

Compumotor

AL/IL Encoder Mounting Guide

Compumotor Division
Parker Hannifin Corporation
p/n 88-009072-01 A

IMPORTANT

User Information

To ensure that the equipment described in this user guide, as well as all the equipment connected to and used with it, operates satisfactorily and safely, all applicable local and national codes that apply to installing and operating the equipment must be followed. Since codes can vary geographically and can change with time, it is the user's responsibility to identify and comply with the applicable standards and codes. **WARNING: Failure to comply with applicable codes and standards can result in damage to equipment and/or serious injury to personnel.**

Personnel who are to install and operate the equipment should study this user guide and all referenced documentation prior to installation and/or operation of the equipment.

In no event will the provider of the equipment be liable for any incidental, consequential, or special damages of any kind or nature whatsoever, including but not limited to lost profits arising from or in any way connected with the use of this user guide or the equipment.

© *Compumotor Division of Parker Hannifin Corporation, 1997*
—All Rights Reserved—

The information in this user guide, including any apparatus, methods, techniques, and concepts described herein, are the proprietary property of Parker Compumotor or its licensors, and may not be copied, disclosed, or used for any purpose not expressly authorized by the owner thereof.

Since Parker Compumotor constantly strives to improve all of its products, we reserve the right to change this user guide and equipment mentioned therein at anytime without notice.

Technical Assistance *Contact your local automation technology center (ATC) or distributor, or ...*

**North America
and Asia:**

Parker Hannifin
Compumotor Division
5500 Business Park Drive
Rohnert Park, CA 94928
Telephone: (800) 358-9070
Fax: (707) 584-3793
FaxBack System: (800) 936-6939
BBS: (707) 584-4059
E-Mail: tech_help@cmotor.com

**Europe
(non-German speaking):**

Parker Digiplan
21 Balena Close
Poole, Dorset
England BH17 7DX
441-202-690-911
441-202-600-820

**Germany, Austria,
Switzerland:**

Hauser Elektronik GmbH
Robert-Bosch-Str. 22
D-77656 Offenburg
Germany
49-781-509-300
49-781-509-176



Table of Contents

General Description.....	1
Mounting Precautions.....	2
Mounting Procedure.....	4

List of Figures

Figure 1. Rack Assembly Cut Away Section View	1
Figure 2. Typical Mounting Configurations.....	3
Figure 3. Leveling Block.....	4
Figure 4. Rack Assembly Greater Than 12'.....	5
Figure 5. Dial Indicator Location.....	6
Figure 6. Pinion Clearance.....	7
Figure 7. Repeatability Check	9

General Description

This section contains a step-by-step procedure to ensure proper mounting of the Compumotor rack and pinion linear encoders. Do not proceed without reading each step carefully. Refer to the AL or IL Encoder user guide (depending on the product you are using) for pertinent dimensional values.

There are two parts of the encoder system: the rack assembly and the encoder assembly. You can connect the encoder to the load—the moving portion. The other portion is stationary.

You must take precautions mounting rack and pinion encoders to ensure optimum encoder performance and life. A rack and pinion linear encoder will not operate properly if it is not mounted within specified tolerances. To understand the mounting procedure, Compumotor recommends that you review the entire mounting guide prior to starting. Do not disassemble the unit until the manual instructs you to do so.

Figure 1 shows a cut-away section of the rack assembly. Notice that the rack that has the teeth is secured with bolts. **Do not touch these bolts.** If you do, the system's calibration will be lost and accuracy will suffer. You can use the bolt holes shown in the spar to mount the encoder assembly to the machine.

