Daedal 105002BTES

# Linear Positioner

$995.00

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# Daedal

## 100 000 SERIES

# OPERATING MANUAL

Parker Hannifin Corporation
Daedal Division
Harrison City, PA 15636

No. 100-1a

# Operating Manual

# Table of Contents



Daedal

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DESIGN: _____ Date_____

PRODUCT ENGINEER: _____ Date_____

ENGINEERING: _____ Date_____

ENGINEERING: _____ Date_____

APPROVED: _____ Date_____

APPROVED: _____ Date_____

| REVISIONS | | | | |
|---|---|---|---|---|
| ZONE | REV | DESCRIPTION | DATE | APPROVED |
| | | | | |

No. 100-1a

## PRODUCT DESCRIPTION AND FEATURES:

Daedal precision grade tables are designed for accurate motor driven linear positioning and motion control. They offer superior performance and satisfy precision grade specification, yet are priced comparably to commercial grade tables. The 100 000 tables have a low profile and accept Daedal half step, microstep and digital servo motors, or any industry standard size 23 flange mount motor.

Series 100 000 tables are available with either non-recirculating ball bearings or cross roller bearing systems. Both the ball bearing and cross roller systems are factory pre-loaded for system stiffness and virtually zero side play. Cross roller models offer higher load capacities and longer life. Dimensions of both systems are identical.

These versatile tables are available in 5.0" and 6.0" widths as single-axis, two-axis, or three-axis units -- with travels up to 12", and they are compatible with Daedal rotary tables for linear-rotary applications. In addition, by combining any of these tables with a Daedal motor controller, cost-effective motion control systems can easily be created, with capabilities ranging from simple start/stop linear motion to high level programmable contouring.

A large selection of leadscrew pitches is available as standard. This permits desirable resolution (in logical engineering units) to be produced, by any Daedal motor used to drive the table. The leadscrew assembly, comprised of a precision-ground steel leadscrew and a low-friction pre-loaded leadscrew nut, provides a precise positioning control, with virtually zero backlash. The housing is constructed of heat-treated aluminum, and is protected with a black anodize surface finish. Both top and bottom mounting surfaces are precision ground to assure flat mounting surfaces, and the mounting holes are fitted with locking steel threaded inserts to prevent mounting bolt from working loose. Standard grade tables are available, for price-sensitive application having less critical performance requirements.

- Positional repeatability to ±0.00005 inches (bi-directional)
- Straight line accuracy to 0.00008 in/in
- Selectable leadscrew pitches (Imperial or Metric)
- Pre-loaded linear ball bearings composed of hardened and ground steel bearing balls and ways or pre-loaded, hardened cross roller bearings for heavier load capacities and longer life
- Precision-ground top and bottom mounting surfaces (precision grade)
- Lightweight aluminum housing with attractive black anodize protective finish
- Mounting holes with locking steel threaded inserts

**PURPOSE**

This manual provides operational information on the 100 000 Series Linear Positioners. Please read the entire manual before operating your new positioner. The positioners performance and service life will be greatly enhanced by proper installation and maintenance. The following procedures will be helpful to you in achieving these objectives.

If at any time you have any questions about your new positioner please contact your authorized dealer or a Sales Applications Engineer (SAE) at the factory at 800-245-6903 or 412-744-4451.

**SATISFACTION:**

All standard products are covered by a 30-day customer satisfaction guarantee. If for any reason you are not satisfied with your purchased item, it may be returned for full credit, provided it has not been damaged or altered (see "Returns"). All systems are covered by our one-year warranty.

**OUT-OF-WARRANTY REPAIR:**

Out-of-warranty products are repaired by our service department. You will be notified of the cost, prior to making the repair.

**RETURNS:**

No product may be returned, in or out of warranty, without a "return authorization number". All returns must reference this number. Daedal assumes no responsibility for products returned without proper authorization. To obtain the return material authorization (RMA), call the Daedal Customer Service Department at 800-245-6903 or 412-744-4451.

When calling you will need the serial number of the positioner. To locate the serial number tag, you will need to position the carriage toward the motor and find the tag on the bottom plate farthest away from the motor. Next to that tag will be a laser testing tag if the unit is a precision grade table.

**UNPACKING:**

Carefully remove the positioner from the shipping crate and inspect the unit for any evidence of shipping damage. Report any damage *immediately* to your authorized dealer. Please save the shipping crate for damage inspection or future transportation of the components.

Incorrect handling of the positioner may adversely affect the performance of the unit in its application. Please observe the following guidelines for the handling and mounting of your new positioner.

- Do not allow the positioner to drop onto the mounting surface; set it into place gently. Impacts can result in flat spots on bearing surfaces or misalignment of drive components.
- Do not drill holes into the positioner or subject the units to impact loads such as hammering, riveting, etc. Daedal will drill holes if necessary, contact your local distributor or a Daedal SAE.
- Do not lift the positioner by the drive screw, manual adjustment knobs or motor drive assembly. The unit should be lifted by the base structure only.
- Do not submerge the positioner in liquids.
- Do not attempt to adjust factory set screws. Factory set adjustments are covered with sealing tape and *unauthorized adjustments may void the product warranty*.

**PRODUCT NUMBER CODE**

*EXAMPLE:* 1 06 04 1P - 10E

**Series Type**

**Table Width**
05 = 5" [1]
06 = 6"

**Travel**
02 = 2" [1,2]
04 = 4"
06 = 6"
08 = 8" [3]
10 = 10" [3]
12 = 12" [3]

**Grade**
1P = Precision Ball Bearing
1S = Standard Ball Bearing
1C = Precision Cross Roller

**Leadscrew (travel/rev)**
02E = 0.02" (50 pitch)
10E = 0.10" (10 pitch)
10AEU = 0.10" (10 pitch Acme for vertical axis motor up, for motor down orientation, order 10AED)
20E = 0.20" ( 5 pitch)
10M = 1.0 mm
20M = 2.0 mm
50M = 5.0 mm

1 Available in ball bearing style table only.
2 02 available in 5.0" table width only.
3 Available in 6.0" table width only.

**INSTALLATION:**

When purchased, the positioner comes with the carriage, bearing housings, and motor adapter fully assembled. Upon request, a motor can be mounted and aligned to your positioner.

Product specification, dimensions and mounting hole configurations for standard products may be obtained by referring to the SPECIFICATION section of this manual, or by contacting your authorized dealer.

*Mounting the Positioner to a Mounting Surface*

A machined plate such as a laboratory optical table or a granite slab will provide the best mounting surface for your new positioner. We recommend the mounting flatness to be 0.0005 inch/foot or better.

The mounting surface (*not* the positioner base pads) may be scraped or shimmed to achieve the required flatness. With a satisfactory mounting surface, the mounting screws (1/4"-20 socket head cap screws or M6 for metric tables) are inserted through four or eight (depending on your model table) available mounting holes in the base of the positioner and tightened to secure the unit.

*Mounting a Motor to the Positioner*

The positioner allows for direct mounting of a NEMA 23 motor. For a NEMA 23 motor, use four bolts to connect the motor to the adapter. After the motor is securely mounted, tighten the shaft coupler to the motor shaft.

*Mounting a Gearhead to the Positioner*

If you have a NEMA 23 gearhead, then it will attach directly to the face of the motor. If not, you will need an adapter, consult your gearhead manufacturer or a Daedal SAE. Follow the instructions of the gearhead manufacturer for mounting their gearhead to your motor. The gearhead can be mounted if it is a NEMA 23 gearhead, to the motor block on the positioner as directed above for mounting a motor. Certain gearhead manufacturers require a spacer, for long shafts, and a different size coupler to accommodate their shaft size. An adapter may be necessary to fit the gearhead to the positioner, consult the gearhead manufacturer or a Daedal SAE with any questions on this subject.

**INSTALLATION (continued):**

*Mounting the Payload to the Positioner*

Before mounting the payload to the positioner, be sure the drive electronics are working and verify that all speeds and positions are attainable. Take notice of the results and record any information that may be helpful to you.

