



SPACE-N-TIME TOOL MASTER KIT INSTRUCTIONS

PART # D7020MK

CONGRATULATIONS! You have just purchased the most innovative and practical tool available for 1970 to 1999 “Big Twin” single cam **HARLEY-DAVIDSON*** style engines. This **DELKRON** tool is all you will need to professionally setup everything in the cam chest of your engine. By simply following these step by step instructions, you can build a more durable and powerful engine in a lot less time than other methods by eliminating the “*Guess Work*” and building an engine with true confidence and peace of mind.

CAMSHAFT END-PLAY

The recommended camshaft end-play for a high performance application is .005” to .015” with .010” being the nominal target. The following method will allow you to check your camshaft end-play.

DIAL INDICATOR METHOD – With your camshaft installed, using **ONLY** the thrust washer, install your **DELKRON** Space-N-Time tool, along with your cam cover gasket in place of your cam cover and torque the tool to the crankcase (use OEM torque spec.)

Mount the dial indicator to the outer face of the tool so that the indicator shaft is in line and contacting the camshaft end protruding through the tool. Push the camshaft back

towards the inboard cam bearing in the crankcase and zero the indicator dial ... now push the camshaft outwards towards the tool and take your reading. This reading will be your **TOTAL CAMSHAFT END-PLAY** ... now subtract .010" from this reading and this will be the amount that you will need to shim your camshaft to achieve a **PREFERRED NOMINAL END-PLAY** ... Example – TCEP = .075" - .010" = .065" camshaft shim needed.



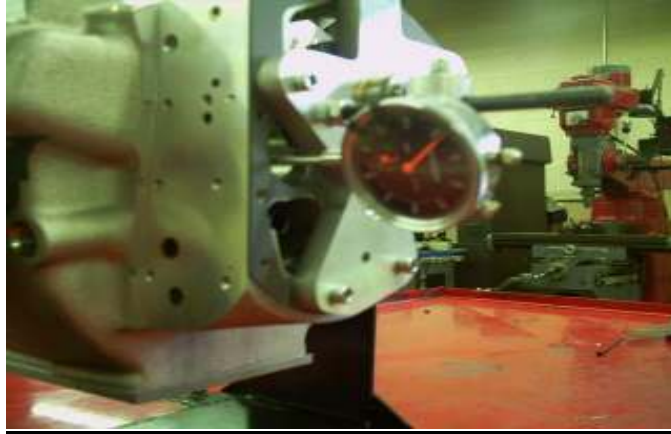
SETTING CAMSHAFT END PLAY

BREATHER GEAR END-PLAY

The recommended breather gear end-play for a high performance application is .003" to .006". The following method will allow you to correctly check your breather gear end-play.

DIAL INDICATOR METHOD – With your breather gear and breather gear spacer installed in the breather port of the crankcase, install the cam cover gasket and the **DELKRON** Space-N-Time tool in place of your cam cover and torque it to OEM specifications. Mount the dial indicator to the face of the tool with the indicator shaft in line and touching the face of the breather gear. Push the breather towards the crankcase and zero the indicator dial ... now push the breather gear outward towards the tool. This reading will be your **TOTAL BREATHER GEAR END-PLAY**. Make any necessary adjustments by increasing or decreasing the thickness of the breather

gear spacer in relation to the dial indicator reading to achieve an end-play of .003” to .005”



SETTING BREATHER GEAR END PLAY

BREATHER GEAR TIMING

The recommended breather gear timing in a high performance application is for the opening event to occur no sooner than 10 degrees **BTDC** and no later than 10 degrees **ATDC**, with the closing event occurring no sooner than 55 degrees **ABDC** and no later than 75 degrees **ABDC** on the **FRONT** cylinder.

To check the opening and closing event of the breather gear, install the camshaft, pinion gear, and breather gear, being sure that all timing marks on the gears are in alignment. Install the **DELKRON** Space-N-Time tool with the cam cover gasket to the crankcase and torque to OEM specifications. Determine TDC of the front cylinder and install the degree wheel of the **DELKRON** Space-N-Time tool to the pinion shaft using the aluminum pinion shaft adapter and ½” allen head bolt and washer supplied with the tool.

Set the degree wheel to zero at **TDC** and rotate flywheel assembly counter clockwise to 10 degrees **BTDC**, note position of breather gear window, it should be closed. Now rotate flywheel assembly clockwise to 10degrees **ATDC**, the breather gear should start to open between these two areas, make note of the degree that the window starts its opening event. Continue rotating the flywheel assembly clockwise until 55 degrees **ABDC**, noting the position of the breather gear window, it should still be open. Continue rotating the flywheel assembly clockwise to 75 degrees **ABDC**, the breather window should start its closing event between these two areas.

