

4. With the Inchworm running and fringes aligned (see alignment of optical measuring head section) observe the signal at pin 7 of U22. Adjust R85 (Bias) and R84 (Gain) so that a 1 volt P-P sine wave centered at 1.5 volt DC is observed. Repeat for pin 8 U22; R81 (Bias) and R80 (Gain). Readout is now calibrated.

An alternate method is to set up a Lissajous pattern. Tie pin 7 to vertical trace on scope, pin 8 to ext input to time base. Scope ground should be floated and probe ground connected to pin 1 of U22. This references the scope to the bias level and will put the Lissajous pattern in the center of the scope screen. The two signals are 90^{o} out of phase and when adjusted properly will produce a circle. The trimpots should be adjusted so that there is no clipping of the circle, that is, it should be round and have a maximum diameter. If any problems arise with calibration of the readout, contact Burleigh Instruments. Under no circumstances should sensors on the reader head assembly be moved.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4. INCHWORM CONTROLLERS

A. Description

The Inchworm Translator is actuated with three piezoelectric elements and the Inchworm Controllers provide a sequence of voltages to drive the Inchworm Translator. The logic family used in the Inchworm Controller is 74C series CMOS and can be driven directly by TTL logic levels, thus making interface between computers or external drivers simple.

The PZ-501 and PZ-550 Inchworm Controllers can be used to program the Inchworm Translator spindle to move forward or backward. When commanded to RUN, the Inchworm Translator will automatically run until it reaches its limits of travel. At either end limit of its travel an internal limit switch on the Inchworm Translator is triggered, and the Inchworm Controller automatically shuts down and turns on an indicator light.

The speed of motion is variable from approximately .01µm/sec to .6mm/sec. All functions can be programmed either by front panel controls or by a remote source with simple N.O./N.C. logic.

Several output signals are provided to monitor the system. These can be interfaced with a computer and are useful for troubleshooting.

The PZ-550 Inchworm Controller contains the display and controls associated with the optical measuring system. The five digit display is accurate to 2µm. The zero point is selected by the user. A preset position can be selected with the thumbwheels and the Inchworm Translator commanded to run to this position (either polarity) and to zero. The position information is also read out digitally on the front panel D-connector. Note: When the preset position thumbwheels are used, the last digit must be even when the readout is in metric units. When the readout is set up for English units the last digit on the thumbwheel can be even or odd. See section 4.B.5.

The center element voltage waveform (of the PZ-501, PZ-550 Controllers) is a 225 step staircase which runs between 0v and 600v. The stepping rate for the staircase is variable from approximately 415,000 steps/sec to 1 step/ sec. The total time duration for the clamps to switch is fixed at 1ms, thus the maximum running speed is approximately .6mm/sec and the minimum running speed is approximately .01µm/sec. The Inchworm Translator can be advanced in approximately 6nm steps by using the slower speeds.

The diagrams below show the properly timed outputs for different speeds and directions. See Figure 11.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