We recommend the mounting flatness to be 0.0005 inch/foot or better. When fixturing the payload to the mechanical positioner, use the mounting screws whose length does not bottom out or hit any components beneath. Longer screws may project into the interior of the mechanism of the positioner causing damage to the unit.

The standard positioner carriage has four, eight, or twelve threaded mounting holes (1/4"-20 or M6) for attaching your payload. All holes have locking threaded inserts. These inserts can be identified by one or more of the coils having a series of straight segments or "chords" (they are also dyed red for identification). When the bolt enters the "grip" coil, these chordal segments flex outward, creating pressure on the bolt. Therefore when tightening the bolt you must overcome the locking element. While doing this it may feel as though you are stripping the bolt. You are not. When tightening the bolt you will have to tighten past the locking element to achieve the tightening torque for your assembly. Consult factory with any questions.

**MAINTENANCE**

To insure long service and performance to specification, it is essential to keep the positioner bearings and drive elements properly lubricated and free of contamination. The nature of the application in consideration of variables such as environment, duty cycle, speed, etc. will determine the inspection, cleaning, and re-lubrication interval.

Lubrication and maintenance information for non-standard products and vacuum prepared systems may be obtained from your local distributor or consult the factory.

*Cross Roller Bearings, Radial Bearings, and Leadscrew Lubrication*

See *pages 7-10* for the Lubrication Sheets.

# PARKER HANNIFIN CORPORATION

## *DAEDAL DIVISION*

## BEARING LUBRICATION SHEET

**SECTION I**

| SUPPLIER'S NAME | TELEPHONE NO. |
|---|---|
| PARKER HANNIFIN CORPORATION, DAEDAL DIVISION | 1-800-245-6903 or 412-744-4451 |

| ADDRESS *(Number, Street, City, and ZIP Code)* | FAX NO. |
|---|---|
| P.O. BOX 500, SANDY HILL ROAD, HARRISON CITY, PA 15636 | 412-744-7626 |

BEARING TYPE

CROSS ROLLER BEARINGS

OIL TYPE

DAEDAL OIL TYPE #1, MODEL NUMBER A1. LIGHT MACHINE OIL CONTAINING ADDITIVES TO ENHANCE OXIDATION RESISTANCE WITH A VISCOSITY EQUIVALENT TO SAE 10.

OIL APPEARANCE

LIGHT YELLOW, FLUID.

**SECTION II**

BEARING MAINTENANCE

CROSS ROLLER WAYS AND BEARING CAGES ARE LUBRICATED AT THE DAEDAL FACILITY PRIOR TO SHIPMENT. TO INSURE LONG SERVICE AND PERFORMANCE TO SPECIFICATION, IT IS ESSENTIAL TO KEEP THE POSITIONER BEARINGS AND WAYS ADEQUATELY LUBRICATED AND FREE OF CONTAMINATION.

THE NATURE OF THE APPLICATION IN CONSIDERATION OF VARIABLES SUCH AS ENVIRONMENT, DUTY CYCLES, SPEED, ETC., WILL DETERMINE THE INSPECTION CLEANING AND RE-LUBRICATION INTERVAL. IN GENERAL IT IS DESIRABLE TO CLEAN AND LUBRICATE THE WAYS APPROXIMATELY EVERY FIVE HUNDRED (500) HOURS OF OPERATION.

**SECTION III**

LUBE APPLICATION

COMMAND THE POSITIONER TO TRAVEL TO THE EXTREME ENDS OF TRAVEL TO ACCESS THE WAYS FROM BOTH ENDS. WIPE THE WAYS DOWN THEIR ENTIRE LENGTH WITH A CLEAN CLOTH. APPLY LUBRICATION ON THE WAYS ALLOWING FRESH OIL TO PASS THROUGH THE BEARING RETAINERS AND ONTO THE BEARINGS.

**SECTION IV**

NOTES

# PARKER HANNIFIN CORPORATION

***DAEDAL DIVISION***

## BEARING LUBRICATION SHEET

**SECTION I**

| SUPPLIER'S NAME | TELEPHONE NO. |
|---|---|
| PARKER HANNIFIN CORPORATION, DAEDAL DIVISION | 1-800-245-6903 or 412-744-4451 |

| ADDRESS *(Number, Street, City, and ZIP Code)* | FAX NO. |
|---|---|
| P.O. BOX 500, SANDY HILL ROAD, HARRISON CITY, PA 15636 | 412-744-7626 |

BEARING TYPE

RADIAL BEARING (BALL AND LEAD SCREW END BEARINGS -- DUPLEX BEARINGS)

OIL TYPE

DAEDAL GREASE TYPE #2, MODEL NUMBER G2. MOBILITH AW2, LITHIUM 12 HYDROXY.

OIL APPEARANCE

DARK BROWN AND VERY TACKY

**SECTION II**

BEARING MAINTENANCE

ALL RADIAL BEARINGS ARE PACKED AT THE FACTORY
FOR THE LIFE OF THE BEARING.

**SECTION III**

LUBE APPLICATION

**SECTION IV**

NOTES

# PARKER HANNIFIN CORPORATION

## *DAEDAL DIVISION*

## LEAD SCREW LUBRICATION SHEET

**SECTION I**

| SUPPLIER'S NAME | TELEPHONE NO. |
|---|---|
| PARKER HANNIFIN CORPORATION, DAEDAL DIVISION | 1-800-245-6903 or 412-744-4451 |

| ADDRESS *(Number, Street, City, and ZIP Code)* | FAX NO. |
|---|---|
| P.O. BOX 500, SANDY HILL ROAD, HARRISON CITY, PA 15636 | 412-744-7626 |

BALL SCREW TYPE

LEAD SCREW WITH A PHOSPHORUS BRONZE NUT

OIL TYPE

DAEDAL OIL TYPE #3, MODEL NUMBER A3. LIGHT MACHINE OIL.

OIL APPEARANCE

CLEAR FLUID

**SECTION II**

SCREW MAINTENANCE

NUT PACKAGES ARE LUBRICATED AT OUR FACILITY PRIOR TO SHIPMENT. FOR LUBRICATION INSPECTION AND SUPPLY INTERVALS FOLLOWING SHIPMENT, APPLY OIL 1000 HOURS AFTER INITIAL START-UP OPERATIONS. INSPECT FOR CONTAMINATION, CHIPS, ETC. AND REPLENISH ACCORDING TO INSPECTION RESULTS.

THE NATURE OF THE APPLICATION IN CONSIDERATION OF VARIABLES SUCH AS ENVIRONMENT, DUTY CYCLE, SPEED, ETC. WILL DETERMINE THE INSPECTION AND RE-LUBRICATION INTERVAL. IN GENERAL, IT IS DESIRABLE TO LUBRICATE THE LEAD SCREW APPROXIMATELY EVERY 1000 HOURS OF OPERATION.

**SECTION III**

LUBE APPLICATION

DRIVE THE CARRIAGE TOP AWAY FROM THE MOTOR END TO GET A FULL VIEW OF THE SCREW. WIPE THE SCREW DOWN THE ENTIRE LENGTH WITH A CLEAN CLOTH. APPLY LUBRICATION ON THE SCREW ALLOWING A FILM OF FRESH OIL TO PASS OVER THE ENTIRE LENGTH OF THE LEAD SCREW.

**SECTION IV**

NOTES

# PARKER HANNIFIN CORPORATION

***DAEDAL DIVISION***

## LEAD SCREW LUBRICATION SHEET

**SECTION I**

| SUPPLIER'S NAME | TELEPHONE NO. |
|---|---|
| PARKER HANNIFIN CORPORATION, DAEDAL DIVISION | 1-800-245-6903 or 412-744-4451 |

| ADDRESS *(Number, Street, City, and ZIP Code)* | FAX NO. |
|---|---|
| P.O. BOX 500, SANDY HILL ROAD, HARRISON CITY, PA 15636 | 412-744-7626 |

BALL SCREW TYPE

LEAD SCREW WITH A PLASTIC NUT

OIL TYPE

DAEDAL OIL TYPE #2, MODEL NUMBER A2. LIGHT MACHINE OIL WITH TEFLON.

