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# EVO: Engine Mechanicals - Sub-04C

## Installing the Rocker Boxes

See also in the Sportsterpedia;

- [Removing the Rocker Boxes](#)
- [Rocker Box / Rocker Arm Inspection and Servicing](#)

One issue in installing the rocker box is that it has no alignment method. <sup>1)</sup>  
Basically, every time you put it on, it's in a different place.

When installing the rocker boxes, be sure to put them on with the engine positioned such that the cams aren't trying to open the valves. <sup>2)</sup>  
Else you can damage parts.

## Compatibility

Middle rocker box:

The 86-90 doesn't incorporate the area where the umbrella flapper valve would go. <sup>3)</sup>  
So due to functionality, the 86-90 mid section won't fit 91-03 boxes.  
But the 91-03 middle cover will fit 86-90 boxes.

## Gaskets

Clean the mating surfaces of all oil / trash before setting the gaskets in place.  
With the bolts 'lightly' hand seated, check all around the box for a gasket squirting out the side before tightening the bolts.  
It's easy to 'just nudge' the top section and squeeze a portion of the rubber gasket out while positioning it.  
See [TT#253](#) regarding the top rocker box gasket.



## Bolt Installation Sequence

The FSM details the proper installation sequence of the bolts.  
Installing the bolts in the proper order prevents potentially warpage of the cover(s).  
It also mentions making sure that both valves are closed prior to removal.

On assembly, it's even more important to slowly tighten things in the proper order to allow the lifters to bleed down.

(prevents things like bent push rods and destroying the cam bushings).

Also, make sure you can spin the push rods BEFORE turning the motor over the first time.

Obviously, you can skip these steps and get lucky.

But, why? Just follow the manual, it's easy enough to do correctly.

Below are pictures of the lower rocker box.

The circled areas are where the bolts would be:

### On assembly: <sup>6)</sup>

- Work in this order. Blue→red→yellow.  
It is suggested to do this slowly (one turn at a time) and for the blue ones to do it in a cross pattern.  
This is to bleed the lifters properly.
- An easy way to remember the order is to work from the larger bolts to the smaller ones.
- If you start with the red ones, you can easily strip the threads in the heads.

### Torque values:

Installing the bolts in the correct order doesn't take much longer and saves some potential headaches.  
While many experienced guys won't use a torque wrench on the smaller fasteners, it is suggested to use one.

It doesn't take much to strip one of these for new or experienced mechanics.

- Blue - 18-22 ft-lbs
- Red - 135-155 in-lbs
- Yellow - 135-155 in-lbs



## Check Pushrod Length

A hydraulic lifter has a plunger in it's body that has about .200" of movement. <sup>9)</sup> Oil sits under the plunger and pushes it up to take the slack out of the valve train.

In the ideal world, the plunger is approximately centered in it's travel, meaning it's preloaded about .100".

So in theory,

It could move up, thus lengthening the effective length of the lifter to compensate for a pushrod that's up to .100" too short.

And likewise, it could move down, thus shortening the effective length of the lifter to compensate for a pushrod that's up to .100" too long.

This self adjusting action is also useful for compensating for changes in needed pushrod length due to engine temp variations.

As the motor heats up, the top end grows and the lifter automatically takes up the slack.

In reality,

The useful operating range of the lifter plunger is only about .050" in either direction away from centered (.050" to .150" of preload).

Outside of this range, the self adjusting function doesn't work nearly as well.

You can measure lifter pre-load to determine if the pushrods are in the size range needed. This method will get you close. <sup>10)</sup>

The cam lobes should be down (as they should be when installing a rocker box).

Set the pushrods in place (the longer one goes on the exhaust) and then place the gasket and rocker box on top installing the four big screws only.

Finger tighten the left (spark plug) side, while making sure the right side is resting with the upper pushrod ends sitting in the cups on the rocker arms.

Use a caliper to measure how much gap you have between the rocker box and the rocker box gasket.

The lifter preload should be app. .100" but anywhere between .050" and .150" should work.

Aftermarket pushrods can be purchased in longer or shorter lengths than stock ones to get the measurement within .100".



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3)

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<https://www.xlforum.net/forum/sportster-motorcycle-forum/sportster-motorcycle-era-specific-and-model-specific/frame-mount-evo-sportster-talk-1986-2003-models/90479-rocker-box-difference?t=732143>

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9) 10)

<http://www.hammerperf.com/ttpushrodlength.shtml>

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