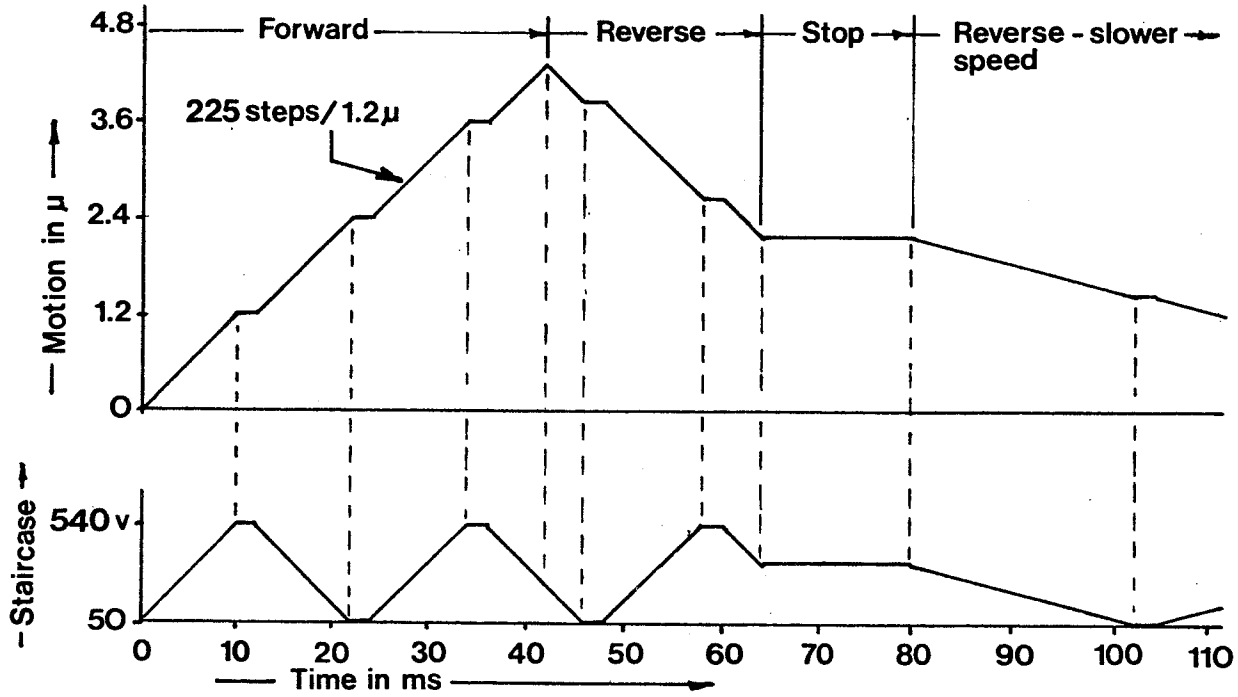


Figure 11

Another feature of the Inchworm Controllers is the Clearance Compensation. This is an electronic adjustment of the fit of the Inchworm Translator shaft and the clamping PZT's. The fit change is achieved by applying a bias voltage to the minus inputs of the piezoelectric elements. This bias is variable (from Gnd to +220v) and is front panel accessible. This adjustment compensates for wear of the piezoelectric elements on the shaft. It also helps to control the ability of the Inchworm Translator to push heavy loads.

NOTE: The Controller must be turned on in order for the Inchworm Translator shaft to be completely clamped.

B. Operation

Front panel switches control all Inchworm Translator functions and inputs are provided to remotely operate the Controller. The remote inputs are active low logic and are TTL compatible.

This section will discuss the manual controls, the remote inputs, the monitor outputs and the protective circuitry.

1) Manual Control

Two controls govern the speed. With the speed range switch in the FAST position the speed can be varied with the SPEED knob from the top speed of approximately .6mm/sec to approximately 6µm/sec. In the SLOW position the adjust is about 6µm/sec to .01µm/sec.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The toggle switch marked FWD and REV governs the direction of travel. Whenever the Inchworm Translator is running, the RUN indicator light will be on. Whenever either limit is reached, the Controller automatically shuts down, one of the limit indicator lights (FWD LIMIT or REV LIMIT) turns on, and the run LED extinguishes.

2) Remote Control

A front panel 25 pin "D" type connector is used for the remote input signals as well as monitor outputs (and digital position outputs on the PZ-550). The remote TTL compatible inputs can be used to command the Inchworm Translator to RUN, to move in forward (FWD) or reverse (REV) directions, and to go at a FAST or SLOW speed. The actual speeds are determined by the speed knob setting or by an external variable resistance (Max 1MΩ, Min 0Ω) tied from pin 3 to pin 2 (+5v). This input must be resistive in nature or damage to IWC or input source will occur.

Burleigh's PZ-501 and 550 are manufactured with 74C series CMOS logic devices powered by a +5VDC supply. Remote control inputs have high noise immunity with a logic 1 nominally being one half the supply voltage (ie 2.5v is ON). All remote inputs are active low with pull-up resistors internal to the controller. Ground, +12v, -12v and +5vDC are supplied on the "D" connector.

For remote operation the following conditions are required.
1) Front panel FWD/REV switch must be in REV position.
2) Front panel RUN switch must be in STOP position.
3) Front panel FAST/SLOW switch must be in FAST position.
Input control signals capable of sinking 300μamp of current will activate the internal logic. The controller can be remotely controlled by switches, relays, transistors, TTL or CMOS logic. See Section 9-C for pin assignments of the "D" connector.

3) Monitor outputs

Several signals are provided on the "D" connector to monitor the operation of the Inchworm System. These outputs can interface with a computer or can be used for troubleshooting. See Section 9-C for pin assignments. These signals are:

1) Clamp 1 voltage ÷ 100. This is an attennuated version of Clamp 1.
2) IWT running, no limits reached.
3) FWD and REV output. A "HI" (+5v) signifies a reverse direction and a "LO" (+0v) signifies a forward direction.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4) Protective Circuitry

The Inchworm Controllers (PZ-501,550) contain additional circuitry to protect both the Inchworm Translator and its own logic. The limit switches contained inside the Inchworm Translator are optically coupled to the control logic. The current drawn from the high voltage supply by the clamps is continually monitored and if it exceeds its preset value the current limit circuitry will be activated. The current limit circuit will instantaneously shut down all three HV PZT voltages which is indicated by both the forward and reverse limit LED's being on. To reset the current limit circuit the instrument should be turned off, and then back on after the cause of the problem has been determined.