OIL APPEARANCE

LIGHT YELLOW, FLUID, WITH WHITE RESIDUE AT BOTTOM.

**SECTION II**

SCREW MAINTENANCE

NUT PACKAGES ARE LUBRICATED AT OUR FACILITY PRIOR TO SHIPMENT. FOR LUBRICATION INSPECTION AND SUPPLY INTERVALS FOLLOWING SHIPMENT, APPLY OIL 1000 HOURS AFTER INITIAL START-UP OPERATIONS. INSPECT FOR CONTAMINATION, CHIPS, ETC. AND REPLENISH ACCORDING TO INSPECTION RESULTS.

THE NATURE OF THE APPLICATION IN CONSIDERATION OF VARIABLES SUCH AS ENVIRONMENT, DUTY CYCLE, SPEED, ETC. WILL DETERMINE THE INSPECTION AND RE-LUBRICATION INTERVAL. IN GENERAL, IT IS DESIRABLE TO LUBRICATE THE LEAD SCREW APPROXIMATELY EVERY 1000 HOURS OF OPERATION.

**SECTION III**

LUBE APPLICATION

DRIVE THE CARRIAGE TOP AWAY FROM THE MOTOR END TO GET A FULL VIEW OF THE SCREW. WIPE THE SCREW DOWN THE ENTIRE LENGTH WITH A CLEAN CLOTH. APPLY LUBRICATION ON THE SCREW ALLOWING A FILM OF FRESH OIL TO PASS OVER THE ENTIRE LENGTH OF THE LEAD SCREW.

**SECTION IV**

NOTES

TUBE MUST BE SHAKEN BEFORE APPLICATION.

**STANDARD OPTIONS -- LH (Magnetic Limit and Home Switches)**

- ***Mounting and Adjustment:***

  * Remove three (3) each flat head screws, one (1) on top, two (2) on opposite side cover. Then the cover will slide off of the bracket. (NOTE: slide away from connector).

  * Counter bored holes in bracket. These holes are to be used to mount to pre-drilled and tapped holes in slide top. (NOTE: Hole may be covered by switch).

  * Each switch has two (2) 4-40 button head screws. Loosen both. *Do not remove*. Slide switch into position. Tighten screws.

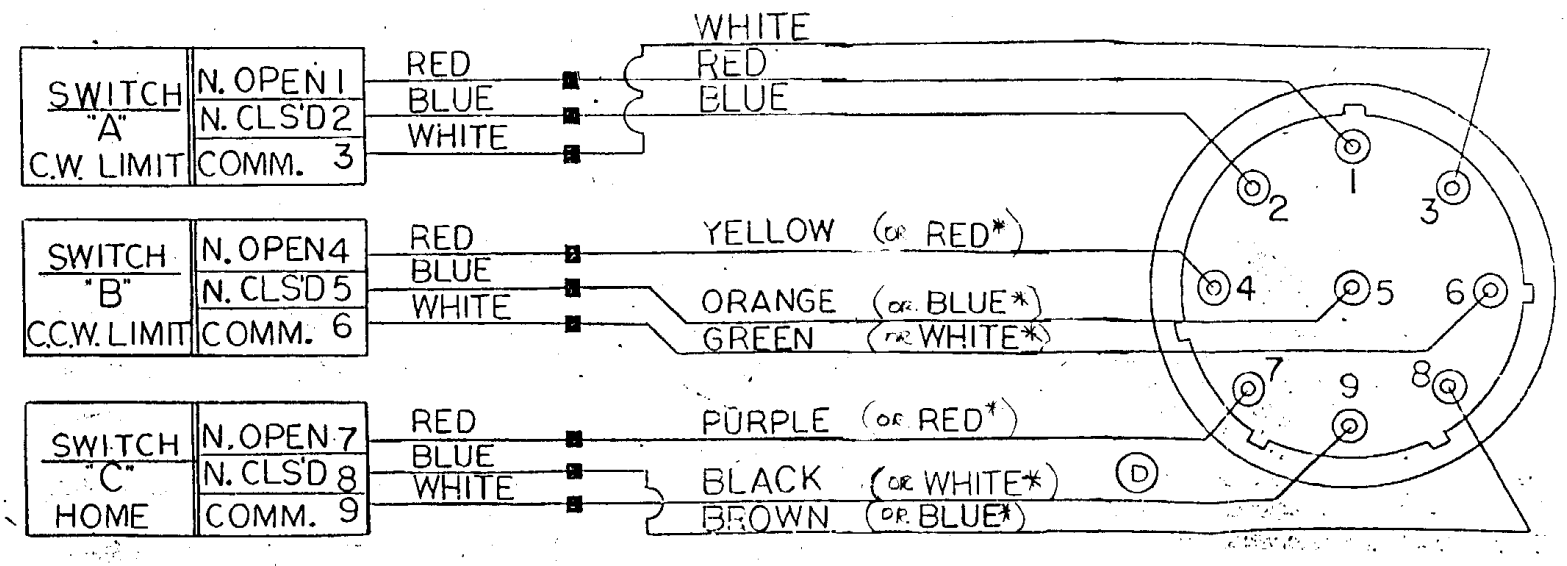
  * The magnet height may require adjustment for the proper switch operation. This can be accomplished by the adjusting slots located on the magnet.

- ***Switch Specifications:***

  * Electrical: Form C, 0.25 A @ 120 VAC; 0.25 A @ 28 VDC
  * Repeatability: 0.002 in
  * Connector: 9 pin, AMP circular plastic; Mating connector AMP #206485-1; Contact sockets AMP #66504-8; Strain Relief AMP #206062-1
  * Mating cable: with pigtailed end (one per LH assembly), PN 006-1102-10

| Pin Number | Function | Typical Wire Color |
|---|---|---|
| 1 | CW Limit, normally open | Red |
| 2 | CW Limit, normally closed | Blue |
| 3 | CW Limit, common | White |
| 4 | CCW Limit, normally open | Yellow |
| 5 | CCW Limit, normally closed | Orange |
| 6 | CCW Limit, common | Green |
| 7 | Home, normally open | Purple |
| 8 | Home, normally closed | Brown |
| 9 | Home, common | Black |

| REVISIONS | | | | |
|---|---|---|---|---|
| ZONE | REV | DESCRIPTION | DATE | APPROVED |
| | | | | |




## WIRING DIAGRAM

* ON SHORT TRAVEL TABLES WIRES ARE NOT SPLICED.

| GR-4 | GR-3 | GR-2 | GR-1 | PART OR IDENTIFYING NO. | DESCRIPTION | SPEC. | MATERIAL OR NOTE | ITEM NO. |
|---|---|---|---|---|---|---|---|---|
| QUANTITY | | | | LIST OF MATERIAL | | | | |

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES
TOLERANCES ON

| FRACTIONS | DECIMALS | ANGLES |
|---|---|---|
| 0 TO 4 ±1/32 | XX ±.01 | ±0°30' |
| 4 TO 8 ±1/16 | XXX ±.005 | |
| 8 AND UP ±1/8 | RMS FINISH | 63 |

REMOVE BURRS, BREAK SHARP EDGES

MATERIAL

FINISH



| | | |
|---|---|---|
| DRAWN | [illegible] | 1-23-97 |
| CHECKED | | |
| DESIGN | | |
| ENGRG | | |
| APPD | | |
| APPD | | |

DAEDAL Parker

INNERCONNECTION DIAGRAM
MAGNETIC LIMIT & HOME SWITCHES

| | | |
|---|---|---|
| | A | 003-1018 |

SCALE FULL | REPRO ~ | SHT 1 OF 1 | REV ~

| REVISIONS | | | | |
|---|---|---|---|---|
| ZONE | REV | DESCRIPTION | DATE | APPROVED |
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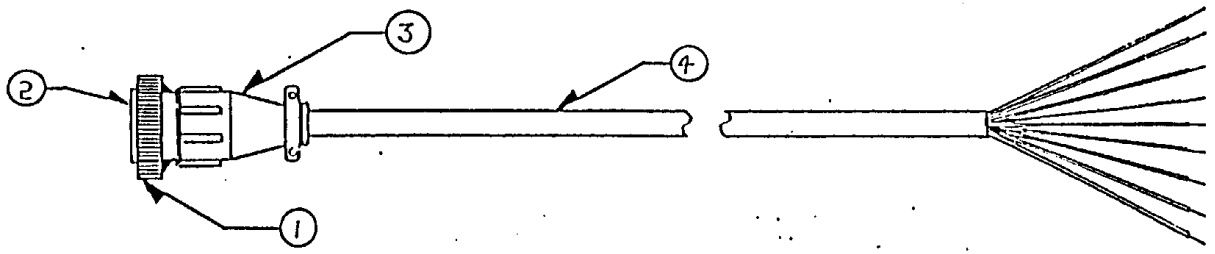


**NOTE:**

1). NUMBER THAT FOLLOWS THE PART NUMBER INDICATES CABLE LENGTH IN FEET. EX: 006-1102-15 IS A 15 FT. CABLE.

