

Mamba Motorsport

Installing & setting your cam

Thank you for purchasing one of our camshafts. Having spent a lot of time & money rebuilding your engine, please take care to correctly install & time your camshaft. Hopefully you will find these notes useful in guiding you through the correct process.

Please ensure you have had new cam bearings installed and that you are using new cam followers and have the following tools at hand as a minimum:

A Plunger type Dial Indicator Gauge attached to a magnetic stand – (say 1” travel & 2” diam dial)

Feeler gauges

An engine “Timing Disc”

If using a chain drive you will need a straight edge (Steel rule will suffice)

It is assumed you are using a Vernier cam drive gear & cylinder head is not fitted.

Camshaft end float

Fit front timing plate and gasket.

Lightly lubricate the cam lobes, journals & followers with the supplied assembly grease, install followers and very carefully install camshaft (do not fit key yet!). Ensure the cam rotates freely in the bearings.

Fit a new camshaft thrust plate. Now fit your timing gear and just nip the retaining nut to hold the gear against the journal.

Use your dial gauge to measure the longitudinal movement of the cam (end float). You are looking for 0.003” - 0.005”.

Any less and it will bind any more and you may encourage timing scatter from the helical distributor drive.

You may need to adjust the thrust plate thickness, How you achieve this depends on what facilities are available to you. You may need a visit to your machine shop to have it put on a surface grinder.

Crank & cam gear alignment for chain drive

It is best if crank key is not fitted yet as shims cannot be added or removed with it in!

Leaving correctly fitted cam gear in place, ensure 2-3 shims are fitted on crank nose & fit crank gear – gently – use a plastic mallet if necessary – but you are looking to ensure cam and crank gears align using your straight edge.

When they do (or do not!), use a feeler gauge to determine whether to add or remove shims. When happy remove crank and cam gears and fit keys.
Check for gear fit over keys before proceeding.

Mounting & setting the Timing Disc

OK, first things first. You need to decide how and where to mount your timing disc. So, a couple of things to consider:

If you mount to the crank nose, you may need to remove & remount during the cam timing process (crank gear may need to be removed & refitted especially if using a chain drive). You will also need a donor crank pulley bolt with a tapping in the hex centre to mount the disc to – or you can try just using a pair of washers one each side of the disc and a crank pulley bolt.

If you opt to mount to the crank drive flange, you can use a much bigger diameter disc (therefore more accurate). You will not need to remove during the timing process BUT you will need to either have the engine side mounted on a stand (we always do) or temporarily fit the sump pan to stand engine on.

We also recommend fitting a pair of over length bolts (or use two “short” head studs) with lock nuts in opposing tappings in the drive flange so the engine can be turned easily with a pry bar or similar,

Either way here is how to start by ACCURATELY determining Top Dead Centre (TDC):

Setting TDC for No1 Piston

Having mounted a Timing Disc, turn the engine until it is at what looks like No1 TDC. Then mount a stiff wire pointer to the block & set it to zero on the disc (adjust disc or pointer & lock up).

Now mount your dial gauge to the block deck using the magnetic base and ensure DIG plunger is as near the centre of the piston as possible to eliminate any piston rock which will affect your dial readings. Ensure the gauge is set to read zero with a little pre load.

Now rotate the engine in direction of normal rotation (clockwise from the front!) until the DIG drops 0.020”. Note the reading on the Timing Disc.

Rotate in the opposite direction past zero until the DIG drops to 0.020” again. Note the reading on the Timing Disc.

The point mid way between is true TDC.

(ie: if say 110 & 98, add together & divide by 2 = 104. Turn crank to the 0.020” @ 110 point and adjust pointer to 104). This should give you true TDC.

Repeat the process to check your true TDC is correct.

Timing camshaft

Your cam has been supplied with setup information – position of crankshaft After Top Dead Centre with No1 inlet at full lift.

So, first fit a pushrod to No1 inlet ensuring it is fully engaged in the follower. Set your DIG with plunger and pushrod vertical and in centre of hole so that you can measure lobe lift. Again ensure that the DIG plunger has a little preload with the cam at zero lift. Ie on base circle.

At this point, if you are using a belt drive system ensure any casings etc are fitted as per manufacturers instructions.

Start by setting your vernier gear to mid point of adjustment and just nip two opposing bolts to hold.

Rotate cam to best guess at full lift No1. Set DIG to zero.

Rotate crank in direction of rotation from No1 TDC until No1 piston is at the desired degrees AFTDC (Usually between 100 – 110).

Now the fun begins. You need to fit your drive train. This can be very frustrating, so take your time to get the crank gear engaged with its key without moving the crankshaft and get the cam gear as close to keyway engagement as possible – you may need to rotate the camshaft slightly to engage.

You may end up repeating this several times before you are done, so be patient – it needs to be right.

With the drive train fitted, rotate the crank in direction of normal rotation to keep the drive chain tensioned (or a tensioned belt) until No1 piston is on its intake stroke – watch your DIG – when you reach a point where the DIG indicates the peak of the lobe has been reached, reset DIG to zero.

Continue to turn the crank in direction it runs until the DIG drops 0.020” . Record the reading from the timing disc.

Rotate the crank in the opposite direction back past zero on DIG until it drops say 0.040” then bring back to 0.020”. (this ensures you maintain tension on the drive). Note the reading on the Timing Disc.

Add the two disc readings together and divide by 2, this is where your cam timing now is. (for example $110 + 104 = 214$ divide by 2 = 107),

Adjusting your vernier accordingly, repeat until your timing is where it needs to be. If you run out of vernier adjustment you will need to reposition the chain/belt accordingly (remember cam gear is much smaller adjustment than crank gear).

TIP: Before removing gears, use a straight edge across gear centres and using a marker pen, mark the adjacent gear faces so you know where you were if you fumble the gears.

Make sure you tighten all fasteners according to your manual and we recommend you double check the timing before putting the covers on as it has been known to creep when tightening things up!

Before you remove that timing wheel – take the opportunity to accurately mark up TDC for your ignition timing :)