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LINEAR MEASUREMENT INSTRUMENTS, Corp.

Research, Development and Manufacturing of Precision Measuring Systems

MOUNTING KIT

INSTALLATION OF LMI 776 BLOCKS ON FIXTURES

Rail Mount Blocks have generally been installed using one of two methods. The first method positions the blocks so that the location hole axis is perpendicular to the top surface of the fixture rail (perpendicular to flush). The second method mounts the block with the location hole axis aligned parallel to the front face of the fixture rail (parallel to gap). Generally there will be a space under the block when it is mounted in this method. (Contact LMI for further mounting detail concerning the second method.)

METHOD 1- Perpendicular to Flush

The LMI 770 Series transducers take their flush and gap checks at 90 degrees to each other. In actual conditions however, the included angle of the fixture rail is seldom 90 degrees. In consultation with various auto manufacturing gage engineers, the LMI 781, LMI 783, LMI 784 and LMI 785 Drill Jig Kits were designed to automatically adjust the position of the LMI 776 blocks on the fixture rail, so that when making a gap check, a perfect part will always be "read" as nominal or zero when gaged by the transducer (The flush check has no error introduced since it is always read in the correct orientation). As the included angle of the rail decreases from 90 degrees, the transducer reads gaps on an expanded scale up to a maximum of 0.10mm when the part is 1mm away from nominal at a 65 degree included rail angle and the part is at the nominal flush condition (see Figure 1, Page 3).

DETERMINE THE FIXTURE RAIL/PART TYPE CONFIGURATION

In order to correctly locate the LMI 776 blocks on the fixture rail, consideration must be given to both the included angle of the fixture rails and the shape of the part to be checked. There are two (2) general categories of Rail/Part systems (see Figure 1).

CATEGORY:

1. The first category is where the included rail angle is less than or equal to 90 degrees, and the part to be measured is a flange.

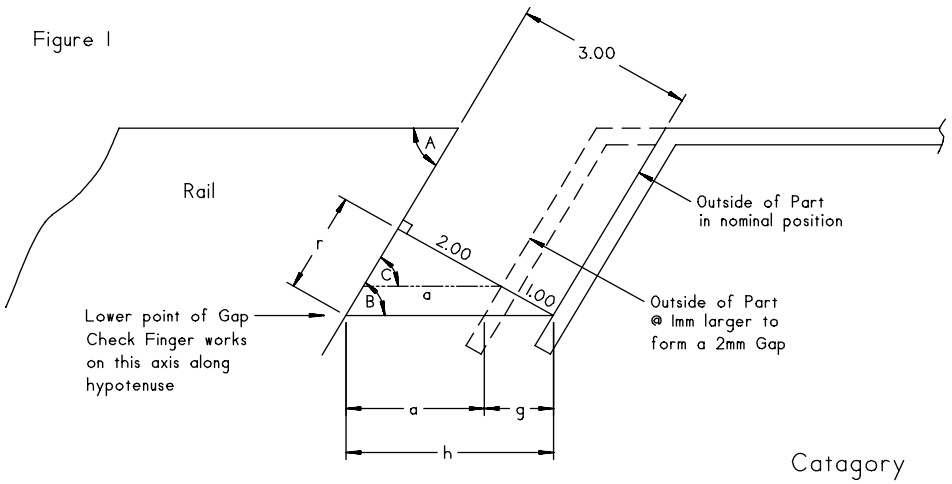
The second category includes two different Rail/Part systems:

2.1 The first system in this category includes any included rail angle from 74 to 110 degrees with a hemmed part. The metal thickness of the hem is assumed to be 2.5mm thick which means that it would be checked at a depth of 1.25mm below the top of the rail.

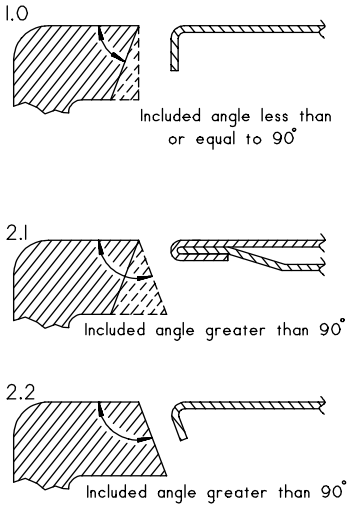
NOTE: If part thickness is different than above, call LMI Corporation to specify kit modifications.