2). MAXIMUM CABLE LENGTH IS 50 FT.

3). SHIELD WIRE IS TO BE CONNECTED TO CHASSIS GROUND.

**WARNING: DO NOT CONNECT SHIELD WIRE TO LOGIC GROUND.**

| COLOR CODE FOR ITEM #1 | | |
|---|---|---|
| PIN # | DESCRIPTION | WIRE COLOR |
| 1 | LIMIT + (N.O.) | RED |
| 2 | LIMIT + (N.C.) | BLUE |
| 3 | LIMIT + (COM.) | WHITE |
| 4 | LIMIT - (N.O.) | YELLOW |
| 5 | LIMIT - (N.C.) | ORANGE |
| 6 | LIMIT - (COM.) | GREEN |
| 7 | HOME (N.O.) | PURPLE |
| 8 | HOME (N.C.) | BROWN |
| 9 | HOME (COM.) | BLACK |

| COLOR CODE FOR PIGTAIL | | |
|---|---|---|
| PIN # | DESCRIPTION | WIRE COLOR |
| --- | LIMIT + (N.O.) | RED |
| --- | LIMIT + (N.C.) | BLUE |
| --- | LIMIT + (COM.) | WHITE |
| --- | LIMIT - (N.O.) | YELLOW |
| --- | LIMIT - (N.C.) | ORANGE |
| --- | LIMIT - (COM.) | GREEN |
| --- | HOME (N.O.) | PURPLE |
| --- | HOME (N.C.) | BROWN |
| --- | HOME (COM.) | BLACK |
| --- | SHIELD | BARE |

| GR-4 | GR-3 | GR-2 | GR-1 | PART OR IDENTIFYING NO. | DESCRIPTION | SPEC. | MATERIAL OR NOTE | ITEM NO. |
|---|---|---|---|---|---|---|---|---|
| QUANTITY | | | | LIST OF MATERIAL | | | | |

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES
TOLERANCES ON

| FRACTIONS | DECIMALS | ANGLES |
|---|---|---|
| 0 TO 4 ±1/32 | .XX ±.01 | ±0°30' |
| 4 TO 8 ±1/16 | .XXX ±.005 | |
| 8 AND UP ±1/8 | RMS FINISH | 63 |

REMOVE BURRS, BREAK SHARP EDGES

MATERIAL

FINISH



| | | |
|---|---|---|
| DRAWN | Momrich | 7/23/87 |
| CHECKED | | |
| DESIGN | | |
| ENGRG | | |
| APPD | | |
| APPD | | |

DAEDAL Parker

MAGNETIC LIMIT/HOME SWITCH
CABLE PIGTAIL ENDED

| | | |
|---|---|---|
| | A | 006-1102-XX |

SCALE FULL | REPRO ~ | SHT 1 OF 1 | REV ~

## STANDARD OPTIONS -- LHO (Optical Limit and Home Switches)

- ***Mounting and Adjustment:***

  * See the following page for a diagram of the assembly.

- ***Switch Specifications:***

  * Input: 5 VDC, 120 mA
  * Output: 5 V, 20 mA (each), TTL outputs
  * Repeatability: 0.0002 in
  * Connector: 9 pin, AMP circular plastic; Mating connector AMP #206485-1; Contact sockets AMP #66504-8; Strain Relief AMP #206062-1
  * Mating Cable: with pigtailed end (one per LHO assembly), P/N006-1288-10

| Pin Number | Function | Typical Wire Color |
|---|---|---|
| 1 | 5 VDC, 0.120 amp input | Red |
| 2 | Ground | Black |
| 3 | Home, normally high | Green |
| 4 | Home, normally low | Brown |
| 5 | Keying Plug | N/A |
| 6 | CW Limit, normally high | White |
| 7 | CW Limit, normally low | Blue |
| 8 | CCW Limit, normally high | Yellow |
| 9 | CCW Limit, normally low | Orange |

| REVISIONS | | | | |
|---|---|---|---|---|
| ZONE | REV | DESCRIPTION | DATE | APPROVED |
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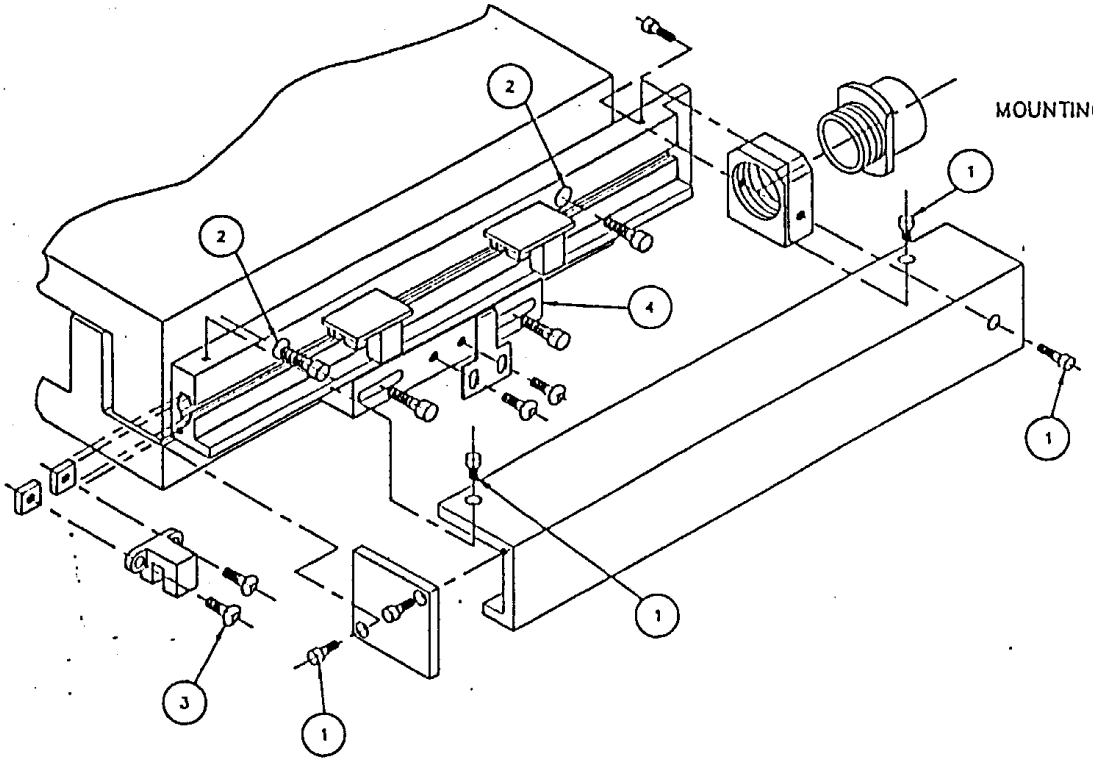


