

ROCKFORD BALL SCREW

LINEAR GUIDE RAIL

INSTALLATION PROCEDURES

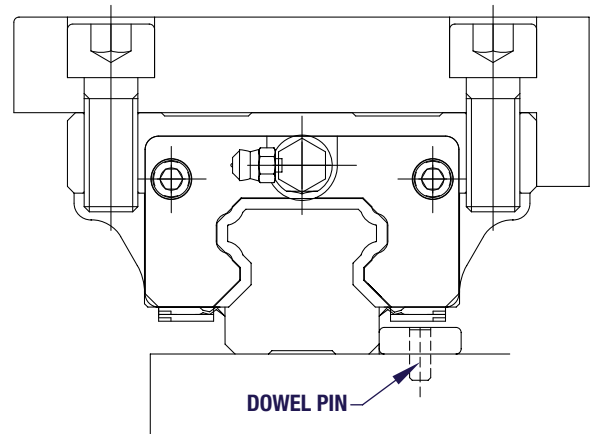


It's Your Move.™

FIXING METHODS OF GUIDE RAILS & BLOCKS

Methods to positively locate the rail in the absence of a datum surface on machine base

The most common arrangement for attaching the rail to a structure is one in which there is not a positive transverse locating surface. The location of the rail under load is maintained by the frictional resistance mounting created primarily by the Rail Mounting Bolt Torque. Therefore, in this instance, proper Bolt Torque (see *Table 2*) is extremely important to maximize the frictional resistance and preclude rail displacement during transverse loading. As a more positive locating method, plates can be installed and dowel pinned in a fashion to more positively resist transverse loading.



Methods to positively lock the rail and blocks against datum surface

There are a number of methods to positively lock the rail and block datum surfaces. These methods will aid in maintaining rigidity and accuracy in applications where vibrations or impacts are present.

RPG Rails are manufactured to be interchangeable, meaning that both edges are datum surfaces. This forgoes having to know which side of the rail is the reference edge. The blocks however have only one datum edge which is the edge with a ground surface.

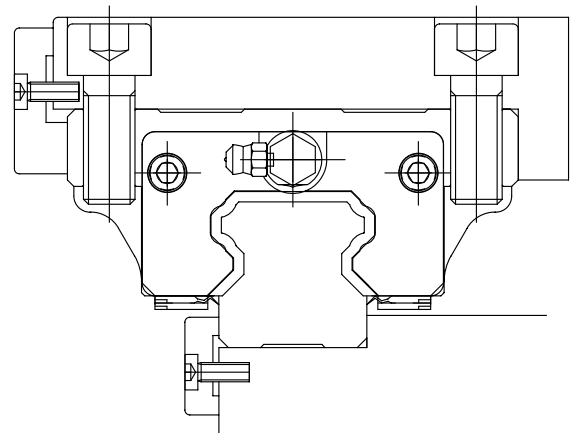
Push Plates

Push Plates can be used in multiple points along the edge of the rail or block, a single push plate may run the full length.

Bolt Torque

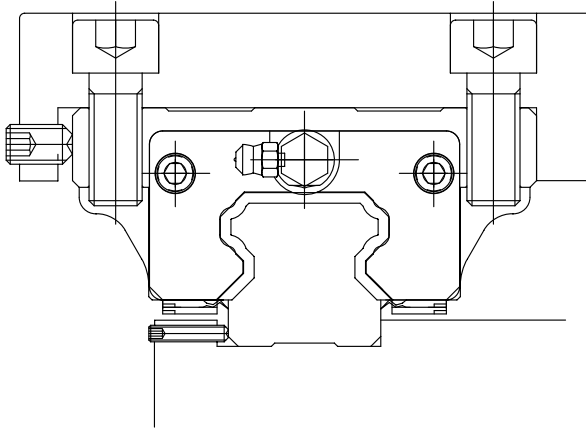
Rail Size	Bolt Size	Torque in Steel		Torque in Aluminum	
		Nm	ft-lbf	Nm	ft-lbf
RPG15	M4x16	4	3	2	1.5
RPG20	M5x20	8.8	6.5	4.4	3.25
RPG25	M6x25	13.7	10	6.8	5
RPG30	M8x30	30	22	15	11
RPG35	M8x30	30	22	15	11
RPG45	M12x40	120	88.5	58	42.75

Table 2 Guide Rail Mounting Bolt Torque



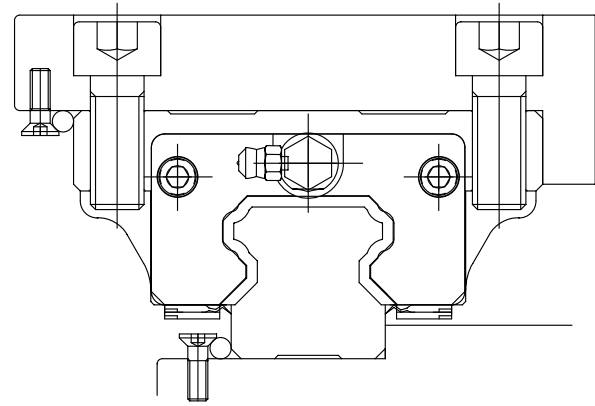
Push Screws

Push Screws can be utilized to hold the block & rail against the datum surface. Multiple screws should be spaced along the length of the rail or block.



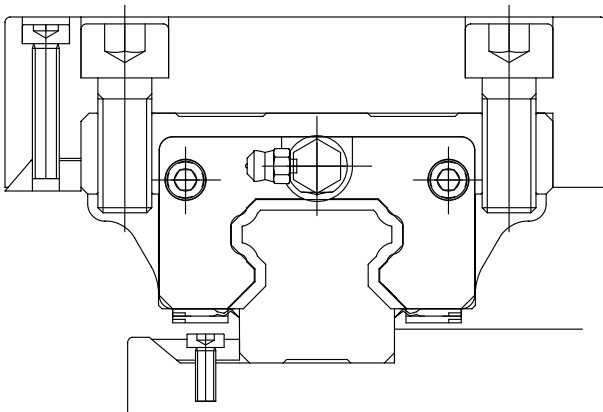
Needle Roller

Needle Roller loading is achieved by the taper of the screw head pressing on the needle roller. The location of the screw is extremely important in order to achieve proper loading on the needle.