2.2 The second system includes rail angles greater than 90 degrees where the part is an inboard flange. In this situation the transducer margin check pin touches the radiused part edge and checks it as if the part were hemmed as above.

Figure 1



Catagory



Included rail angle in degrees		Gap distance measured parallel to top of rail	Actual Transducer reading when gaging a constant 2.00mm gap measured parallel to front of rail
ANGLE	DIMENSION r	DIMENSION h	DIMENSION g
90	.000	3.000	1.000
89	.052	3.000	1.000
88	.105	3.002	1.001
87	.157	3.004	1.001
86	.210	3.007	1.002
85	.262	3.011	1.004
84	.315	3.017	1.006
83	.368	3.023	1.008
82	.422	3.029	1.010
81	.475	3.037	1.012
80	.529	3.046	1.015
79	.583	3.056	1.019
78	.638	3.067	1.022
77	.693	3.079	1.026
76	.748	3.092	1.030
75	.804	3.106	1.035
74	.860	3.121	1.040
73	.917	3.137	1.046
72	.974	3.154	1.052
71	1.033	3.173	1.058
70	1.092	3.192	1.064
69	1.152	3.213	1.071
68	1.212	3.237	1.078
67	1.273	3.259	1.086
66	1.338	3.284	1.095
65	1.399	3.310	1.103

Formulas

angle A = angle B = angle C

$$\text{Tan } B = \frac{3.00}{r} \quad r = \frac{3.00}{\text{Tan } B}$$

$$\text{Sin } B = \frac{3.00}{h} \quad h = \frac{3.00}{\text{Sin } B}$$

$$g = h - a = \frac{3.00}{\text{Sin } B} - \frac{2.00}{\text{Sin } C}$$

FIGURE 2

DRILL JIG TOOL CONFIGURATION GUIDE

CATEGORY 1 CHECKS

Flange Checks, included rail angle is less than or equal to 90 degrees.

Gap, Margin or Outline Specification	Part Type	LMI Tool #'s to be assembled together	Transducer Used
1.5mm gap checking 5.0mm below top rail surface	outboard flange	use 7015 with 7007	770-G, GF
3.00mm gap checking 5.0mm below top rail surface	outboard flange	use 7016 with 7007	770-G, GF
3.0mm gap checking 3.0mm below top rail surface	outboard flange	use 7017 with 7007	770-G, GF
6.0mm gap checking 5.0mm below top rail surface	outboard flange	use 7018 with 7007	770-G, GF

DRILL JIG TOOL CONFIGURATION GUIDE

CATEGORY 1 CHECKS

All Hem Checks, and Flange Checks where included rail is greater that 90 degrees.

Gap, Margin or Outline Specification	Part Type	LMI Tool #'s to be Assembled Together	Transducer Used
1.5mm gap checking 1.25mm below top rail surface	Hem or Flange	use 3029 with 7007	770-G, GF, GC & GG
3.0mm gap checking 1.25mm below top rail surface	Hem or Flange	use 3031 with 7007	770-G, GF, GC & GG
3.0mm gap checking 2.50mm below top rail surface	Hem or Flange	use 7014 with 7007	770-G, GF, GC & GG
6.0mm gap checking 2.50mm below top rail surface	Hem or Flange	use 7013 with 7007	770-G, GF, GC & GG

INSTALLATION OF A LMI 776 RAILMOUNT BLOCK ON A FIXTURE RAIL USING LMI 781, LMI 783, LMI 784, OR LMI 785 INSTALLATION KIT

*Assemble the LMI drill jig and set up detail (Figure 2).
*Locate the check point on the rail edge (Figure 3 Progressive View #1).
*Scribe a centerline and an "edge line" on the top rail surface using the LMI 7005 centering square (Figure 3 Progressive View #2).
*Align the LMI drill jig tool assembly on the top rail surface at the scribed "edge line" (Figure 3 Progressive View #3).
*Using the LMI 3023 transfer punch, mark the location to be drilled and tapped, for the LMI 7008 clamp down bolt.
*Remove the LMI drill jig assembly from the rail, then drill and tap a #10-32 hole 10mm deep for the clamp down bolt. The hole should be drilled perpendicular to the top of the rail (Figure 3 Progressive View #4).