MOUNTING & ADJUSTING OPTICAL LIMIT & HOME SWITCHES

1. REMOVE 4 SOCKET HEAD SCREWS: 2 ON TOP, 1 ON END, 1 ON SIDE
2. C'BORED HOLES IN BRACKET. THESE HOLES TO BE USED TO MOUNT TO PRE-DRILLED & TAPPED HOLES IN SLIDE TOP. (HOLES MAY BE COVERED BY SWITCHES)
3. EACH SWITCH HAS (2) #4-40 BUTTON HEAD SCREWS. LOOSEN BOTH; DO NOT REMOVE. SLIDE SWITCH INTO POSITION. TIGHTEN SCREWS.
4. VANE BRACKET MOUNTS TO PRE-DRILLED & TAPPED HOLES IN BASE OF SLIDE. THIS BRACKET MAY HAVE TO BE ADJUSTED TO GET LIMIT SWITCHES TO ACTIVATE AT EXTREME ENDS OF TRAVEL.

| GR-4 | GR-3 | GR-2 | GR-1 | PART OR IDENTIFYING NO. | DESCRIPTION . | SPEC. | MATERIAL OR NOTE | ITEM NO. |
|---|---|---|---|---|---|---|---|---|
| QUANTITY | | | | LIST OF MATERIAL | | | | |

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES
TOLERANCES ON

| FRACTIONS | DECIMALS | ANGLES |
|---|---|---|
| 0 TO 4 ±1/32 | XX ±.01 | ±0°30' |
| 4 TO 8 ±1/16 | XXX ±.005 | 63 |
| 8 AND UP ±1/8 | RMS FINISH | |



| | | | |
|---|---|---|---|
| | DRAWN | MCM | 7/24/91 |
| REMOVE BURRS, BREAK SHARP EDGES | CHECKED | MCM | 7/24/91 |
| MATERIAL | DESIGN | | |
| | ENGRG | | |
| FINISH | APPD | | |
| | APPD | | |

DAEDAL Parker

OPTICAL LIMIT/HOME SWITCH ADJUSTMENT ASSEMBLY

| | | | | |
|---|---|---|---|---|
| | A | 006-1356 | | |
| SCALE | REPRO ~ | SHT 1 OF 1 | REV ~ | |

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| REVISIONS | | | | |
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| ZONE | REV | DESCRIPTION | DATE | APPROVED |
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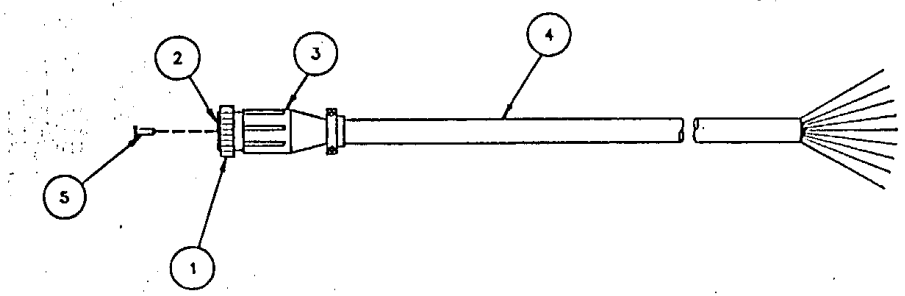



**NOTE:**

1). NUMBER THAT FOLLOWS THE PART NUMBER INDICATES CABLE LENGTH IN FEET. EX: 006-1288-15 IS A 15 FT. CABLE.

2). MAXIMUM CABLE LENGTH IS 50 FT.

3). SHIELD WIRE IS TO BE CONNECTED TO CHASSIS GROUND.

**WARNING: DO NOT CONNECT SHIELD WIRE TO LOGIC GROUND.**

| COLOR CODE FOR ITEM #1 | | |
|---|---|---|
| PIN # | | WIRE COLOR |
| 1 | +5 VDC | RED |
| 2 | GROUND | BLACK |
| 3 | HOME (N.O.) | GREEN |
| 4 | HOME (N.C.) | BROWN |
| 5 | KEYING PLUG | |
| 6 | CW LIMIT (N.O.) | WHITE |
| 7 | CW LIMIT (N.C.) | BLUE |
| 8 | CCW LIMIT (N.O.) | YELLOW |
| 9 | CCW LIMIT (N.C.) | ORANGE |

| COLOR CODE FOR PIGTAIL | | |
|---|---|---|
| PIN # | | WIRE COLOR |
| --- | +5 VDC * | RED |
| --- | DC GROUND | BLACK |
| --- | HOME (N.O.) | GREEN |
| --- | HOME (N.C.) | BROWN |
| --- | CW LIMIT (N.O.) | WHITE |
| --- | CW LIMIT (N.C.) | BLUE |
| --- | CCW LIMIT (N.O.) | YELLOW |
| --- | CCW LIMIT (N.C.) | ORANGE |
| --- | SHIELD | BARE |

* +5 VDC POWER SUPPLY
200mA MINIMUM

| GR-4 | GR-3 | GR-2 | GR-1 | PART OR IDENTIFYING NO. | DESCRIPTION | SPEC. | MATERIAL OR NOTE | ITEM NO. |
|---|---|---|---|---|---|---|---|---|
| QUANTITY | | | | LIST OF MATERIAL | | | | |

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES
TOLERANCES ON

| FRACTIONS | DECIMALS | ANGLES |
|---|---|---|
| 0 TO 4 ±1/32 | XX ±.01 | ±0°30' |
| 4 TO 8 ±1/16 | XXX ±.005 | |
| 8 AND UP ±1/8 | RMS FINISH | 63 |

REMOVE BURRS, BREAK SHARP EDGES

MATERIAL

FINISH



| | | |
|---|---|---|
| DRAWN | MCM | 5/7/91 |
| CHECKED | MCM | 5/7/91 |
| DESIGN | | |
| ENGRG | | |
| APPD | | |
| APPD | | |

DAEDAL Parker

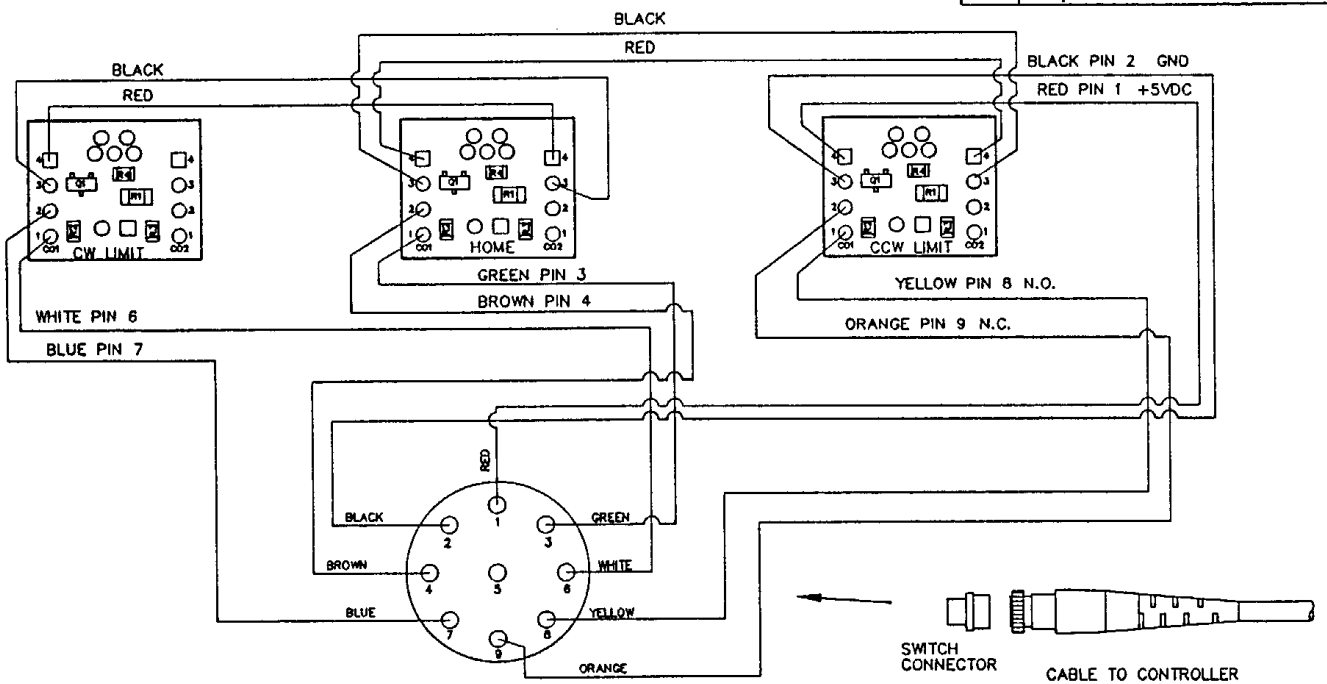
OPTICAL LIMIT/HOME SWITCH
CABLE PIGTAIL ENDED