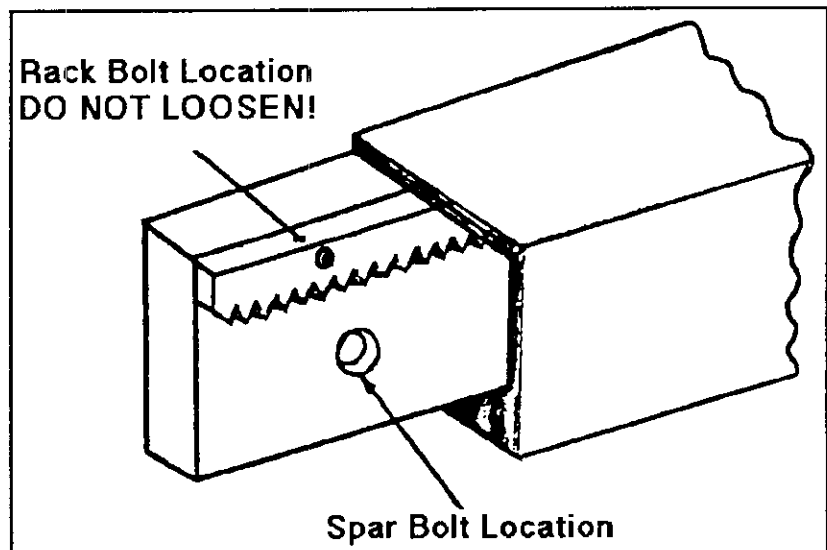


Figure 1. Rack Assembly Cut Away Section View

Mounting Precautions

Note the following precautions before you mount your encoder.

1. Do not remove cover until later.
2. Lay out the mounting arrangement.

The layout must ensure that the axis of movement of the machine and the encoder are in line. If the layout does not achieve this, errors will be introduced. In severe cases, you may damage the encoder.

3. Limit the travel of the encoder.

The travel of the load to which the encoder is attached cannot be allowed to exceed the encoder maximum travel or the encoder will be damaged. Travel must be limited in some fashion if the load can traverse further than the encoder can. To obtain usable travel of the encoder, refer to the product user guide for verification of the usable length.

4. Keep contaminants away from mounting location. Even though this encoder is well protected from liquids and dirt, additional steps should be taken to ensure trouble-free operation. Always mount the encoder seal so it is facing away from contaminants.
5. Decide whether the encoder assembly or the rack assembly should be moving.

The optimal combination is for the rack assembly to be attached to the machines' moving surface and the encoder assembly to be attached to the stationary portion. This allows the cable from the encoder assembly to be fixed.

6. Check the two mounting surfaces for flatness and parallelism to one another.

The two surfaces must be parallel to one another within ± 0.004 " (0.1mm). You can measure this with a dial indicator. Figure 2 illustrates mounting surfaces that must meet tolerance. This is the recommended tolerance. Surfaces that do not meet the recommended tolerance may jeopardize accuracy, speed, and product life