Tapered Gibbs

Tapered Gibbs can generate large pressing forces and can cause rail deformity. Therefore, this method should be used with caution.



INSTALLATION PROCEDURE

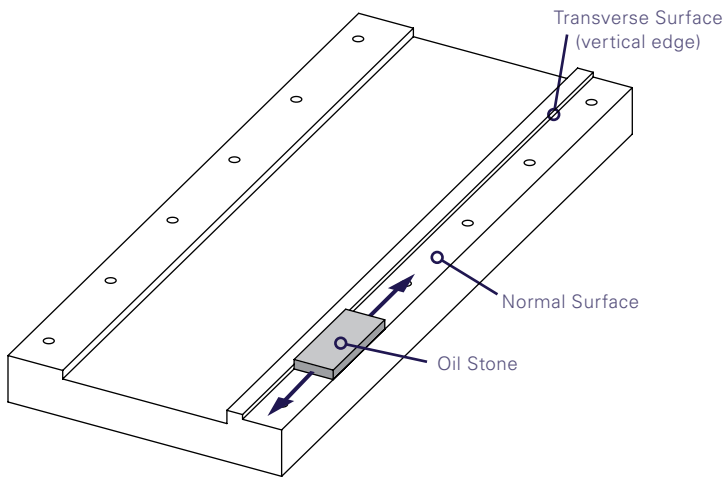
RPG Guide Rails are manufactured to be interchangeable, meaning that either side of the rail can be used as a primary locating datum edge. When two or more rails are used in a parallel system, one of the rails is considered the master rail while all others are auxiliary. In a single rail installation there is only a master rail.

Installation Instructions for a Two Rail System with Positive Reference Edge & Normal Mounting Surfaces for the Master Rail

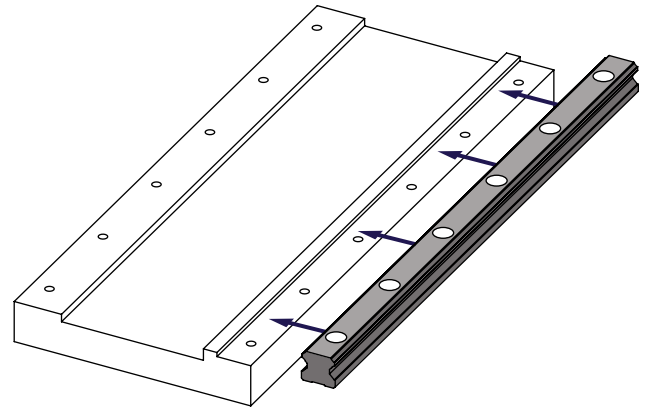
Grease Fittings and Accessories.

If block accessories, such as additional end seals and/or metal scrapers are not required, the grease fittings and lube port plugs should be assembled onto the blocks prior to installing the blocks on the rail. However if additional accessories are being used, please refer to the installation instructions on *page 10* as some kits will require an alternative lube fitting.

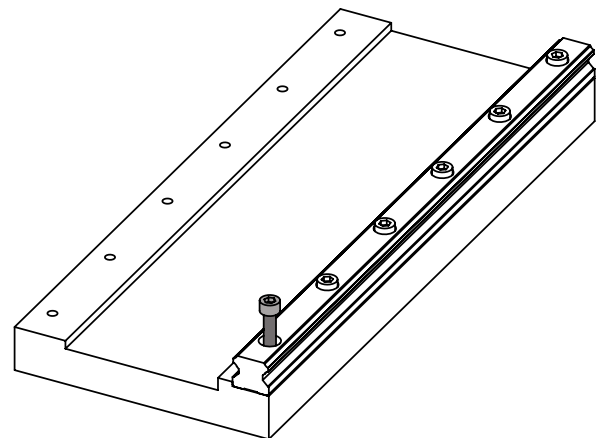
- 1 The rail mounting surfaces need to be free of burrs, dirt, rust preventative oil, and foreign material before installation of the rails. Use an oil stone on the master and auxiliary rail mounting surfaces to remove any high spots or dislodge any foreign material that may exist.



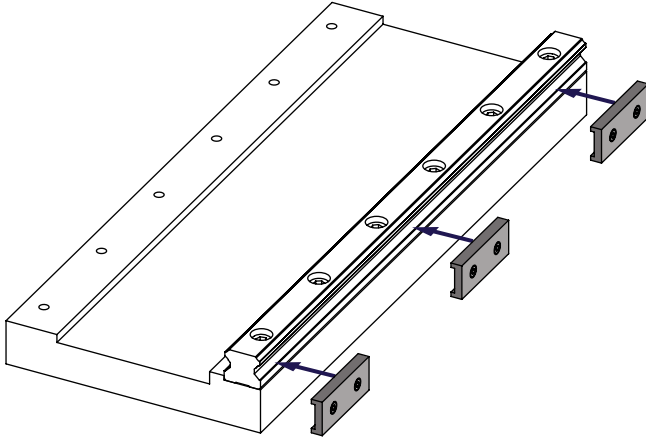
- 2 Place the Master rail on the prepared rail mounting surface. It is recommended to install the block(s) at a later point in this procedure to avoid accidental block damage. However for applications where subsequent block installation is not possible, proper access to all of the rail mounting bolt holes should be checked and block end accessories installed as applicable. Refer to *page 10* for end accessory installation instructions.



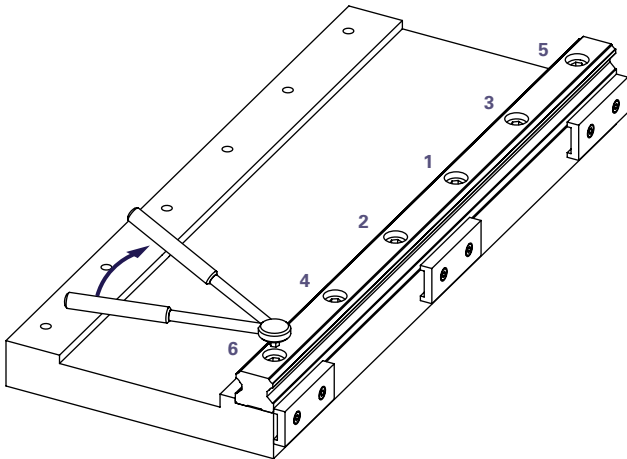
- 3 While holding the rail against the datum edge, insert clean bolts, check for correct bolt fit, and lightly snug all bolts. The torque applied to the bolts during this step should allow for subsequent rail movement as may occur during installation of the push plates.