5) Optical Measuring System

The PZ-555 Inchworm System includes an optical measuring system with an optical transducer head on the PZ-551 Inchworm Translator and a digital display with controls on the PZ-550 Inchworm Controller. The resolution and accuracy of the five digit display is 2µm. The display may be changed from metric to English units as follows. Add a jumper between points M and E which are located above pin 1 on U-24 and can be found on the PC board behind the front panel. The other jumper which has to be added is between points A and B which are located about 1" below U-24. Cut the jumper between B and C.

The user selects the zero point for the display by depressing the ZERO SET push button. This must be done each time the Inchworm Controller is turned on. It is recommended that the Inchworm Translator be set to 0 before shutting down so that the Controller can be reset to zero when it is turned back on. Alternately, the zero can be set at either limit or at any other point desired. Depressing the TO ZERO push button will cause the Inchworm Translator to run from any position to zero, regardless of the direction selected.

A five digit thumbwheel is used to select a set-point. Depressing the TO SET PT push button will cause the Inchworm Translator to run in the direction selected to the set-point. The set-point feature works for both polarities, so that one can run automatically between three points: -SET PT, ZERO and +SET PT. NOTE: the direction must be set so that the Inchworm Translator runs to the set point. When the preset position thumbwheels are used, the last digit must be even when the readout is in metric units. When the readout is set up for English units the last digit on the thumbwheel can be even or odd.

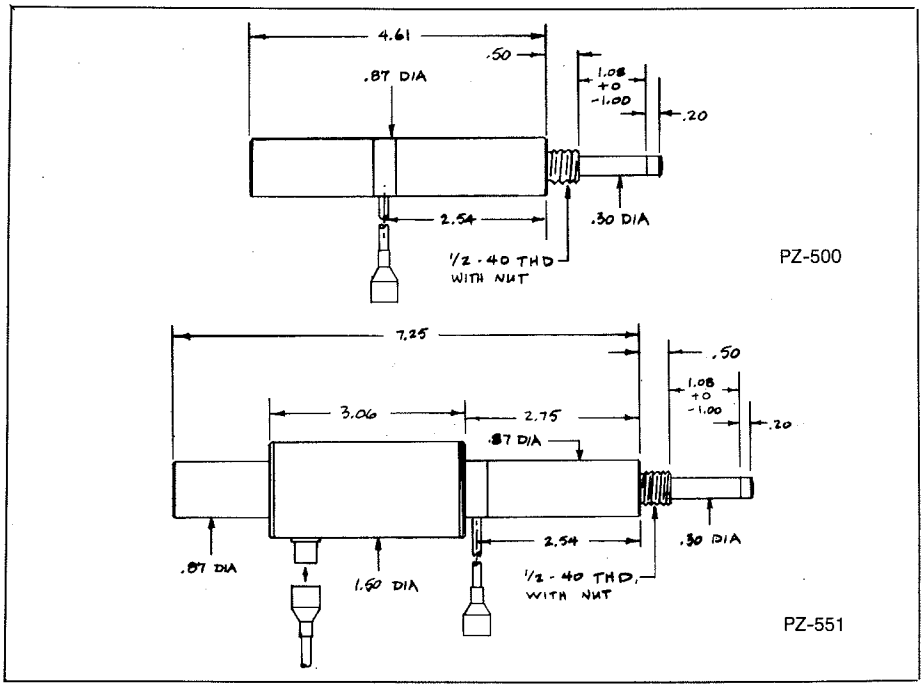
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The ZERO SET and TO ZERO functions are brought out to the "D" connector. (They are also active low signals). The "D" connector also contains the information present on the five digit display in the following format; The digit information is BCD encoded and scanned from Most Significant Digit (MSD) to the Least Significant Digit (LSD) (left to right). The digit lines (D_3-D_7) are high (logic 1) when the respective digit's BCD output is valid. The D_0 signal indicates the end of scan (all BCD bits are high, +5v), The scan clock is also outputed. All outputs from the "D" connector are buffered and will drive two standard TTL loads.

6) Warranty

Burleigh Inchworm Translators and Inchworm Controllers are warranted against defects in material and workmanship for a period of one year after date of delivery. At its option, Burleigh will repair or replace the instrument. The instrument must be returned prepaid to the factory. The warranty will not apply if the instruments have been damaged by accident, misuse, or as a result of modifications by persons other than Burleigh personnel.