SPECIAL NOTE: If the LMI 776 block is to be installed using the included jackposts, remove the two #36 ID drill bushings that are installed in the LMI 7007 drill jig block.
*Install the LMI drill jig assembly on the top of the rail using the #10-32 1 1/2"SHCS. Align the edge of the LMI drill jig block with the scribed "edge line" making sure that the attached setup detail is fully contacting the front surface of the fixture rail (Figure 3 Progressive View #5).
*Drill the two (2) #6-32 tap holes thru the LMI drill jig block using drills provided in kit part LMI 7003.

SPECIAL NOTE: If using jackposts, drill the two (2) 1/4"-28 tap holes thru the drill jig block using LMI 7004 drills provided in the kit.

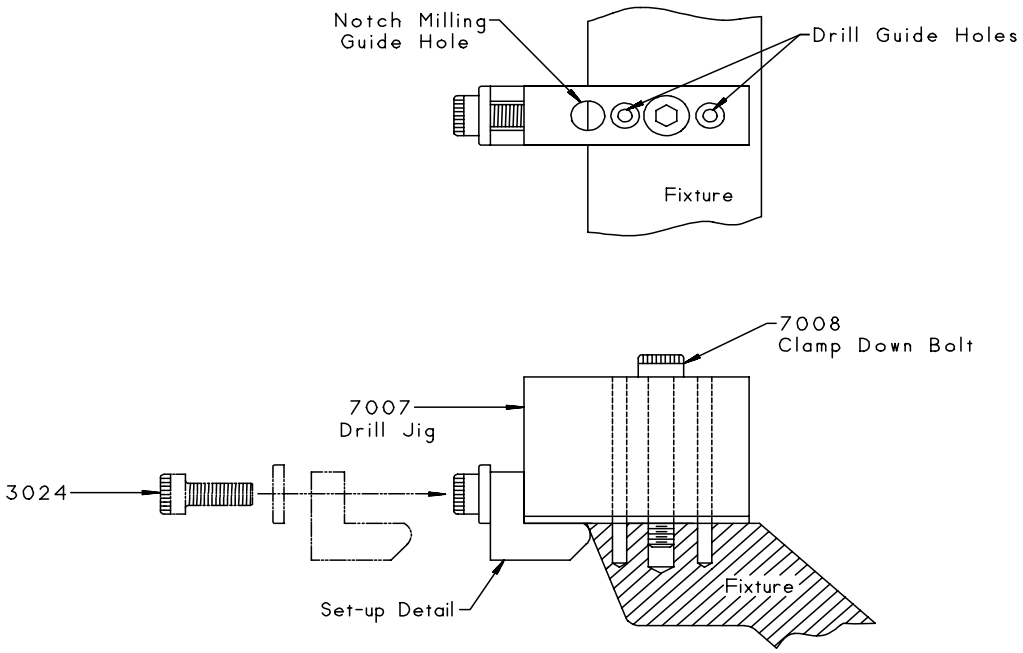
*Install the LMI 3019 carbide end mill into a high speed drill motor and insert the end mill into the drill jig block. Notch the rail approximately 7mm deep (the stop can be installed on the end mill to control depth) by running the drill motor at the highest possible speed. Be sure to stop the drill motor before removing the end mill from the drill jig guide block to avoid rapid block wear.
*Remove the LMI drill jig assembly from the fixture rail. Tap the #6-32 or #1/4-28 holes (Figure 3 Progressive View #6).
*Install the LMI 776 rail mount block on the rail and bolt it down using the 5/8" or 3/4" X #6-32 SHCS (included with the LMI 776 Block). Install the jackposts before the block if they are to be used.
*Lightly "snug" the gap simulator (LMI #7009) around the LMI 776 Block by adjusting the (2) adjustment screws located on the outside of the gap simulator (Fig. 4). Make sure the standoff screws contact the fixture rail.
*Adjust the LMI 776 block to its correct position by using a pre-mastered LMI 770-G flush and gap transducer and the LMI 7009 gap simulator (Figure 4).