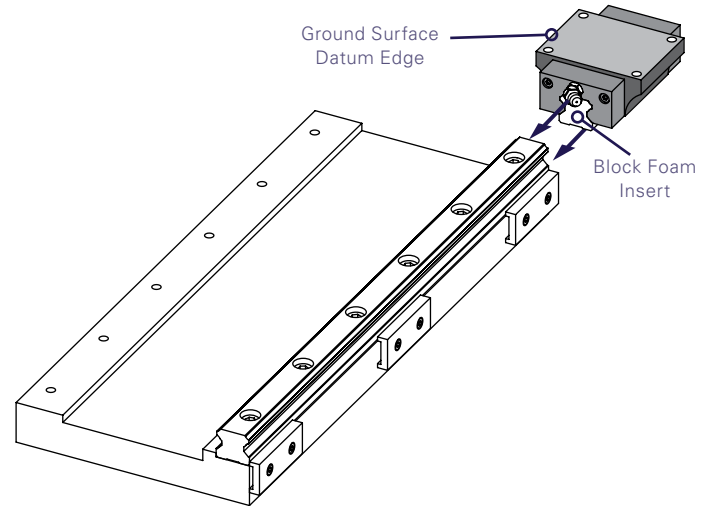
- 4** Install and tighten the clamping mechanisms (Push Plates shown) in sequence starting from the middle of the rail and working towards the ends.



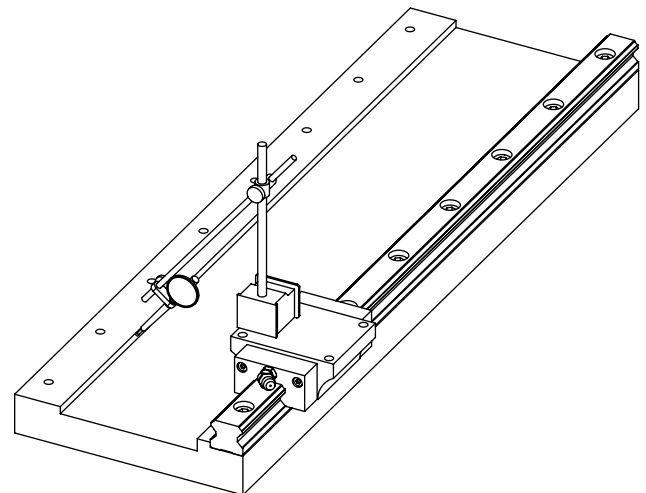
- 5** Torque the rail mounting bolts to specification (as shown below) in sequence beginning with the bolts at the center of the rail and working towards each end as shown below. A torque wrench should be used to set the specified Bolt Torque (*Specifications shown on page 2*).



- 6** The block(s) should now be installed on the master rail only. Be sure the end of the rail is free from burrs and all foreign materials prior to attempting installation. If a datum edge is being utilized on the component that assembles on the block(s), remember to install the block so the ground datum edge of the block faces towards the datum locating surface.

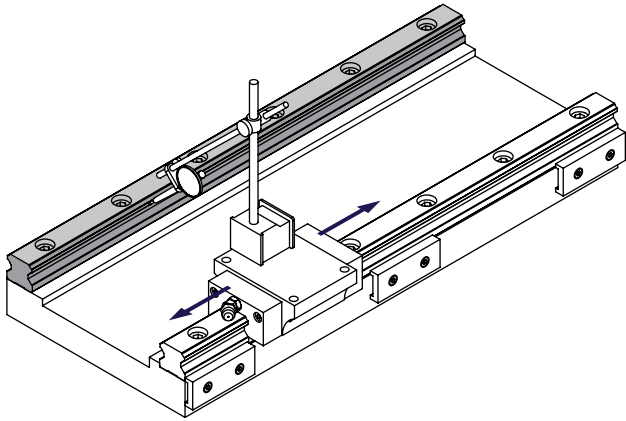


- 7** Install a block and dial indicator on the master rail for alignment purposes. While displacing the block and indicator from one end of the master rail to the other and indicating relative to positive locating feature(s) of the device, verify the alignment of the rail assembly to the indicated locating features



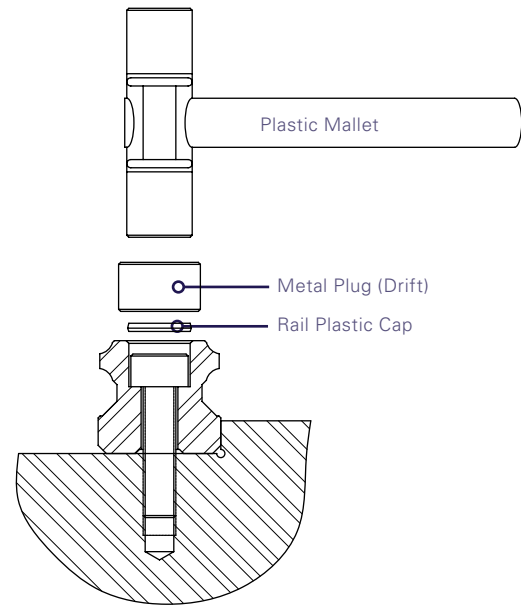
8 Place the auxiliary rail on the prepared rail mounting surface, insert clean rail mounting bolts, and lightly snug the bolts in preparation for aligning the auxiliary rail to the master rail. Torque the bolts to the same standard as used in *Step 3*.