If the opening and closing events of the breather gear do not fall within the specified areas, then either the window in the breather port of the crankcase will need modification or the breather gear will need to be modified. The window in the breather port of the

crankcase can be modified by machining the top and bottom edges of the window to bring the opening and closing events into specification ... *care must be taken to ensure that too much material is not removed during this process.* Another method (preferred) of modifying the opening and closing events of the breather gear is to modify the breather gear its self. This can be done by indexing the breather gear clockwise or counter clockwise until the events are with in specification. Once the events are within the specified range of degrees adjust the timing mark on the breather gear to indicate its new timing location. Also, there are after market breather gears that are available that allow for the gear to be indexed to achieve the opening and closing events that are needed.



SETTING BREATHER GEAR TIMING

CAMSHAFT TIMING

Camshaft timing is a very important aspect of building a high performance engine. This particular issue is not as important in a “*street*” application, but it does not hurt to have it right. With varying tolerances in machining of the flywheel components, camshafts, and valve train components it can be somewhat difficult to achieve accurately timed valve events.

Accurate valve timing events can be achieved using the **DELKRON** Space-N-Time tool.

Different camshaft manufacturers use different camshaft specifications, but most use either .020” or .053” of camshaft lift. If the camshaft that you are using does not specify a particular starting lift then it is recommended that .053” of camshaft lift be the starting point ... if the camshaft that you are using does specify a particular starting lift then be sure to use that measurement.

It is very important to locate true “TDC” to accurately set camshaft timing. After locating “TDC”, rotate the flywheel assembly clockwise until the front intake lifter is on the heel of the camshaft (*lowest point of travel*), place the dial indicator in position with the front intake lifter, with the axis of the dial indicator in line with the front lifter axis and zero the indicator dial. You will be checking the front intake closing event. Slowly rotate the flywheel assembly forward until you arrive at maximum lifter lift, and then continue to slowly rotate the flywheel assembly clockwise until the dial indicator reads .053” or the specification that the manufacturer has stated. Now check the position of the degree wheel and note the degrees at this position. The reading on the degree wheel indicates the timing of the front intake closing event in crankshaft degrees. This should correlate to the closing specifications stated by the camshaft manufacturer. If the measurements do not match that of the manufacturer, camshaft timing can be modified by pressing the drive gear from the camshaft and indexing it to achieve the correct timing event ... care must be take in doing this or irreparable damage can be done to the camshaft and gear. If the camshaft drive gear is moved it is imperative that the timing event be rechecked or severe engine damage can occur.



DEGREEING CAMSHAFT

Special note – Only rotate the flywheel assembly clockwise, do not change direction of rotation during the camshaft timing exercise. Changing rotation direction can result in erroneous readings due to backlash in the camshaft and pinion gears.

As stated earlier in this section, for “street” application this is not a crucial issue, and +/- 2 degrees is a very acceptable number, but for all out race engines this is a very important process with no room for variance.

LOCATING TOP DEAD CENTER (TDC)

Locating and knowing your engines true **TDC** is very important, and is crucial to engine performance. With the **DELKRON** Space-N-Time tool you can achieve true **TDC**, which will allow you to optimize your camshaft, breather gear, and ignition timing to achieve maximum performance from these components.

DIAL INDICATOR METHOD WITH CYLINDER HEADS INSTALLED - Using one of the dial indicator adaptors screwed into the spark plug hole rotate the engine clockwise until the front cylinder piston is approximately a ½” before **TDC**. Now install the dial indicator into the adaptor until it gently touches the piston. Next, continue to rotate the flywheel assembly clockwise, watching the movement of the dial indicator needle. The dial indicator needle will continue to advance and then stop and start to reverse its movement. True “**TDC**” has been achieved at the point when the dial indicator needle has stopped its advancement and started its reversal. Set the DELKRON Space-N-Time degree wheel to zero (0) at this time.



LOCATING TRUE “TDC” WITH HEADS ON

DIAL INDICATOR METHOD WITH CYLINDER HEADS REMOVED – Using the cylinder hold down knobs gently secure the front cylinder to the crankcase. Install the DELKRON Space-N-Time dial indicator cylinder bridge over the top of the cylinder with the dial indicator installed in the bridge. Slowly rotate the flywheel assembly clockwise until the deck of the piston contacts the dial indicator probe. Now continue to rotate the flywheel assembly clockwise watching the movement of the dial indicator needle. The

dial indicator needle will continue to advance and then stop and start to reverse its movement. True “TDC” has been achieved at the point when the dial indicator needle has stopped its advancement and started its reversal. Set the DELKRON Space-N-Time degree wheel to zero at this time.



LOCATING TRUE “TDC” WITH HEADS REMOVED

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