NOTE: The gap simulator is setup with an edge simulator pin that simulates the radius of the part flange or hem (Figure 4). It is critical that the edge simulator pin stay adjusted so that the pin's radius is tangent to the "face" of the swing arm (this "face" is the surface that is used to set the gap).

SPECIAL NOTE: To set the gap on the gap simulator, the included "stand- off" set up screws allow for a 1.5, 3, or 6mm gap to be preset. The #7011 (3mm) set up screws are installed in the gap simulator when shipped. (Figure 4)

*When the block is in its correct position, dowel the block to the rail using the two (2) stainless steel roll pins provided with the block. A .0980" Diameter Reamer should be used to size roll pin holes.

Figure 3



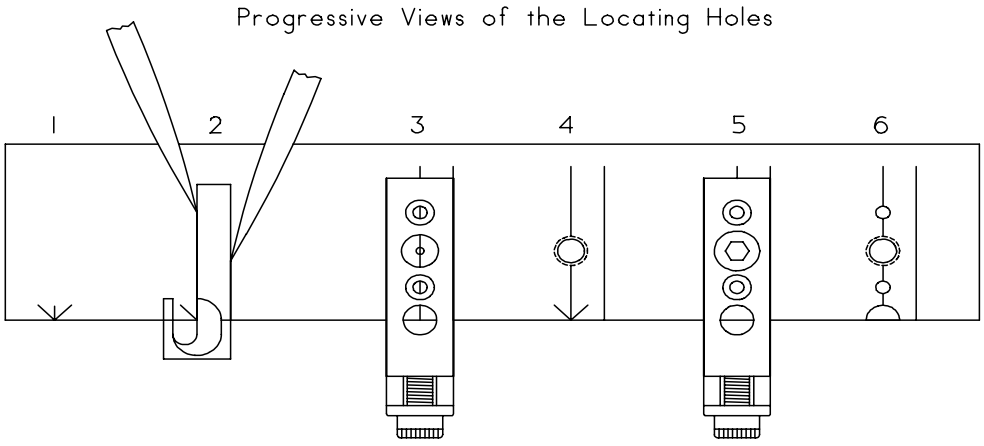


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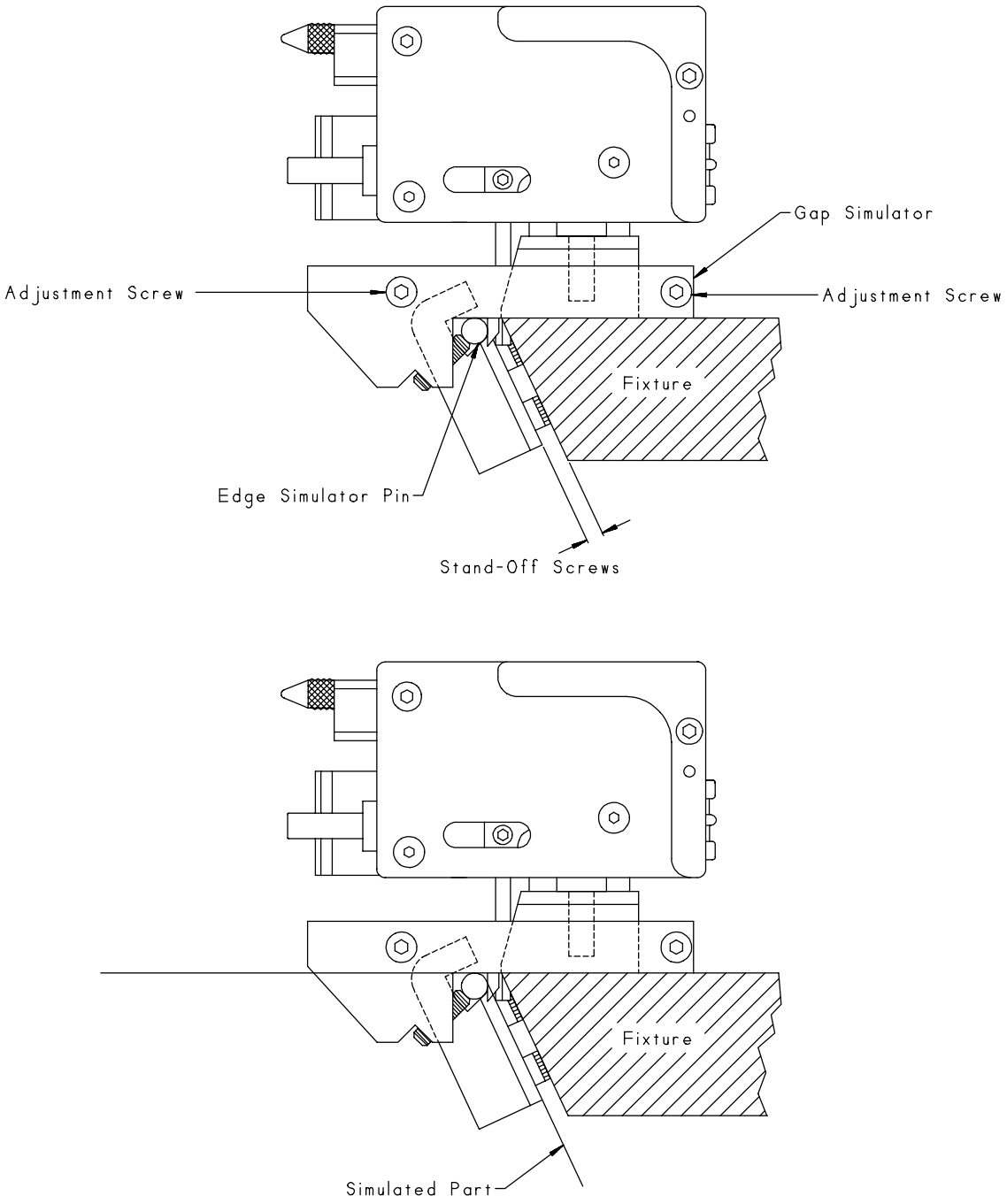
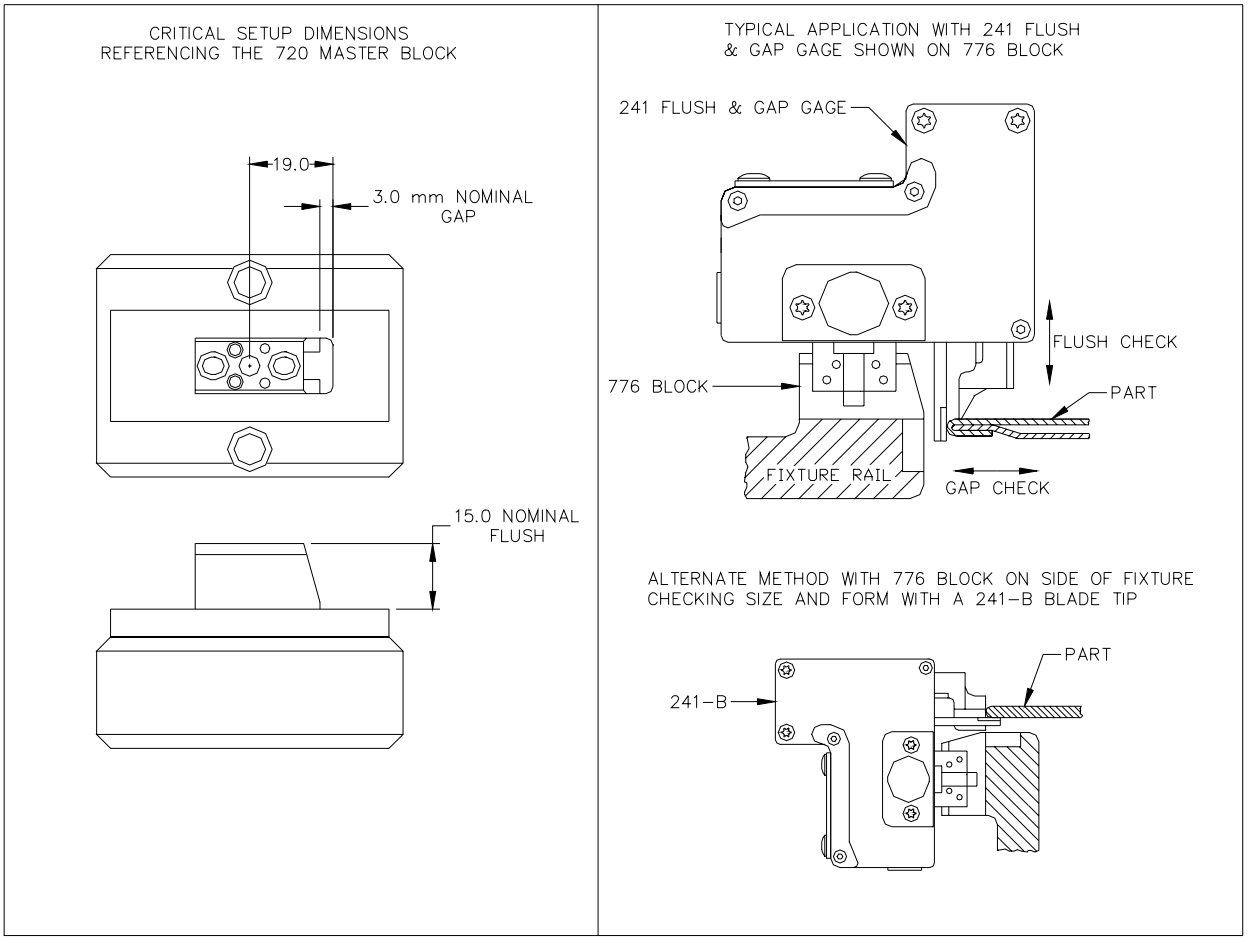
FIGURE 4