9 Inspect the parallelism and height variation of the auxiliary rail relative to the master rail by using an indicator or other appropriate means. The specifications for running parallelism and height variation limits are stated on *page 11, Figure 11B*. If necessary, the auxiliary rail should be gently re-positioned relative to the master rail within the noted variation limits.



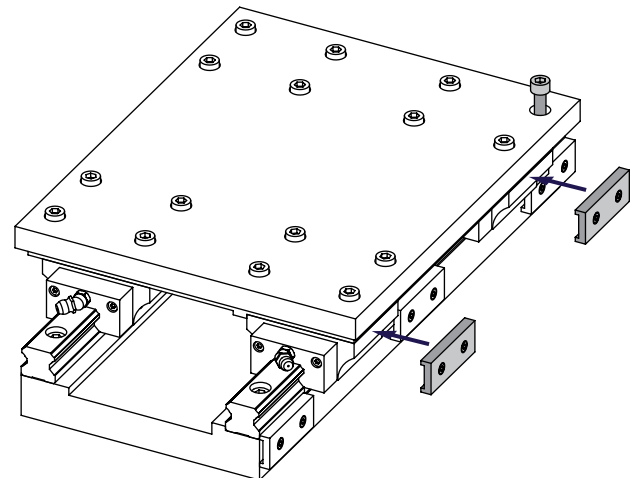
10 Torque the auxiliary rail mounting bolts to specification in sequence beginning with the bolts at the center of the rail and working towards each end (*See Step 5*). A torque wrench should be used to set the specified bolt torque. Once the bolts have been sequentially torqued, the alignment of the auxiliary rail to the master rail should be re-verified by using the procedure stated in *Step 9*.

11 Install the cap plugs into the bolt hole counter bores as shown below.

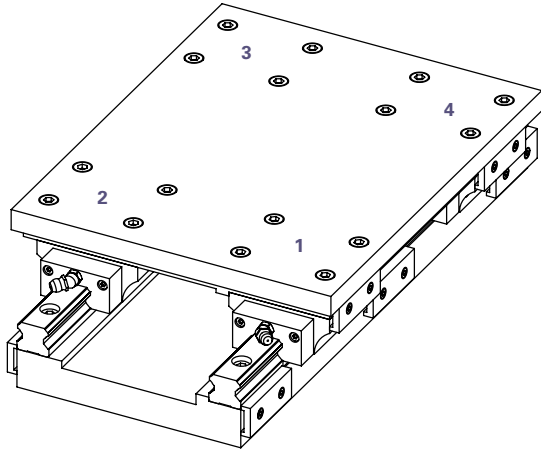


12 Install the remaining blocks on the master and auxiliary rails. Additional end seals and/or scraper kits should be assembled while the block is installed on the rail as shown in kit assembly instructions, (*page 10*).

13 Install the assembled component(s) that mount onto the blocks and lightly tighten the mounting bolts. If push plates are being used, they should be installed and their mounting bolts tightened to secure positive location of the block datum surface to the mating component datum surface.



- 14** Sequentially torque the assembled component(s) mounting bolts starting with **Block #1** and finishing with **Block #4**. The linear guidance system should be checked for smooth operation along the entire travel. If any binding or excessive resistance is encountered, the alignments as shown in *Step 9* should be re-verified.



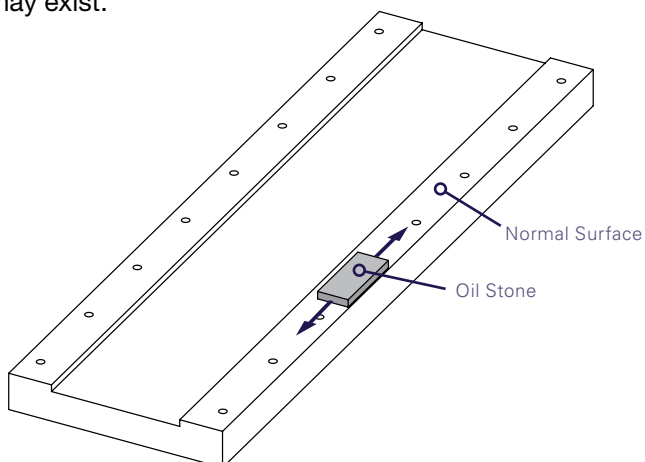
- 15** As a final measure, the initial charge of lubricant should be introduced into each block as recommended on *page 13*.

Installation of a Rail System Without a Positive Reference Edge Locating Surface

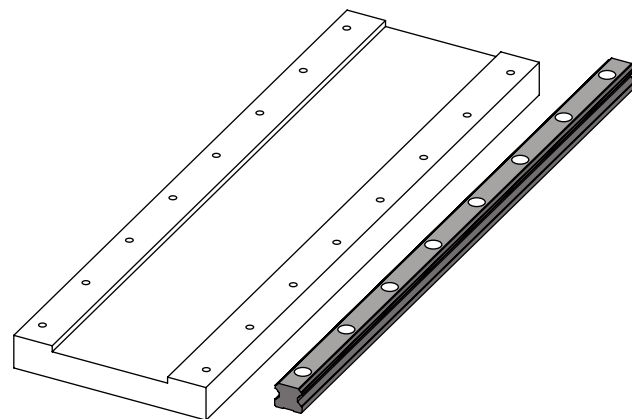
Grease Fittings and Accessories.

If block accessories, such as additional end seals and metal scrapers are not required, the grease fittings and lube port plugs should be assembled onto the blocks prior to installing the blocks on the rail. However if additional accessories are being used, please refer to the accessory installation instructions as some kits will require an alternative lube fitting.