A | 006-1288-XX

SCALE FULL | REPRO ~ | SHT 1 OF 1 | REV ~

17

| REVISIONS | | | | |
|---|---|---|---|---|
| ZONE | REV | DESCRIPTION | DATE | APPROVED |
| | A | REWIRED FOR COMPACTNESS | 10/8/91 | MCM |




ALL WIRE 28 AWG

| GR-4 | GR-3 | GR-2 | GR-1 | PART OR IDENTIFYING NO | DESCRIPTION | SPEC. | MATERIAL OR NOTE | ITEM NO |
|---|---|---|---|---|---|---|---|---|
| QUANTITY | | | | LIST OF MATERIAL | | | | |

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS 0 TO 4 ± 1/32; 4 TO 8 ± 1/16; 8 AND UP ± 1/8
DECIMALS XX ± .01; XXX ± .005; 63 RMS FINISH
ANGLES ± 0° 30'

CHAMFERS .45° X .02 RADII .02 "

REMOVE BURRS BREAK SHARP EDGES

MATERIAL

FINISH



| | | |
|---|---|---|
| DRAWN | MCM | 5/23/91 |
| CHECKED | MCM | 10/16/91 |
| DESIGN | | |
| ENGRG | | |
| APPD | | |
| APPD | | |

DAEDAL Parker

INNERCONNECTION DIAGRAM
OPTICAL LIMIT & HOME SWITCHES

| CODE IDEN NO | SIZE | DWG NO. | REV |
|---|---|---|---|
| | B | 006-1357 | |

SCALE NONE | REPRO | SHT / OF / | REV A

**STANDARD OPTIONS -- Linear Encoders**

- ***ELE Specifications:***

  * Max Resolution with quadrature: 0.0001 in
  * Non cumulative Accuracy: 0.0004 in
  * Maximum Speed: 15 in/sec
  * Input: 5 VDC @ 220 mA
  * Output: Differential, TTL compatible, RS422 line drive, 40 mA sink and -40 mA source.

- ***ELM Specifications:***

  * Max Resolution with quadrature: 0.001 mm
  * Non cumulative Accuracy: 0.010 mm
  * Maximum Speed: 380 mm/sec
  * Input: 5 VDC @ 220 mA
  * Output: Differential, TTL compatible, RS422 line drive, 40 mA sink and -40 mA source.

- ***Encoders:***

  * Motor mounted rotary encoders are also available.

- ***Metric Tables:***

  * 100 000 Series Tables are available with metric drive mechanism and holes/spacing.

## SPECIFICATIONS and DIMENSIONS

| Model Series | Bearing Type | Width (inches) | Travel (inches) | Load Capacity (lbs) | | Inertia * (in-oz-sec^2) | Weight (pounds) |
|---|---|---|---|---|---|---|---|
| | | | | Horiz. | Vert. | | |
| 105021* | Ball Bearing | 5.0 | 2.0 | 60 | 30 | 0.000590 | 4.0 |
| 106041 | Ball Bearing | 6.0 | 4.0 | 100 | 70 | 0.000682 | 7.2 |
| 106061 | Ball Bearing | 6.0 | 6.0 | 110 | 80 | 0.000994 | 10.2 |
| 106081 | Ball Bearing | 6.0 | 8.0 | 120 | 90 | 0.001310 | 13.2 |
| 106101 | Ball Bearing | 6.0 | 10.0 | 130 | 100 | 0.001620 | 16.0 |
| 106121 | Ball Bearing | 6.0 | 12.0 | 140 | 105 | 0.001930 | 19.1 |
| 106041C | Cross Roller | 6.0 | 4.0 | 200 | 100 | 0.000670 | 7.6 |
| 106061C | Cross Roller | 6.0 | 6.0 | 220 | 110 | 0.000970 | 10.5 |
| 106081C | Cross Roller | 6.0 | 8.0 | 240 | 120 | 0.001280 | 13.6 |
| 106101C | Cross Roller | 6.0 | 10.0 | 260 | 130 | 0.001580 | 16.7 |
| 106121C | Cross Roller | 6.0 | 12.0 | 280 | 140 | 0.001890 | 19.8 |

* For 105021P, the overall accuracy is 0.00032

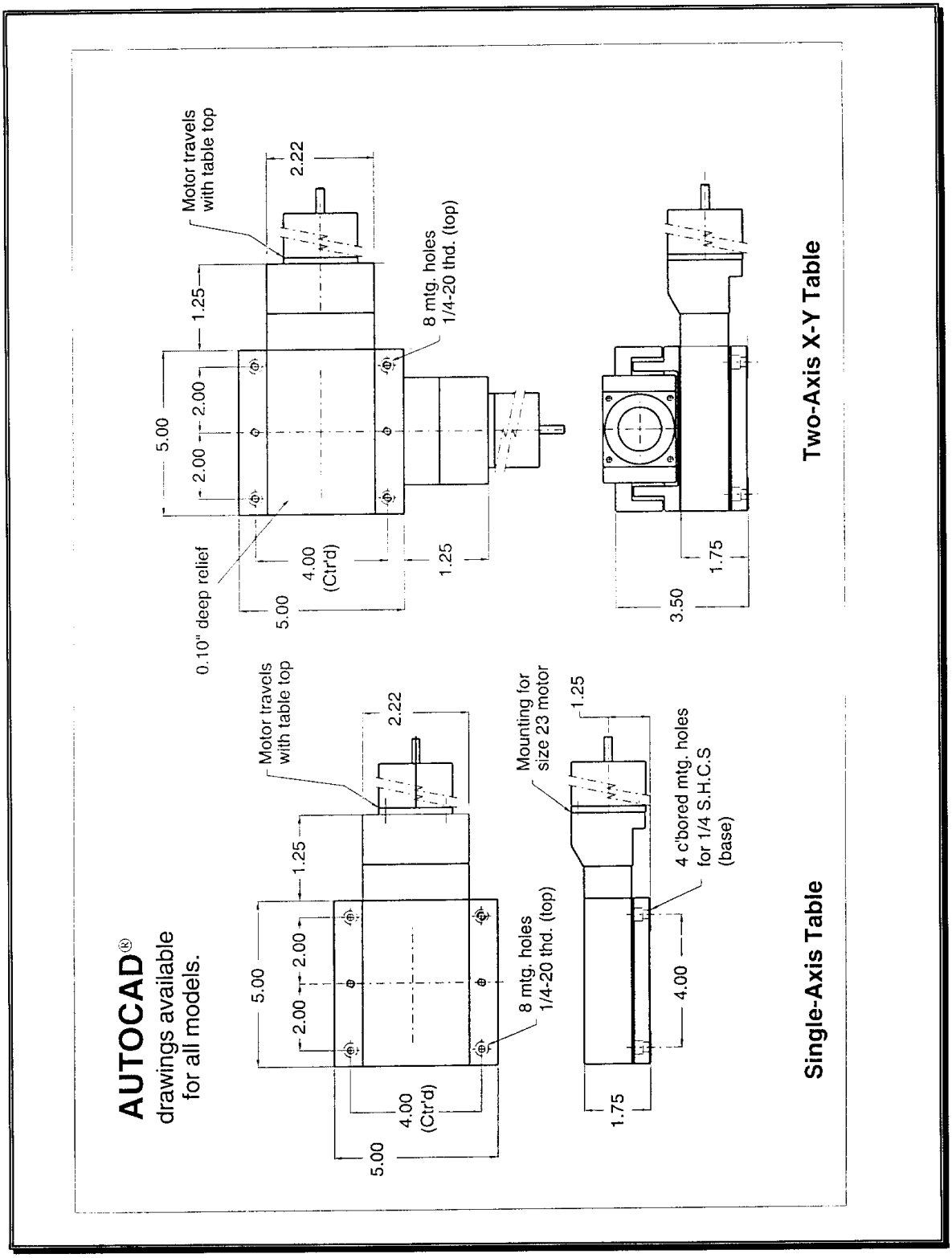
** Inertia calculation based on 5 pitch screw