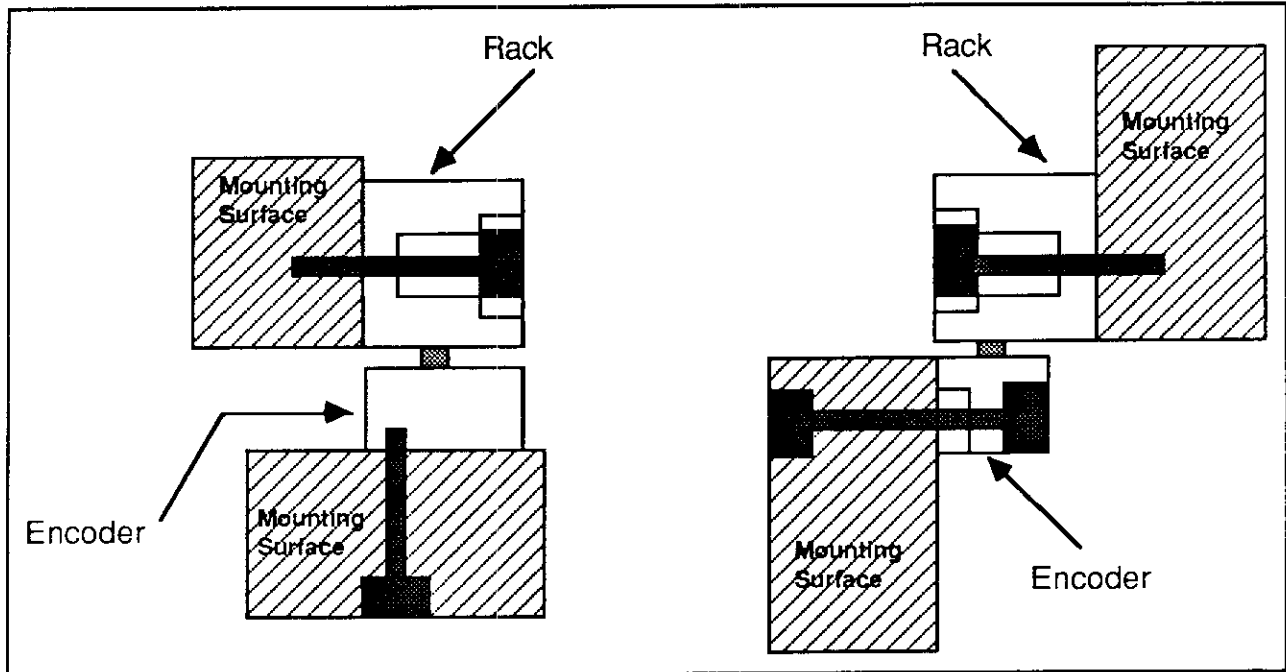


Figure 2. Typical Mounting Configurations

7. If parallelism does not meet the tolerance requirement, you can create a new surface.

Use a single piece of cold rolled steel that is equal to the entire length of the rack assembly, or use blocks under each mounting hole to create a parallel surface. In either case, use a set screw arrangement in the material for calibration. This technique of creating a new parallel mounting surface is referred to as *leveling*. Figure 3 illustrates the leveling block concept. After you calibrate a new surface, secure the set screws with loctite.

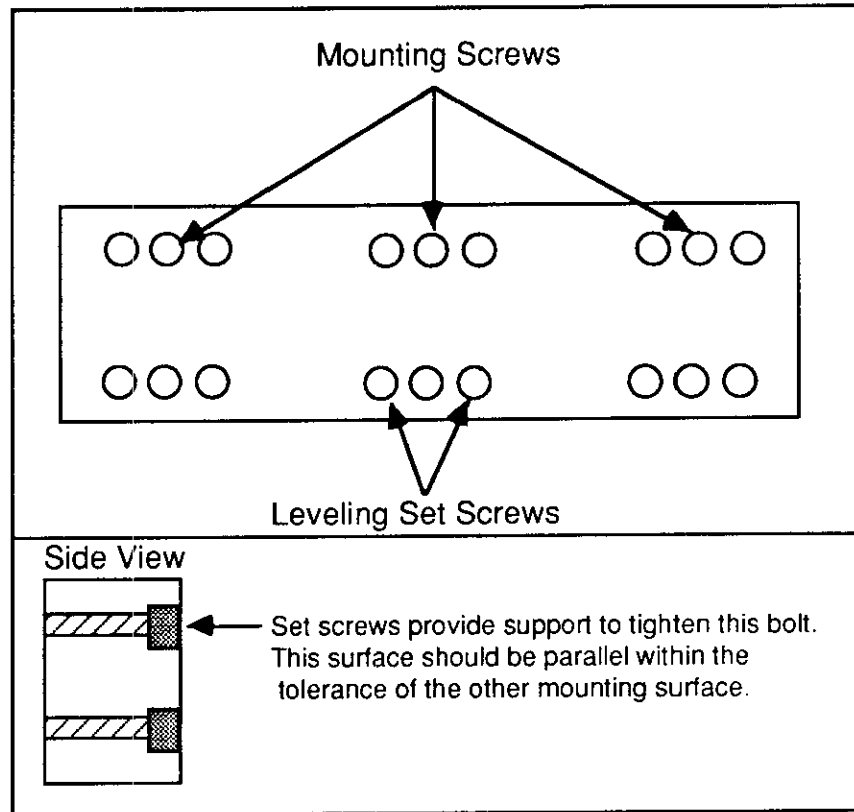


Figure 3. Leveling Block

8. Determine where the encoder head will be mounted.

If the two 8-32 threaded holes provided in the encoder base are not sufficient, you may need to manufacture a bracket to conform to the machine's geometry.

9. Specify where the cable will be routed and determine if fluid will be present.

Route the cable **down** from the encoder head so fluid flow will not damage the encoder head. Cable looping is a very effective means of preventing fluid flow to the encoder head (when excess cable is present).

Mounting Procedure

After you address the above precautions and make necessary changes, you can begin to mount the unit. Below is the step-by-step process that you should follow to properly mount and test the rack and pinion encoder. This process assumes that two parallel surfaces exist for mounting.

If you are mounting a rack assembly that is greater than 12', use the special instructions (marked "For Rack Assemblies Greater Than 12"). **Special instructions for rack assemblies greater than 12' are provided for Steps 2, 3, and 6.**

To minimize installation time, obtain the equipment listed below prior to starting.

- Phillips-head screw driver
- 1/4" socket & ratchet
- 1/4" allen wrench
- Dial indicator

Step 1

- Remove the three screws on each of the two end-plates.
- Remove the end-plates and seals. Try not to separate the seals from the corresponding end-plate.
- Loosen, *but do not remove* the screws on the top of the extrusion. Once the screws are loose, remove the extrusion covering the rack assembly. *Do not remove the strip seal inside the cover.*

Step 2

Align the rack assembly on the mounting surface and mark the spar bolt location for drilling and threading process. See Figure 1 for the location of spar bolts if any location uncertainty exists. The top of the rack should be as parallel to the encoder head mounting surface as possible at this point. These holes may be machined (removing burrs or extrusions from holes) prior to mounting. This method provides the best mounting results. Machining should be done for 1/4-20 screws.

For Rack Assemblies Greater Than 12'

Align the two pieces of the rack assembly on the mounting surface. The adjoining ends are marked by either arrows or other ink marks. Match the ends together as shown in Figure 4. The gap between the rack assembly must be correctly set to maintain accuracy when the pinion moves from one rack to the next. Push the extra rack segment (supplied) into the rack assembly, half on each end of the adjoining racks.

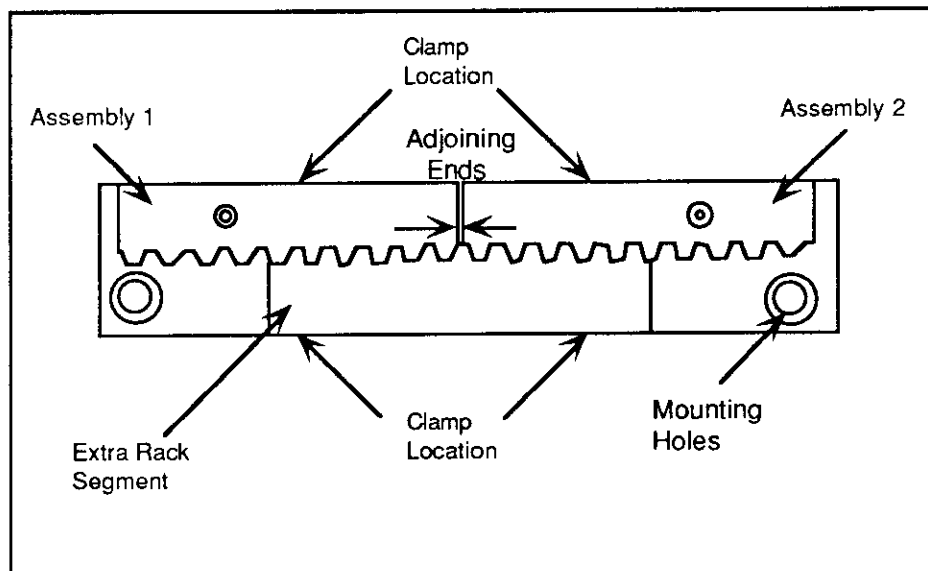


Figure 4. Rack Assembly Greater Than 12'

Mark the spar bolt location for the drilling and threading process. Refer to Figure 1 if you are not certain about the location of the spar bolts. The top of the rack should be parallel to the encoder head mounting surface. You may machine the holes (remove burrs or extrusions) before mounting. This method provides the best results. If you machine the holes, prepare the holes for 1/4-20 screws.

Step 3

Using the supplied socket-head cap screws, bolt the rack spar to the designated surface through the 5/16" holes starting from one end going to the next location until all screws are installed. Do not tighten any screws. The clearance in the holes allow adjustment for parallelism calibration.

Using a dial indicator as shown in Figure 4, adjust the spar (starting from one end) to read not more than ± 0.002 total indicated reading (TIR) on the indicator. Read the indicator with reference to the mounting location of the encoder head. Once the measurement is within the above value, tighten the screw. This indicator should be located over the screw to be tightened and measured from off the top of the rack and not the spar. **Never loosen the bolts that hold the rack in place.**

For Rack Assemblies Greater Than 12'

Using the supplied socket-head cap screws, bolt the rack spar to the designated surface through the 5/16" holes starting from one end going to the next location until all screws are installed. Do not tighten any screws. The clearance in the holes allows you to adjust for parallel calibration.

Invert the rack segment into the teeth of the rack assembly and clamp the pieces together. Keep the rack segment clamped together while you adjust the assembly for parallelism.

Using a dial indicator as shown in Figure 5, adjust the spar (starting from one end) to read not more than ± 0.002 total indicated reading (TIR) on the indicator. Read the indicator with reference to the mounting location of the encoder head. Once the measurement is within the above value, tighten the screw. This indicator should be located over the screw to be tightened and measured from off the top of the rack and not the spar. **Never loosen the bolts that hold the rack in place.**

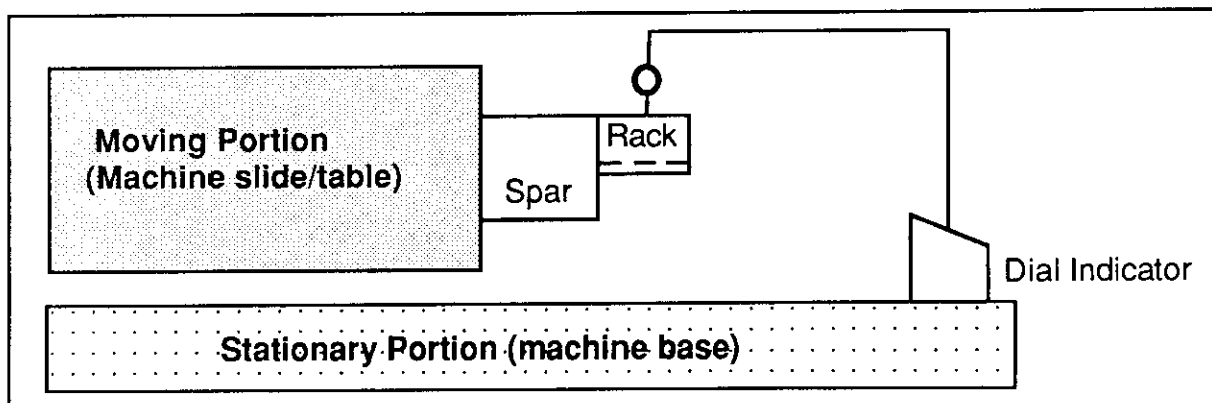


Figure 5. Dial Indicator Location

Move the dial indicator to the next screw location and manually tap the spar up or down until the same reading on the indicator is provided as above. Tighten the screw after you obtained the measurement. When you adjust the spar, always avoid direct contact with the rack. Adjustments should be made with light force. Use this process for the remaining screws also.

If you cannot pull the spar into proper position by hand, use a small brass punch and hammer. Locate the brass punch on the spar above the mounting screws and lightly tap it into position.

Once all screws are tightened, measure the *runout* (the straightness between the machine base and the rack) over the entire length of the rack. Use the procedure shown in Figure 5. There should not be a measurement above ± 0.004 ".

Step 4

You must mount the encoder head and align it . The encoder head must be parallel to the rack assembly. You can check this in the same manner as the rack shown in Figure 6. Gently place the pinion head onto the rack. Space and preload properly. The face of the pinion should be between 0.015" to 0.045" away from the spar surface.

If the pinion is touching the spar, the increased friction will reduce system speed and cause greater wear. Too little pinion contact on the rack will wear on the portion of the pinion that is in contact with the spar; consequently, the pinion may travel off the rack if it is not parallel. See Figure 6 for the recommended clearance specifications.

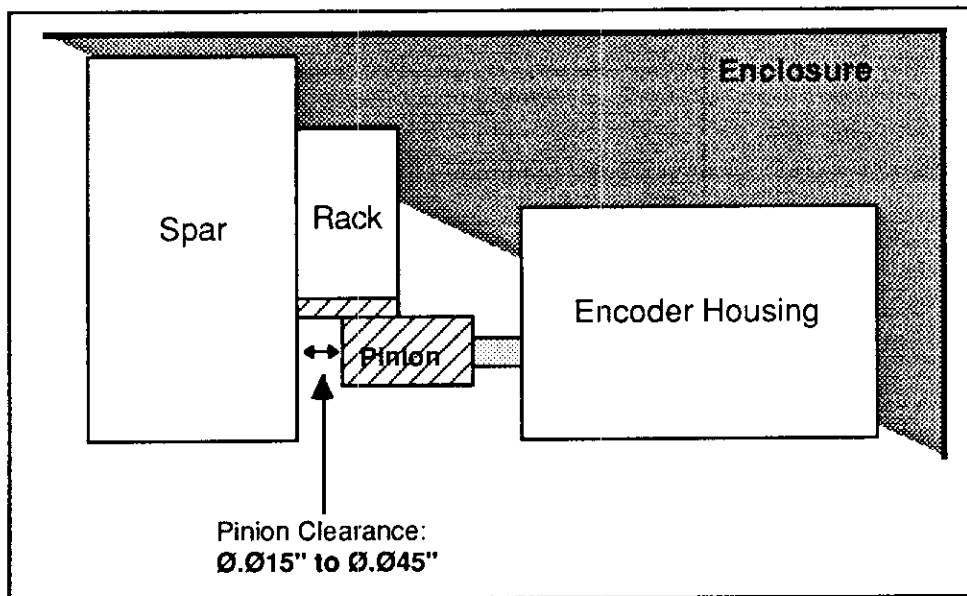


Figure 6. Pinion Clearance

Before fully mounting the head bracket in place, you must preload the spring-loaded pinion to reduce backlash and optimize performance and life of the product. To preload the pinion, press it firmly against the rack.

This preload should be within the 1 to 2 lb. range. This can be checked by placing the encoder head in its final position and installing the mounting screws, but not fully tightening them. Put your finger on top of the encoder housing shown in Figure 5 and depress the spring downward. If deflection can be felt and the spring has room to come back the same amount as deflected, then the preloaded pinion roughly meets the required specification.

If you do not notice any deflection and the spring is totally depressed, lower the mounting bracket until deflection is obtained. If proper preload is not provided, the spring will eventually wear out and cause the unit to fail prematurely. If the preload is set properly, tighten the screws to the encoder bracket.

If the pinion is not making contact with the rack, you may need to install a shim under the pinion (if the pinion is base mounted) to move the pinion into place. If you side-mount the pinion, you must lower the rack or alter the encoder mounting surface.

Step 5 To make sure the pinion rides smoothly and does not go off the rack, manually deflect the portion of the system that moves back and forth (slowly). If the unit travels off the rack, repeat Step 4.

Step 6 Replace the extrusion cover and tighten the screws on the sides and on the top of the cover.

For Rack Assemblies Greater Than 12' *Replace the extrusion covers and tighten all of the screws. Install the rubber wipers into the extrusion covers. Seal the seams in the extrusion covers with aluminum tape (supplied). Do not apply the tape in such a way that it seals the entire extrusion cover (especially the small radius grooves on the cover).*

Step 7 Before you begin cable routing, you may have to disconnect the cable from the decoding box for ease in routing (this only applies to the AL Encoder). The -1 Decoder box has an external connector.

If the encoder head is mounted to the *stationary portion* of the machine, you may clip or pin the cable in a permanent position. If the encoder head is mounted to the *moving portion*, you will need a cable track or cable loop to avoid any problems. If cable tracks are required, contact Gortite at (414) 786-1500.

Step 8

Now you can check the system for repeatability and accuracy. To check for repeatability, place the dial indicator at the zero or home position and program the system to move out and then back to the zero position. Reset the indicator before starting. Repeat this process several times to make sure the system always comes back to the same point. Figure 7 illustrates the repeatability check layout.

If the unit proves not to be repeatable within specifications, recheck the system's alignments and tolerances. Misalignment or mounting the system outside of tolerance specifications are the most common reasons for repeatability problems. If problems persist, contact our Applications Department [(800) 358-9068; in CA call (800) 345-2084].

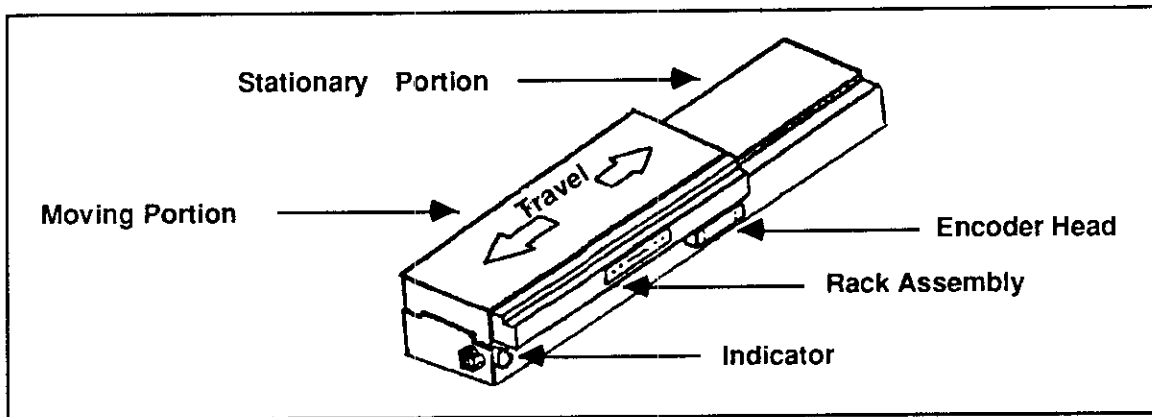


Figure 7. Repeatability Check