INSTALLATION OF LMI 776 MOUNTING BLOCKS

PRIOR TO INSTALLATION, BASIC FUNCTION

There are a wide variety of checking scenarios and the fixture designer and builder needs to be familiar with the function of the 776 block and its relationship to the actual measuring device. Tracing templates and CAD data are available to assist in mounting and determining the proper 776 block setup. The 776 block is used as a patented locating device for the LMI 241 flush and gap gage. The 241 measures flush and gap readings 90 degrees to each other, and is mastered to a 720 master block. The fixture should be set up to relate the nominal/perfect part size to this known reference. See the drawings below and the templates in your catalog for reference.

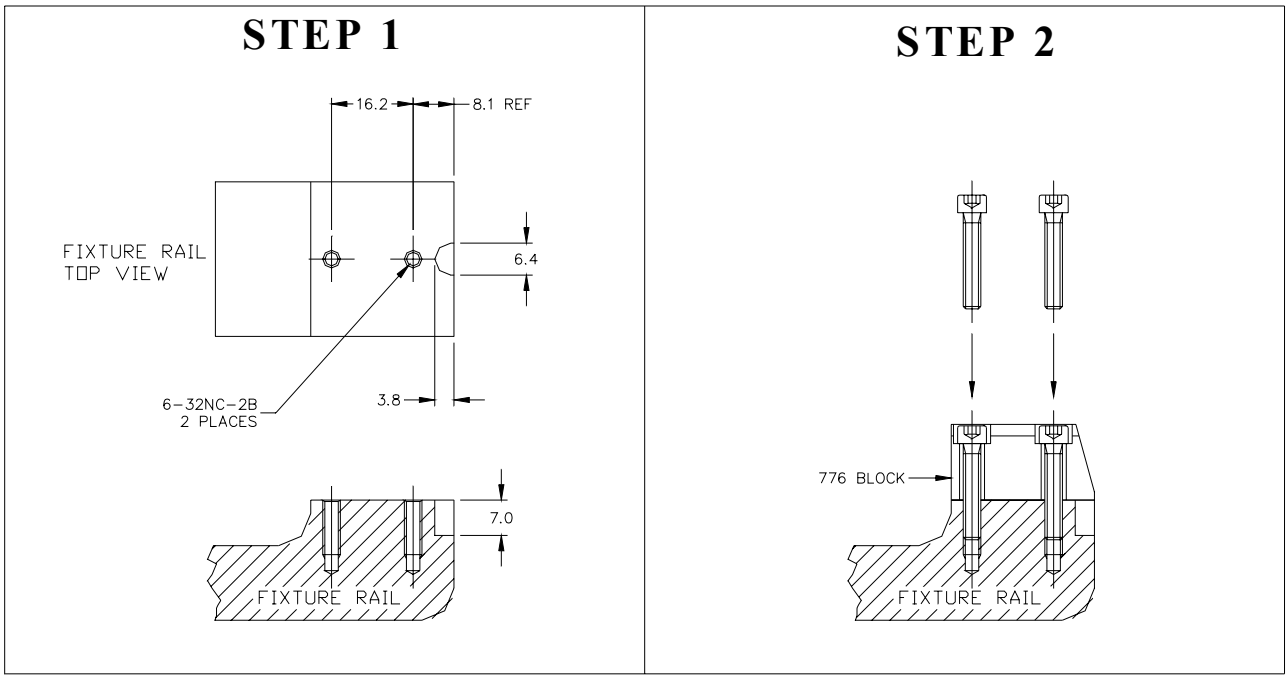


BASIC MOUNTING:

The following is a general guideline on mounting the 776 blocks. Changing some of the specific mounting dimensions may be required depending on part geometry, part specifications or the fixture design. Use the following drawings to relate to each step of the mounting procedure. The directions below assume the rail is perpendicular to the part and the nominal gap on the part is 3.0 mm. Feel free to contact LMI for additional technical assistant.

STEP 1 - At each check point, drill and tap two 6-32 holes for the socket head cap screws supplied with the 776 block. Machine a clearance notch into the front of the fixture rail for clearance for the gap pin on the 241 gage. The standard 241 gage has a gap pin that extends 5 mm below the fixture surface so a 7 mm deep notch should be sufficient. The holes and clearance notch are usually machined into the fixture with a CNC machine or an LMI 7007 drill jig is available.

STEP 2 - Mount the 776 block onto the fixture using the supplied screws. Snug the screws into the slotted counter bored holes so the block can be adjusted for next step of certifying the block into location.



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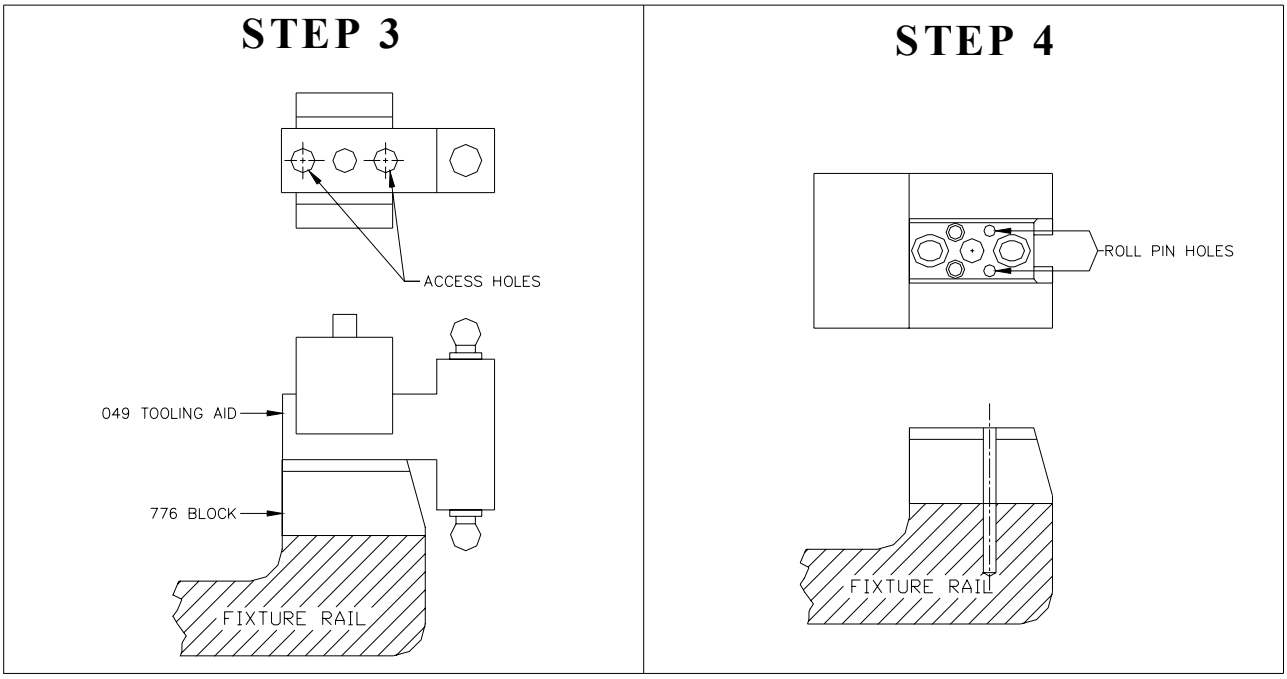
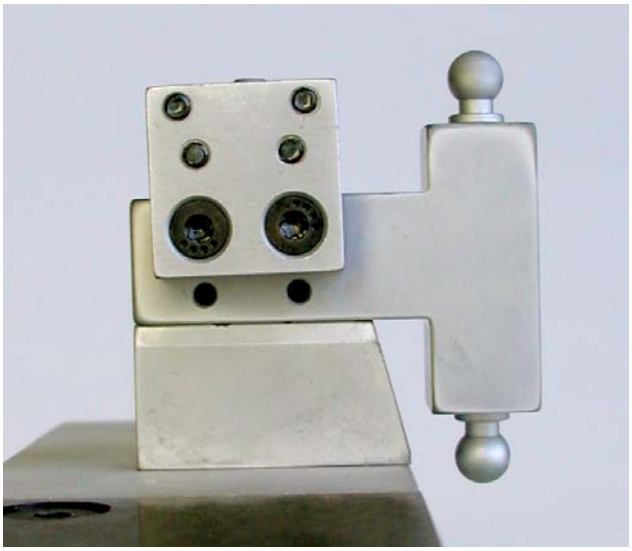
STEP 3 - Use a 049 Tooling Aid and a CMM to indicate the position of the tooling balls to properly locate the 776 block. It is critical to reference the tracing template for the tooling aid and the 776 block to accomplish this. To find the edge of the theoretical perfect part (assuming a 3 mm nominal gap) simply subtract 5.0 mm from the center of the tooling balls which is 24.0 from the center of the locating post. (24.0-5.0 = 19.0) Once the block is properly positioned use the access holes in the 049 to tighten the 6-32 mounting screws.

STEP 4 - Drill through the secured 776 block and pin the block into location using the supplied 3/32" diameter roll pins.



The pictures below show an 049 Tooling Aid on a 776 block and the top view of a mounted 776 block.



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1. The 3/32” dowel pins have been replaced with the 3/32” roll pins. Do not mix these 776 blocks with blocks received prior to 7/15/1994. Rail Mount Blocks received prior to this date have a smaller dowel pin hole size.

2. The jack posts and set screws used to mount the LMI 776 block are now sold separately.

3. This product is protected by one or more of the following United States Letters Patent:

4,731,935	4,831,742	4,843,727
4,787,151	4,831,743	

Any unauthorized manufacture, use and/or sale of the products are strictly forbidden and will subject anyone engaging in such unauthorized activities to legal action for patent infringement with resultant monetary penalties and punitive damages.