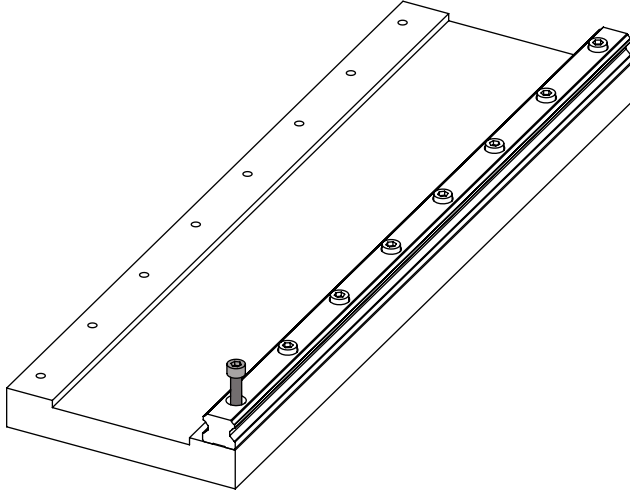
- 1** The rail mounting surfaces need to be free of burrs, dirt, rust preventative oil and foreign material before installation of the rails. Use an oil stone on the master and auxiliary rail mounting surfaces to remove any high spots or dislodge any foreign material that may exist.



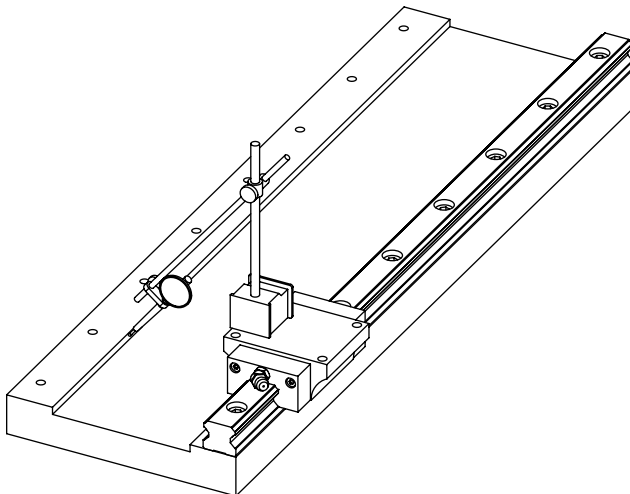
- 2** Place the Master rail on the prepared rail mounting surface. It is recommended to install the block(s) at a later point in this procedure to avoid accidental block damage. However for applications where subsequent block installation is not possible, proper access to all of the rail mounting bolt holes should be checked and block end accessories installed as applicable. Refer to *Step 12* for end accessory installation instructions.



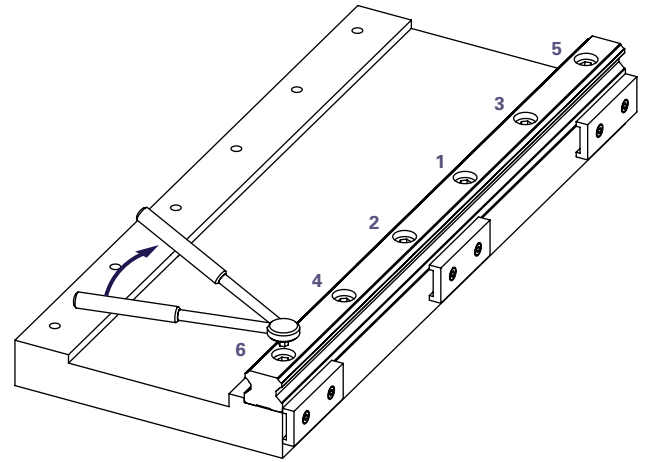
- 3** Insert clean bolts, check for correct bolt fit, and lightly snug all bolts. The torque applied to the bolts during this step should allow for subsequent rail adjustment as may be necessary during the following alignment procedures.



- 4** While keeping the block datum edge in proper orientation, install a block and dial indicator on the master rail for alignment purposes. While displacing the block and indicator from one end of the master rail to the other and indicating relative to positive locating feature(s) of the device, gently re-position the rail into proper alignment. An example of this alignment procedure is shown in *Step 7 on page 5*. Reference *Step 6 on page 5* for block installation.

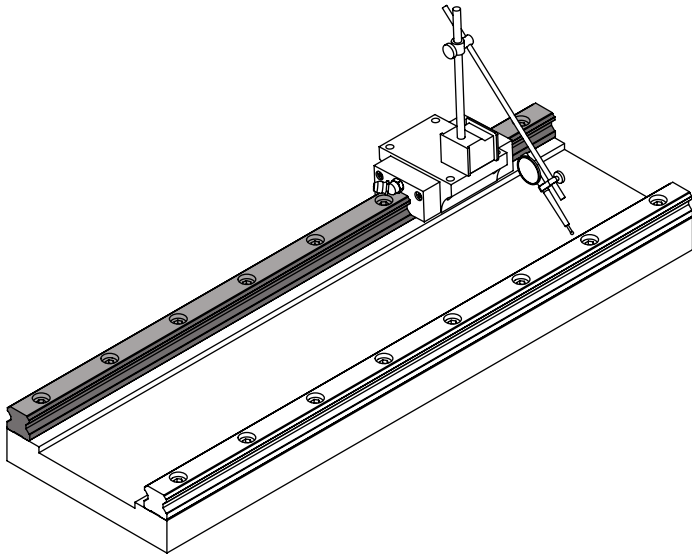


- 5** Torque the rail mounting bolts to specification *shown on page 2*, in sequence beginning with the bolts at the center of the rail and working towards each end. A torque wrench should be used to set the specified bolt torque. Once the bolts have been sequentially torqued, the alignment of the master rail should be re-verified by using the procedure stated in *Step 4*.



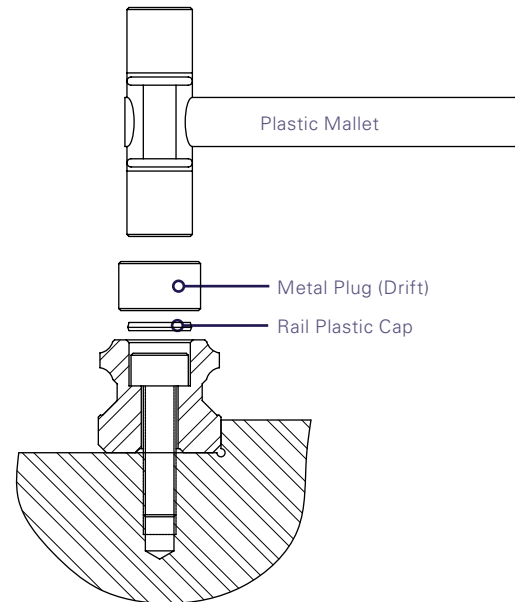
- 6** Place the auxiliary rail on the prepared rail mounting surface, insert clean rail mounting bolts, and lightly snug the bolts in preparation for aligning the auxiliary rail to the master rail. Torque the bolts to the same standard as used in *Step 3*.

- 7** Inspect the parallelism and height variation of the auxiliary rail relative to the master rail by using an indicator or other appropriate means. The specifications for running parallelism and height variation limits are stated on *page 11, Figure 11B*. If necessary, the auxiliary rail should be gently repositioned relative to the master rail within the noted variation limits.

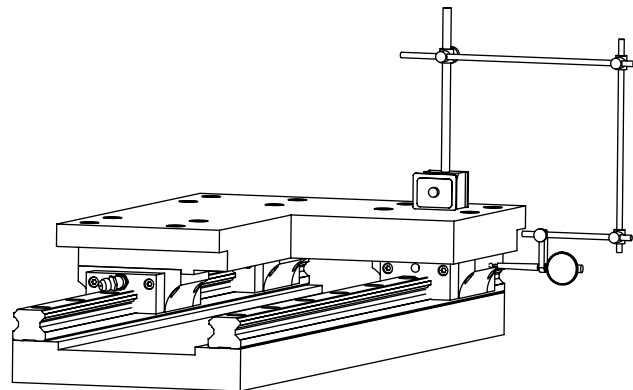


- 8** Torque the auxiliary rail mounting bolts to specification *shown on page 2*, in sequence beginning with the bolts at the center of the rail and working towards each end (*Step 5*). A torque wrench should be used to set the specified bolt torque. Once the bolts have been sequentially torqued, the alignment of the auxiliary rail relative to the master rail should be re-verified by using the procedure stated in *Step 7*.

- 9** Install the cap plugs into the bolt hole counter bores as shown below.

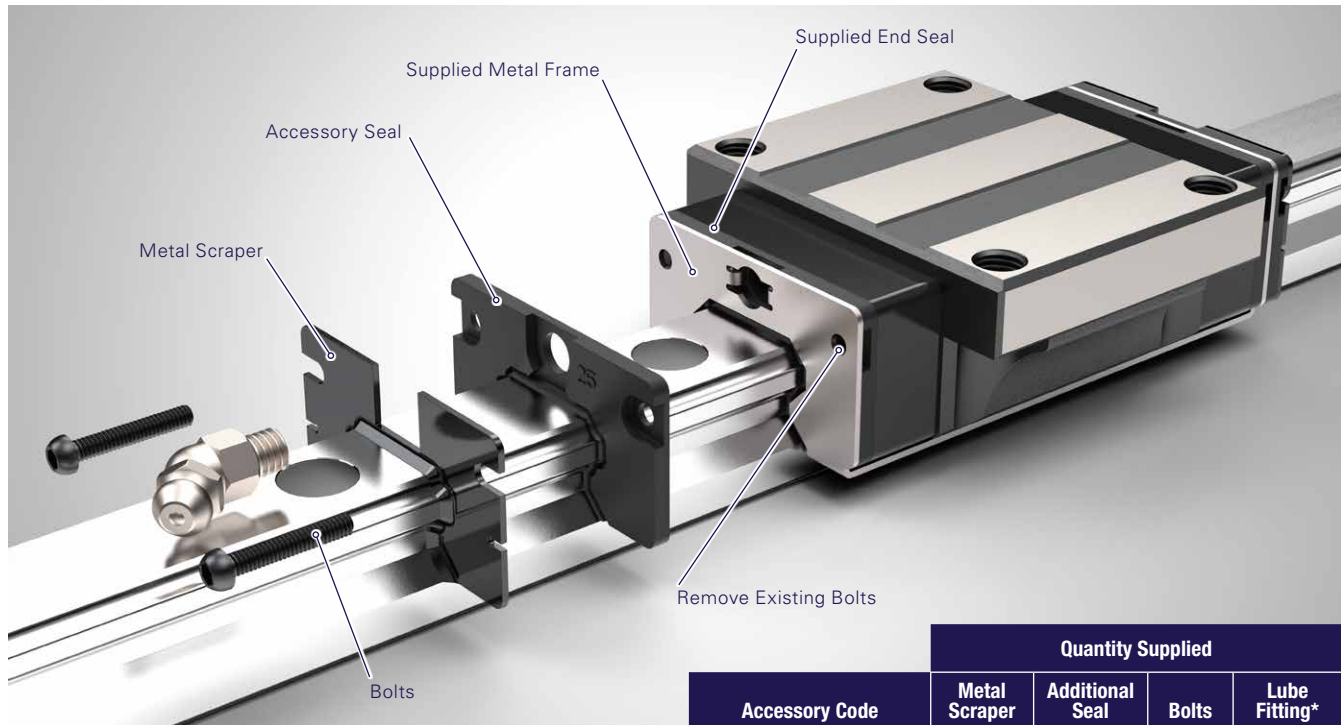


- 10** Install the remaining blocks on the master and auxiliary rails. Additional end seals and/or scraper kits should be assembled while the block is installed on the rail as shown (reference accessory installation instructions).
- 11** The assembled components mounting to the blocks should be installed and aligned to the linear guidance system. Once these alignments are completed, the linear guidance system should be checked for smooth operation along the entire travel. If any binding or excessive resistance is encountered, the alignments as shown in *Step 7* should be re-verified.



- 12** As a final measure, the initial charge of lubricant should be introduced into each block as recommended on *page 13*.

ACCESSORY INSTALLATION



Accessory Code	Quantity Supplied			
	Metal Scraper	Additional Seal	Bolts	Lube Fitting*
"A" Metal Scraper Kit	2	0	4	1
"B" End Seal Kit	0	2	4	1
"C" Scraper & End Seal Kit	2	2	4	1

Table 10A Available Accessory Kits

*if required

Installation Instructions

Note: The RPG Block(s) should be installed on the rail before proceeding with the accessory installation. Complete installation on one end of the block before beginning the other end.

- 1** Remove the existing bolts from the end of the block assembly.
- 2** Gently slide the accessories onto the rail and up against the block. Depending on the model, the additional accessories will either be installed flush to the existing end seal or the metal frame of the block. The scraper plate, if applicable, should always be mounted last.
- 3** Insert the proper bolts into the bolt holes of the block and tighten. Note: When additional end seals and/or scrapers are installed on the RPG blocks, the overall length (L dimension) will increase (See *Table 10B* for scraper and seal thickness). If required, a longer lube fitting and bolts will be provided with the accessory kit and should be used in place of the original. If an additional lube fitting and/or bolts are not supplied as part of the kit, the original parts should be used.

Block Series Accessory	Metal Scraper Thickness		Seal Thickness	
RP615	1 mm	0.039 in.	2.5 mm	0.098 in.
RP620	1 mm	0.039 in.	2.5 mm	0.098 in.
RP625	1.5 mm	0.059 in.	2.5 mm	0.098 in.
RP630	1 mm	0.039 in.	3.3 mm	0.130 in.
RP635	1 mm	0.039 in.	3.7 mm	0.146 in.
RP645	1 mm	0.039 in.	3.7 mm	0.146 in.

Table 10B Scraper and Seal Thickness Chart

Running Parallelism

Running parallelism is defined as the deviation of parallelism between the reference datum surface of the guide block and the reference surface of the rail when the guide block is moving over the entire length of the rail.

RPG blocks have one qualified datum edge where as the rail edges are universal, meaning both edges of the rail are considered datum edges.

Difference in Height (ΔH)

By definition, difference in height is the maximum difference in height (H) measured between any pair of blocks on the same rail or set of rails mounted on the same plane.

Difference in Width (ΔW)

The maximum difference in width (W) between each block mounted on the same rail is known as the difference in width.

Note: The accuracy is measured at the center or central area of the block.

	Accuracy Grade		
	Normal (N)	High (H)	Precision (P)
Tolerance of Height (H)	+/- 0.10	+/- 0.04	+ 0.00 - 0.04
Tolerance of Width (W)	+/- 0.10	+/- 0.04	+ 0.00 - 0.04
Difference of Heights (ΔH)	0.03	0.02	0.01
Difference of Widths (ΔW)	0.03	0.02	0.01
Running parallelism of block surface C in relation to A	ΔC refer to chart below		
Running parallelism of block surface D in relation to B	ΔD refer to chart below		

Table 11 Accuracy Table (mm)

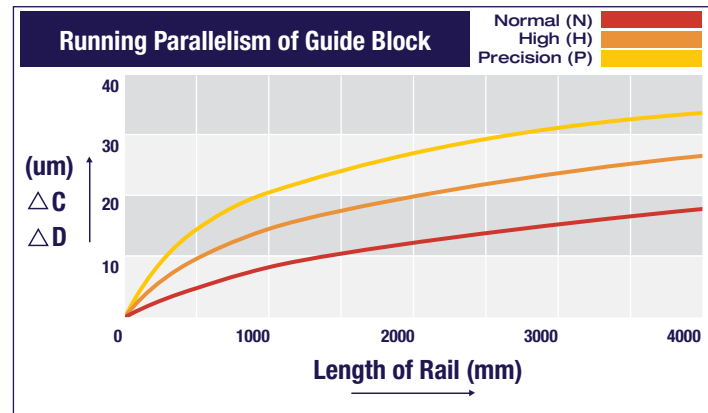


Fig. 11B Running Parallelism of Guide Block

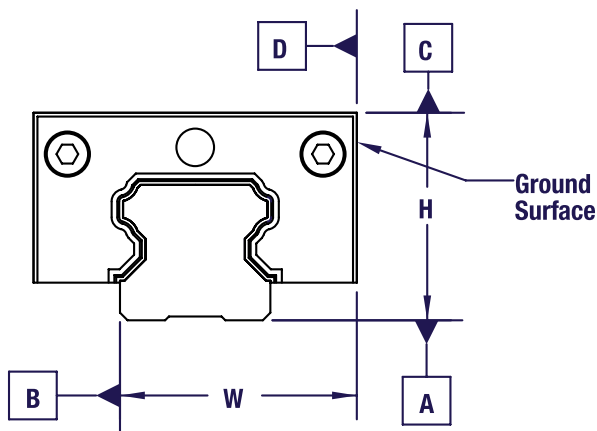
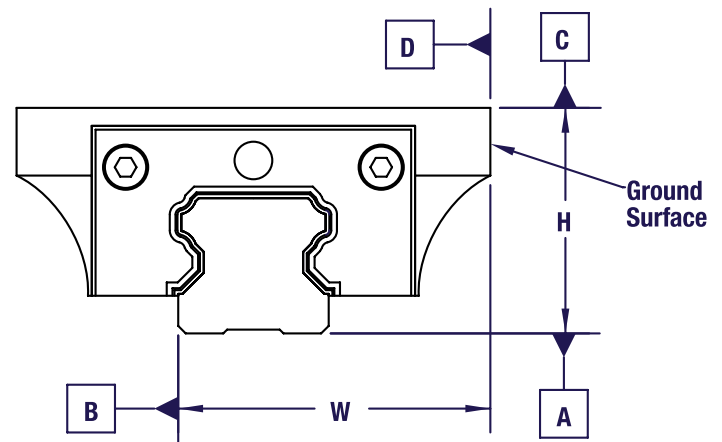
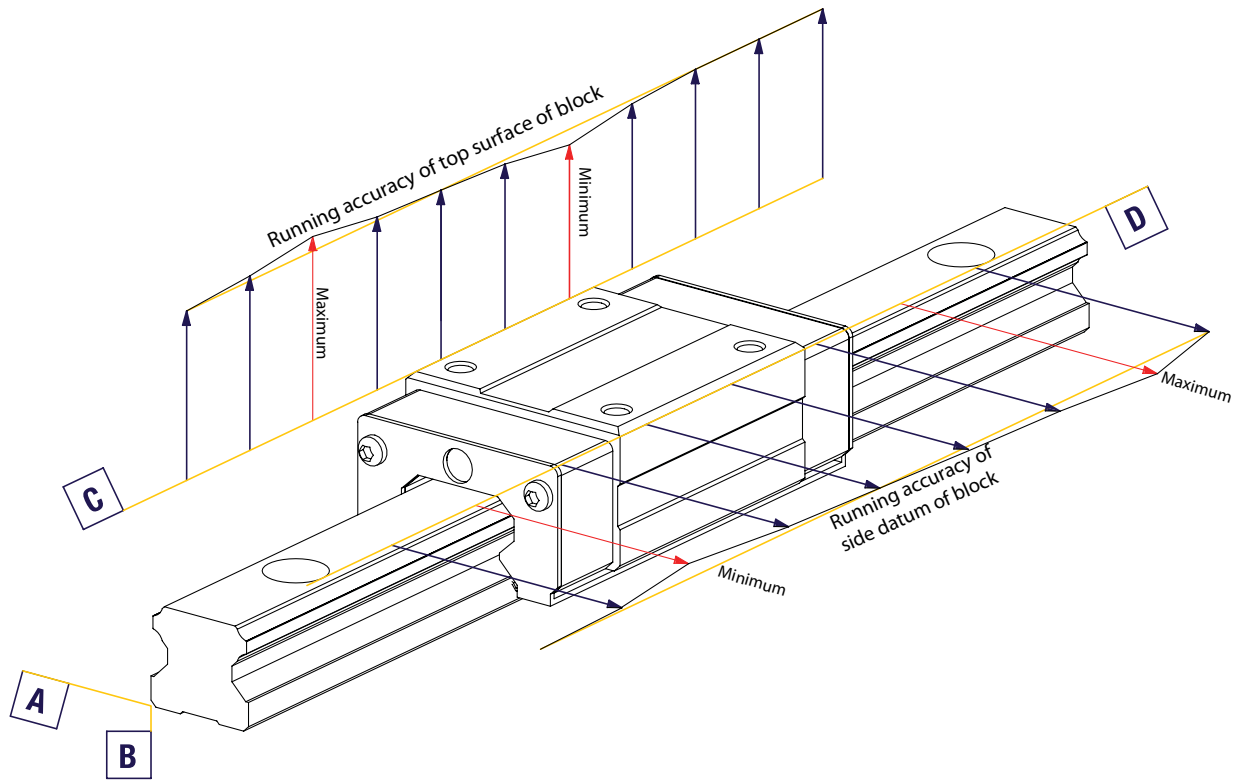


Fig. 11A Datum Surfaces





	Application	N	H	P		Application	N	H	P
Machine Tools	Machining Center			X	Robots	Cartesian Center	X	X	
	Lathe			X		Cylindrical Coordinate	X	X	
	Milling Machine			X		Gantry Root	X	X	
	EDM			X	Semi-conductor Machines	Wire Bonder			X
	Punch Press		X	X		Inserter		X	X
	Wood Working	X	X	X		Circuit Board		X	X
	Drilling/Tapping		X	X		Injection Molding	X	X	
	Pallet Changer	X			Others	Office Equipment	X	X	
	Engraving Machine	X				Transfer Equipment	X	X	
	ATC	X				XY Table		X	X
	Wire Cutter			X		Medical Equipment	X	X	X
	Small CNC Machine	X				Paint, Weld Machines	X	X	

Table 12 Accuracy Grades For Various Applications

Selecting the proper lubrication is critical to maximize the performance and the life of RPG guide assemblies. Therefore, the types of lubricant and lubrication methods should be carefully determined based on operating parameters and conditions.

All Rockford Ball Screw RPG blocks need to be lubricated with a NLGI Grade 2 bearing grease KP2K-20 to Din 51825. This is a high-performance lithium complex grease capable of operating at high speeds, heavy loads, and at temperatures beyond the limits of conventional lithium bearing greases.

RLM recommends grease as the preferred lubricant unless speeds are in excess of 60 m/min, in which case oil should be used.

Note: Any selected lubricant must meet or exceed the stated factory bearing grease specifications.

When using oil as the lubricant, it is imperative to choose a product with the correct viscosity to meet the demands of the application (CLP; viscosities of ISO VG 32 to 680 per Din 51519). Oil mist lubrication systems can be utilized with a small positive pressure cavity to help keep the guide blocks clean. These misting systems will require oils with a viscosity that has high atomizing rates. The same factors that influence the choice of a grease should also be considered when choosing an oil; such as loading, speed, temperature, vibrations, humidity, and others.

A Lubrication Reservoir is standard on RPG blocks sizes 15 through 30. The reservoir and block are not filled with grease at the factory and will need to be lubricated prior to operating. The amount of lubrication required is shown in *Tables 13A and 13B*.

Lubrication Procedure

For best lubrication dispersal, the block should be lubricated through the supplied lube port while the block is in motion. This will ensure circulation to all internal bearing surfaces. When a guide system is oriented vertically, the uppermost lubrication port should be utilized to ensure gravity assisted lubrication dispersal. Excessive lubrication will result in lubricant escaping through the block seals.

In the instance of short stroke assemblies ($\leq 2x$ block length (L_b)), the block should be lubricated from both ends to ensure adequate lubrication to the entire ball track.

Lubrication Interval

The Lubrication Interval is often times dependent on operational and environmental criteria such as loading, speed, stroke travel, and ambient conditions. Lubricating blocks with a lubrication reservoir 2-5 times at equal intervals during the calculated life of the guide block should be sufficient. Blocks that do not have a reservoir should be lubricated more frequently.

Environments

Special environments such as vacuums, clean rooms and the food industry will require specialized grease or oils. Please consult the factory for recommendations.

Block Size	Block Equipped with Lubrication Reservoir	
	Initial Fill Grease (cm ³)	Re-Grease
RPG15	1.3	1.1
RPG20	2.3	2
RPG25	2.8	2.5
RPG30	3.5	3

Table 13A Equipped Reservoir Re-lubrication Required

Block Size	Blocks NOT Equipped with Lubrication Reservoir	
	Initial Fill Grease (cm ³)	Re-Grease
RPG35	7	4
RPG45	8.5	5

Table 13B Non-equipped Reservoir Re-lubrication Required