7) Outline Dimensions



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

8) Specifications

A. PZ-501 and PZ-550 Inchworm Controllers

Clamp Voltage #1:	0 to approx. 600 volts
Clamp Voltage #2:	0 to approx. 600 volts
Center Voltage:	50v to 540v staircase with 225 steps
Running Rates:	Staircase takes individual steps at a rate variable from 1Hz to 415KHz; 225 6nm steps/stair.
Clearance Compensation:	Variable from 0v to +220v
Regulation:	0.1% for 10% line voltage change.
Output Current for Center and Clamp Voltages:	10ma, maximum
Line Voltage Requirements:	100v, 50/60Hz or 220v, 50/60Hz
Type:	All solid state, push-pull drive circuitry with CMOS low voltage logic. Fully TTL compatible.
Ripple on center voltage and Bias:	500mv P-P typical
Connector type:	
1) I/O connector	Amp, 206770-1 25 pin "D" Connector
2) To Inchworm Translator	Viking TKR07-102, 7 pin
3) Optical Readerhead	Winchester M7S, 7 pin

B. PZ-550 Inchworm Controller

Digital Display Option	5 digit LED display with minus indication, Resolution to 2 microns. Floating zero set-point.
Preset Feature	5 digit thumbwheel switch. Resolution to 2 microns. Preset activated by single push button, with return to zero push button which automatically returns Inchworm to preselected zero point.

C. PZ-500 and PZ-551 Inchworm Translators

Travel	25mm
Resolution	$\leq$20nm
Step Size	Approx. 6nm
Max. load	1.5Kgm
Speed:	
No load	.6mm/sec. to .01µm/sec
1Kgm load	.25mm/sec. to .01µm/sec
Operating range	-20°C to +70°C
Life Expectancy:	
Load $\leq$1Kgm	Indefinite
Load $\geq$1Kgm	$\geq$25,000 cycles before cleaning; can be cleaned at least 2 times.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Connector type:

PZ-500	Viking TKP07, 7 pin
PZ-551	Viking TKP07, 7 pin and Winchester M7PLSNH19C 7 pin

D. Optical Readerhead

Resolution	2µm
Accuracy	2µm
Reseatability	2µm

9) Wiring Codes

A. Output to Inchworm Translator - Viking Connector

Pin 1	Clamp PZT #1	0 to 600 volts
Pin 2	Clamp PZT #2	0 to 600 volts
Pin 3	Center PZT	0 to 540 volts
Pin 4	Rear Switch Contact	5 volts
Pin 5	Front Switch Contact	5 volts
Pin 6	Clearance Compensation Output	0v to +220 volts
Pin 7	Switch Common	Ground

B. Reader Head Output to Inchworm Controller

Reader Head	TO	Viking Pin	TO	Winchester Pin	TO	PC BD Header
Orange Wire		5		A		2
Orange Wire		6		B		1
Grey Wire		3		C		4
Black Wire		4		H		9 & 10
Red Wire		1		E		5 & 6
Yellow Wire		2		D		8

C. "D" Connector Pin Assignments

PIN NO.	INPUT (I) or OUTPUT (O)	PZ-501	PZ-550
1	O	GND	GND
2	O	+5v DC	+5v DC
3	I	R64 speed input (analog)	R64 Speed Input (analog)
4	O	Running, no limit	Running, no limit
5	O	Clamp 1 ÷ 100	Clamp 1 ÷ 100
6	I	Fast/Slow (Lo = slow)	Fast/Slow (Lo = slow)
7	O	FWD/REV (Hi = Rev)	FWD/REV (Hi = Rev)
8	I	-	"Zero" (Lo zeroes disp
9	I	-	"TO ZERO" (Lo forces IWT to return to zero reference)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

PIN NO.	INPUT (I) or OUTPUT (O)	PZ-501	PZ-550
10	I	Run (Lo = run)	Run (Lo = run)
11	I	FWD/REV (Lo = fwd)	FWD/REV (Lo = fwd)
12	O	-	BCD 4
13	O	-	BCD 2
14	O	+12VDC	+12VDC
15	O	-12VDC	-12VDC
16	O	-	D4 2nd digit
17	O	-	D5 3rd digit
18	O	-	D7 LSD 5th digit
19	O	-	+/- Sign (Hi = minus)
20	O	-	D3 MSD 1st digit
21	O	-	D6 4th digit
22	O	-	Digit scan clock
23	O	-	D_o (end of scan)
24	O	-	BCD 8
25	O	-	BCD 1

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP