

Table of Contents

REF: Engine Mechanicals - Sub-07G	3
Further Study of the Timed Breather Valve	3
Air / Oil Path Out of the Crankcase	3
Details in Pictures	4
Breather Gear Specs and Information	5
Breather Gear Pics	6
Breather Gear Timing Events	6
<i>Timing events for 1 crank rev</i>	6
<i>Pressures changes in the crankcase for 1 rev</i>	7
<i>Comparing Amount of Vacuum Created</i>	9

[Go To Technical Menu](#)

REF: Engine Mechanicals - Sub-07G

Further Study of the Timed Breather Valve

Air / Oil Path Out of the Crankcase

In stock configuration, most all used oil ends up in the flywheel cavity.

Pressured oil in the rocker boxes splashes oil to the exhaust valves and enters the crankcase through the head drains.

The rotary breather valve functions to relieve crankcase pressure and scavenge oil from the crankcase.

It also controls the flow of oil in the lubrication system.

The breather valve does not pull any oil or air out of the crankcase. Piston downstroke does that.

The breather is nothing more than a window of opportunity for air and oil to escape the crankcase.

It's timed to engine rotation, opens just after piston downstroke and closes at Bottom Dead Center (BDC) 71< or 85°-90° (ABDC) after piston upstroke begins 72-76 respectively.

Piston downstroke provides "pushing power" to usher the oil into the rear oil slot in the case and to the oil trap in the gearcase at the breather window.

The FSM states that it is the flywheels that sends air and oil into the scavenge path to the gearcase.

This isn't the whole story. The oil slot (or galley) is taller than the scraper. Oil has to be "ushered" there by downstroke and wheel motion.

The volume under the pistons on downstroke pushes oil thru the slot to the oil trap at the breather gear.

The wheels alone are not powerful enough to push oil from under the scraper and into the slot pushed against the breather valve.

The flywheel scraper provides forward windage in the crankcase but can't scavenge oil by itself.

Most of wheel windage is above the scraper.

Oil gets behind and under the scraper from gravity as well as the wheels.

Anything that is thick enough on the wheels to be slung off will hit skirts, piston unders, walls, crank bearings etc. and fall below the scraper.

Anything that slides down the wall will fall below the scraper.

Gravity holds it there under the scraper. The wheels are done with it until the oil shows up on the rear end.

The force from downstroke pushes oil to the slot. However, on the that end, higher windage and vacuum CAN pull it back up instead.

The scraper won't stop that and air can only leave thru through the oil trap.

So the scraper keeps oil from perpetually wrapping the wheels.

Piston downstroke pushes both oil from under the scraper to the oil slot and to the oil trap and exhaust air to the oil trap as well.

The breather window is rotated to where the window is exposed to the crankcase area and oil and exhaust air pressure is pushed into the center of the gear.

From there, oil and air is spun out the top of the hollow gear into the gearcase and further oil separates thru stages to lube moving parts on from there.

Opening and closing times of the different breather valves are below but the exact opening-closing points may vary between engines.

As the pistons rise, the breather window is closed and vacuum begins building in the crankcase until the pistons reach TDC.

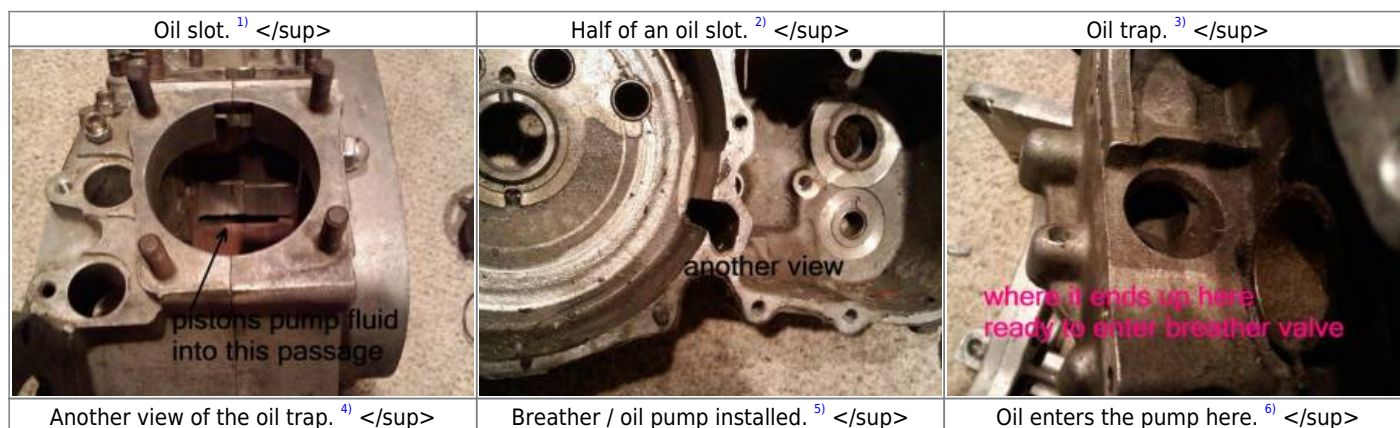
Then the whole cycle starts over again.