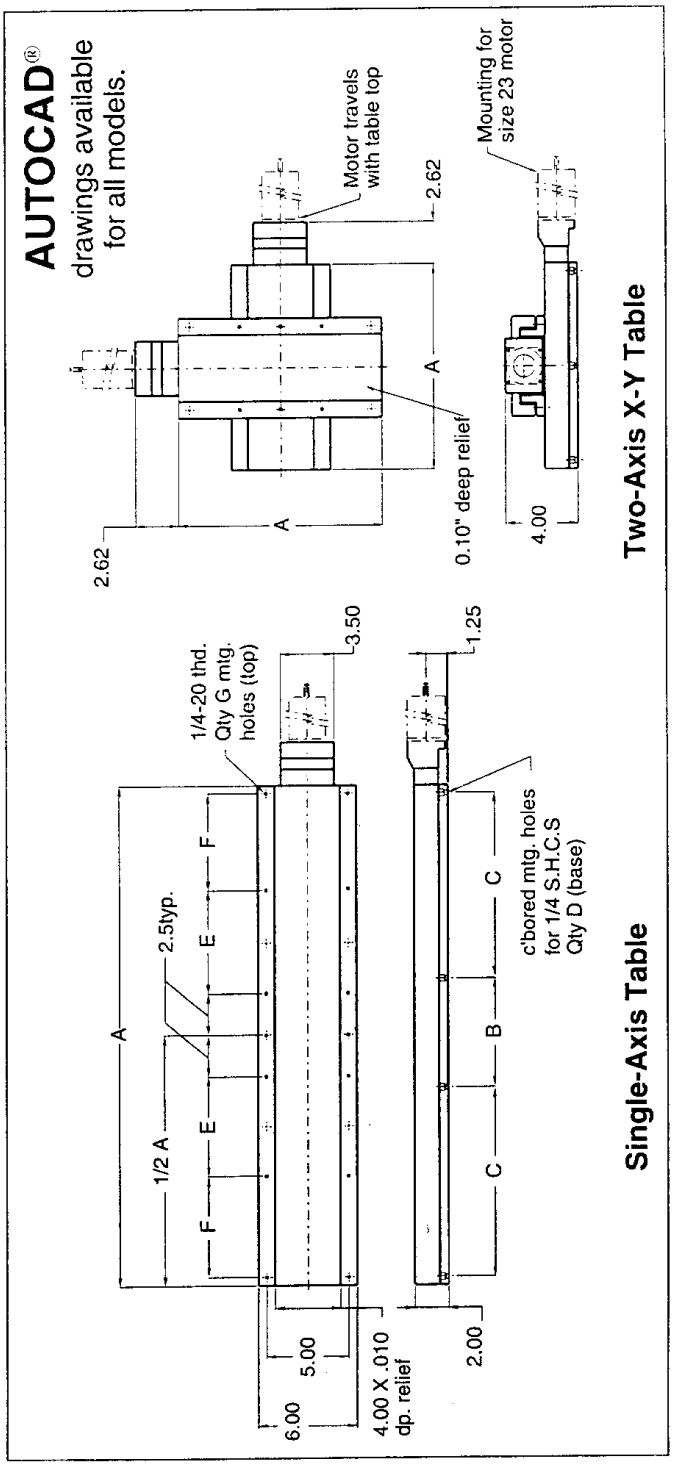
| | | |
|---|---|---|
| Friction Torque: | 8 to 15 oz-in | |
| Accuracy[1]: | | |
| Positional | Standard: 0.0002 in/in | Precision: 0.00008 in/in (0.0006 in/ft maximum) |
| Straight Line | Standard: 0.0002 in/in | Precision: 0.00008 in/in |
| Repeatability: (bi-directional) | Standard: ±0.001 in | Precision: ±0.00005 in |
| Material: | aluminum/steel | |
| Finish | black anodize | |

1 Note: The inch/inch specification is defined as the mean travel deviation determined by the least squares method.

### 106 000 Series Tables (see illustrations on the following pages)

| Travel (in) | Length A (in) | Base Mounting Holes | | | Top Mounting Holes | | |
|---|---|---|---|---|---|---|---|
| | | B (in) | C (in) | Qty D | E (in) | F (in) | Qty G |
| 4 | 6 | 5 | ---- | 4 | ---- | ---- | 6 |
| 6 | 9 | 5 | 1.5 | 8 | 1.5 | ---- | 8 |
| 8 | 12 | 5 | 6 | 8 | 2.5 | ---- | 8 |
| 10 | 15 | 6 | 4 | 8 | 2.5 | 2 | 12 |
| 12 | 18 | 7 | 5 | 8 | 5 | 1 | 12 |





## SPECIFICATION DEFINITIONS

*Horizontal Load Capacity:*

The maximum load capacity of a positioning device when the device is mounted to a horizontal plane. For linear positioner, the plane of travel would be horizontal.

*Vertical Load Capacity:*

The maximum (pitch) load capacity (center of gravity 2" off table surface) of the positioning device when the unit is mounted on a vertical plane. For linear positioners, the plane of travel would be vertical. Vertical load capacity is a measure of the load capacity effects of table bearing only, not that of the screw.

*Load Capacity:*

The maximum load or weight that a positioning device can support without causing excessive wear or damage to the device. The load capacities stated are based on loads positioned over the bearings, not cantilevered.

*Repeatability:*

Once a positioning device moves away from a specific point or position, "repeatability" defines how accurately it can repeat, or return to that original position. Repeatability specifications in this manual are for tables only, and exclude motor and encoder effects on repeatability.

*Resolution:*

The smallest attainable increment of adjustment or positioning.

*Straight Line Accuracy (Straightness and Flatness of Travel):*

In theory, a linear slide or stage moves along its axis of travel in a perfectly true straight line. In reality, the actual travel path deviates from the true straight line and flat line in both the horizontal and vertical directions, respectively. Straight and flat line accuracy is defined as the maximum distance that the travel path deviates from the theoretical straight line in either plane, measured from the moving carriage surface center. Specifications for straight line accuracy are for overall travel maximum deviations, and include yaw, pitch, and roll error when measured 2" above the table surface mount.

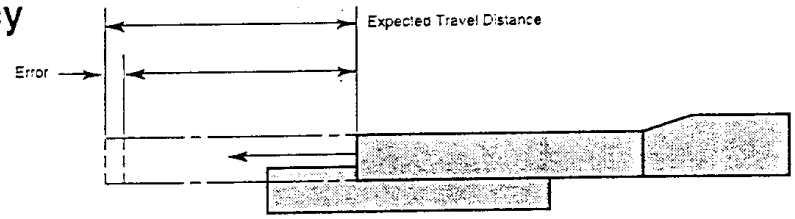
**SPECIFICATION DEFINITIONS (continued)**

*Table Specifications:*
Table specifications in this manual apply to single axis tables only. When one or more positioning tables are integrated with motors, drives and controls, any one component can affect the system specifications.

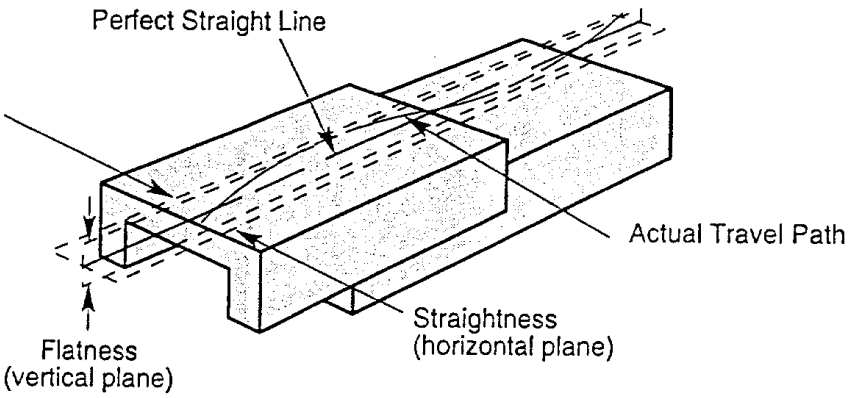
*Yaw, Pitch, and Roll:*
Yaw, pitch, and roll are terms used to describe angular movement (error) found in all linear table travel. The illustrations on the following page shows how these elements affect straight line and positional accuracy. Flatness of travel is also affected, but is insignificant in most applications.

*Positional Accuracy:*
When ever a motorized positioning table is commanded to travel a desired distance (from one point to another) it should, theoretically move that exact distance and then stop. Positional accuracy is defined as the maximum allowable difference (error) between the expected travel distance, measured 2" above the moving carriage surface center. Positional accuracy specifications include pitch and yaw error for standard center drive tables. Positional accuracy stated, is for tables only, effects of motors and encoders are not included. Positional accuracy specifications are for overall travel maximum deviation defined by the least squares method described on *page 25.*

## Positional Accuracy




## Straight Line Accuracy



## PITCH ERROR
AND ITS EFFECTS ON
LINEAR ACCURACY

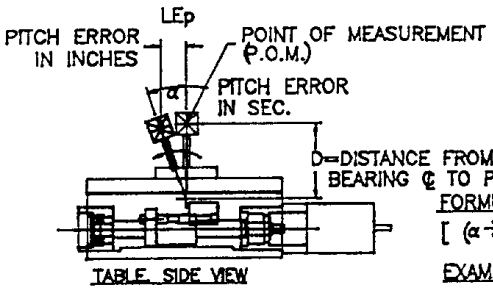



TABLE SIDE VIEW

FORMULA:
[ (α ÷ 3600) TAN ] X D = LEp

EXAMPLE: D = 2.5" ;PITCH ERROR = 10 SEC.
[ (10 ÷ 3600) TAN ] X 2.5 = .00012 (3.1μ)

## YAW ERROR
AND ITS EFFECTS ON
LINEAR ACCURACY

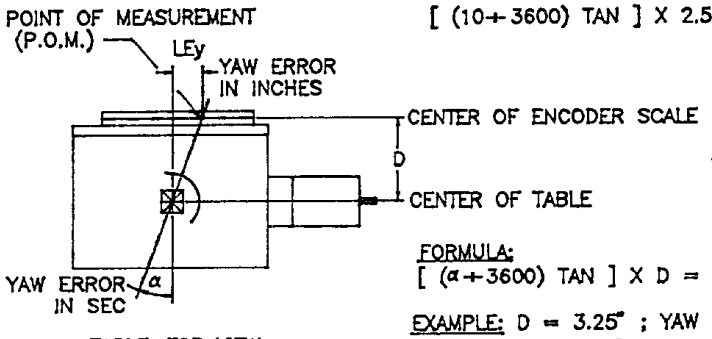



TABLE TOP VIEW

FORMULA:
[ (α ÷ 3600) TAN ] X D = LEy

EXAMPLE: D = 3.25" ; YAW ERROR = 10 SEC.
[ (10 ÷ 3600) TAN ] X 3.25 = .000157 (4.04μ)

## ROLL ERROR
AND ITS EFFECTS ON
STRAIGHT LINE ACCURACY

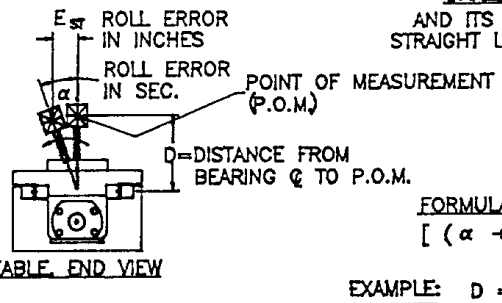



TABLE END VIEW

FORMULA:
[ (α ÷ 3600) TAN] X D = E ST

EXAMPLE: D = 2"; ROLL ERROR = 10 SEC.
[ (10 ÷ 3600) TAN ] X 2 = .000,097 (2.47μ)

## YAW ERROR
AND ITS EFFECTS ON
STRAIGHT LINE ACCURACY

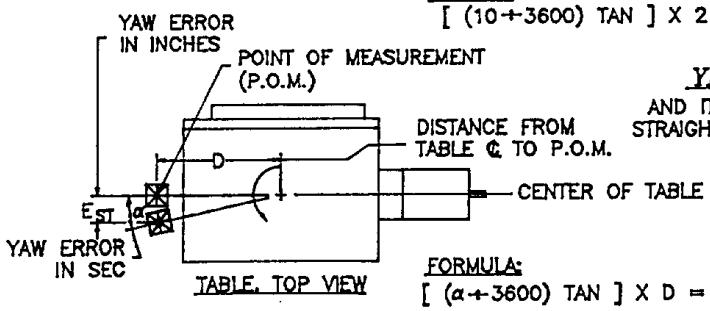



TABLE TOP VIEW

FORMULA:
[ (α ÷ 3600) TAN ] X D = E ST

EXAMPLE: D = 8.5" ; YAW ERROR = 10 SEC.
[ (10 ÷ 3600) TAN ] X 8.5 = .0004 (10.6μ)

**SPECIFICATION DEFINITIONS (continued)**

*Inch/inch Specification*

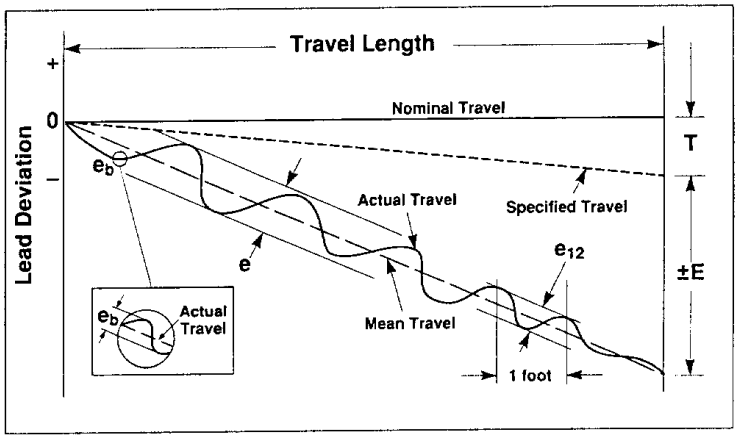
The inch/inch specification is used *only* to determine the mean travel deviation **E**, as determined by the least squares method. The inch/inch specification is *not* used to determine a maximum bandwidth deviation.

**Example:** Precision Grade Leadscrew with 4" of travel
= 80 micro inches/inch
= 600 micro inches/foot
**E** = 320 micro inches

*Inch/foot Specification*

The inch/foot specification $e_{12}$ is used to determine the maximum bandwidth deviation in a given foot from the mean travel deviation **E**. The inch/foot specification is also used to determine **E** when the inch/inch values in a given foot exceeds the inch/foot values.

**Example:** Precision Grade Leadscrew with 10" of travel
= 80 micro inches/inch
= 600 micro inches/foot
**E** = 600 micro inches




**e** Maximum bandwidth deviation for overall travel from mean travel deviation **E**.

**E** Mean travel deviation is obtained by the least squares method. See the inch/inch and inch/foot definition to determine **E** values. To determine worse case overall travel deviation from specified travel, use **E** for catalog 100 000 Series tables.

**$e_b$** Deviations per revolution normally seen by the screw and bearing combined.

**T** Values selected by the customer to compensate for elongation caused by temperature changes or external loads. This value is normally set at zero and neglected in most cases.

**Notes:** Measurements made with screw and assembly at 68°F.