Details in Pictures

The pics below show the flow from the flywheel cavity to the return pump (applies to 76< only).

- The slot that runs East and West on the rear wall leads to the oil trap near the breather gear.
(oil galley, oil slot, oil passage, maybe other names for it)
That is the way out for both air pressure and pressurized oil from piston downstroke.
- The oil trap is a compartment (or temporary trap) that is sealed off from the gearcase by the breather window being closed.
Both the two different breather windows open after the pistons start decending.
The pistons create positive air pressure before the breather opens (later down the cylinder).
So when the breather opens, oil and air are shot out of the gear faster since the piston has now built up some juice behind.
So air and oil is "trapped" there momentarily by piston pressure during downstroke.

XL / XLCH scavenge oil path out of the crankcase.





Breather Gear Specs and Information

Breather Gear #	Factory Year Model	Timing
26331-52	1952-1955 K Models	
Notes:		
26331-56	1956 KH / 1957-1959 Sportster	Opens 25° (ATDC) and Closes at (BDC) ⁷⁾
Notes: Timed off front cylinder. The window is open for 155° of rotation. Full vacuum is created for 135° of upstroke travel of each cylinder and continues to TDC front cylinder.		
26331-60	1956 KH, 1960-1971 Sportster	Opens 25° (ATDC) and Closes at (BDC) ⁸⁾
Notes: Replacement for breather gear 26331-56. Timed off front cylinder. It came with the new breather and scavenge gear set (26330-56). The window is open for 155° of rotation. Full vacuum is created for 135° of upstroke travel of each cylinder and continues to TDC front cylinder.		
26331-72	1972-1976 XLH/XLCH	Opens 20°-25° (ATDC) and Closes 85°-90° (ABDC) ⁹⁾
Notes: Timed off front cylinder. It's open for 245° of rotation. This is the same as the XR model preferred specs. ¹⁰⁾		
26331-56R	1970 XR-750	Opens 16°-20° (ATDC) and Closes at 80°-85° (BDC) ¹¹⁾
Notes: Timed off front cylinder. 1/4 speed oil pump		
26331-72R	1972 XR-750	Opens 14°-16° (ATDC) and closes 85°-90° (ABDC) ¹²⁾
Notes: Standard version. Timed off front cylinder. 1/4 speed oil pump (2:1 ratio).		
26331-72R	1972 XR-750	Opens at 5° (ATDC) and closes at 105° (ABDC) ¹³⁾

Breather Gear Pics

1957 to 1976 Sportster production pump breather.	Notes: Improved timing version. Slot in upper cover must be widened to app. .340" to make pump breathe. 1/4 speed oil pump (2:1 ratio). Still timed off front cylinder.	
26331-74R 16)	Some of amf's signature quality control. These are 3 - 72 breather gears. 17)	A closer view 18) No timing slot 14)
26331-56 used 57-59 26331-60 used 60-71 26331-72 used 72-76  note the 2 different retaining grooves	Engine has a bolt on sump and Breather valve has been  Turn rear piston to T.D.C. and line up 0.12" dia. hole in gear shaft with notch in breather sleeve.	a 1/4 speed oil pump (2:1 ratio).  note the relationship from timing hole to tooth
Left is the unmodified 1/4 speed R valve. Right is the 1000 stock.	R model is the left one.	
		

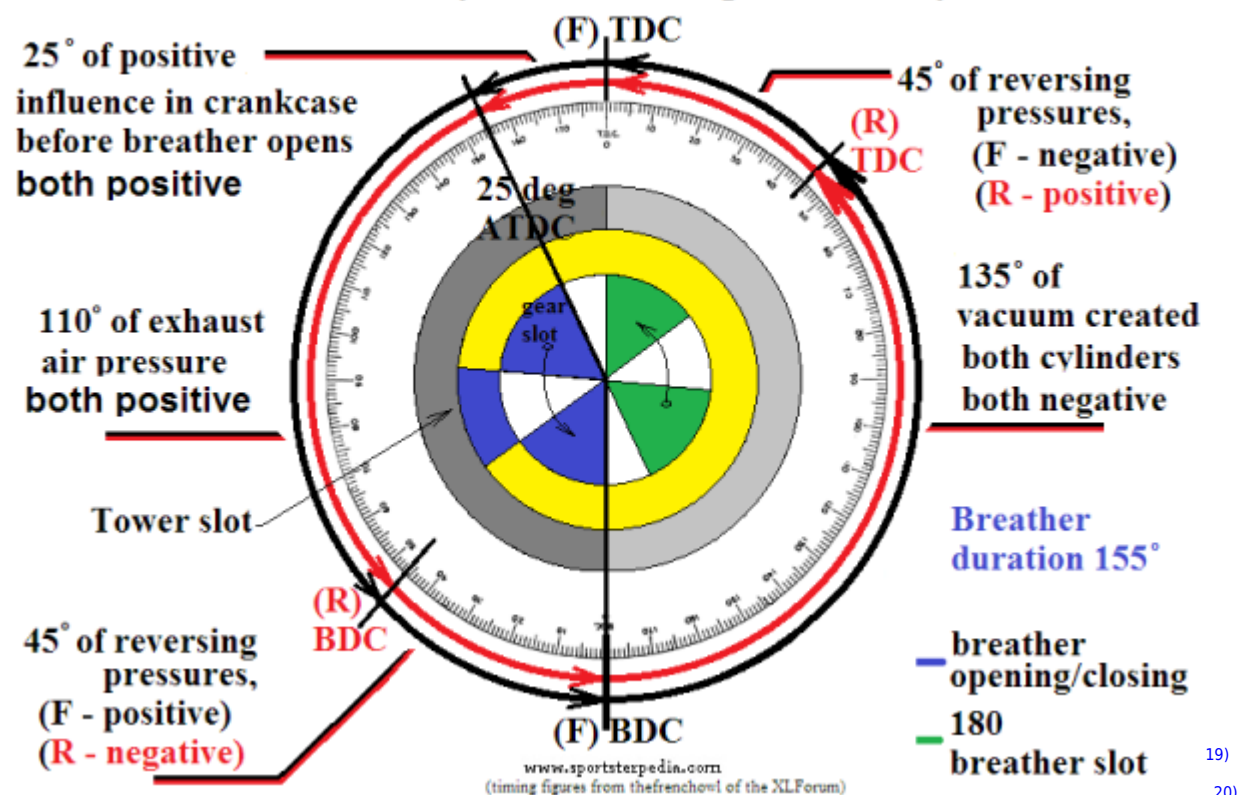
Breather Gear Timing Events

Timing events for 1 crank rev

1957-1971 Sportster Timed Breather Cycle

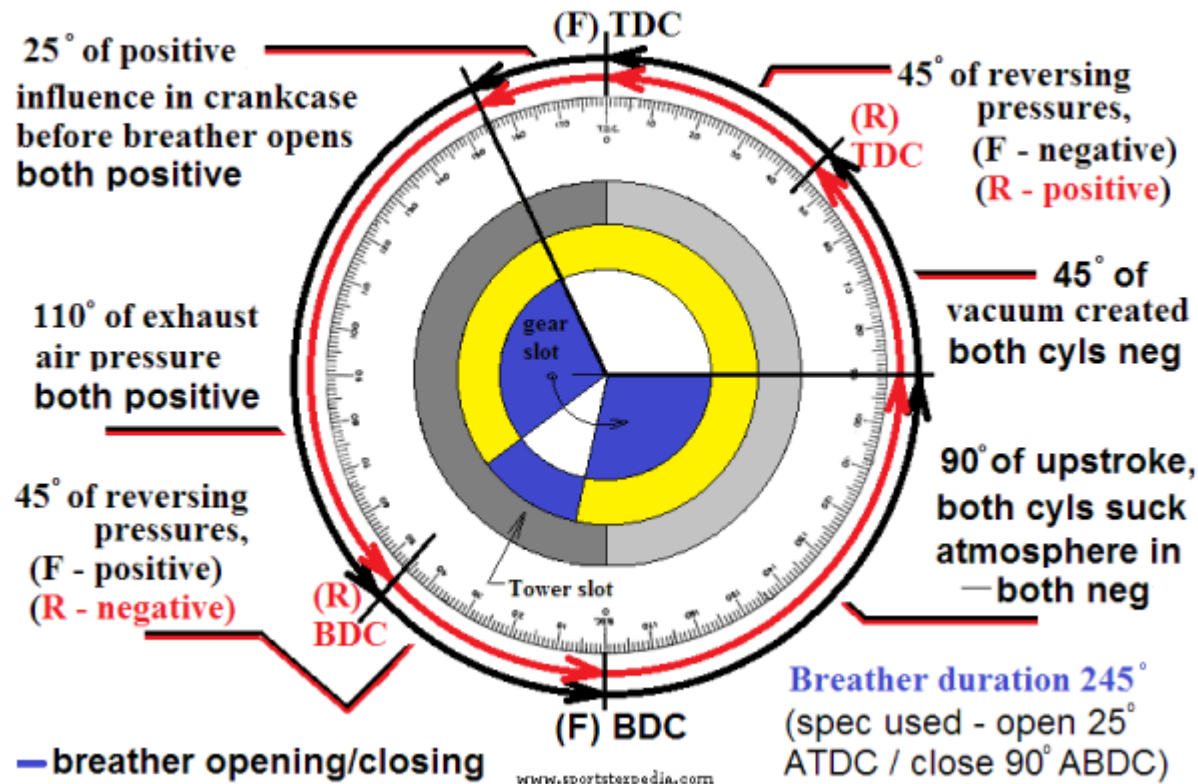
1957-1971 Sportster Crankcase Pressure Cycle

One crank rev shown, front cylinder, w trailings from rear cylinder



1972-1976 Sportster Crankcase Pressure Cycle

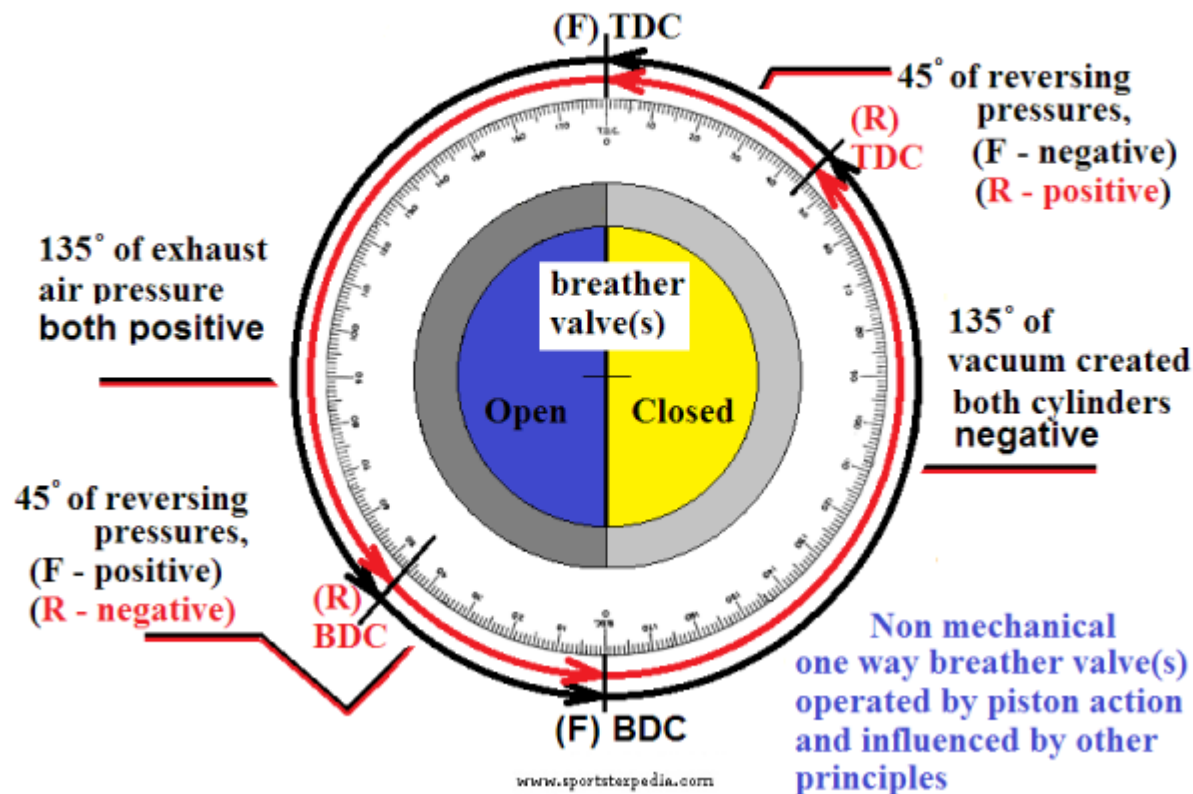
One crank rev shown, front cylinder, w trailings from rear cylinder



21)

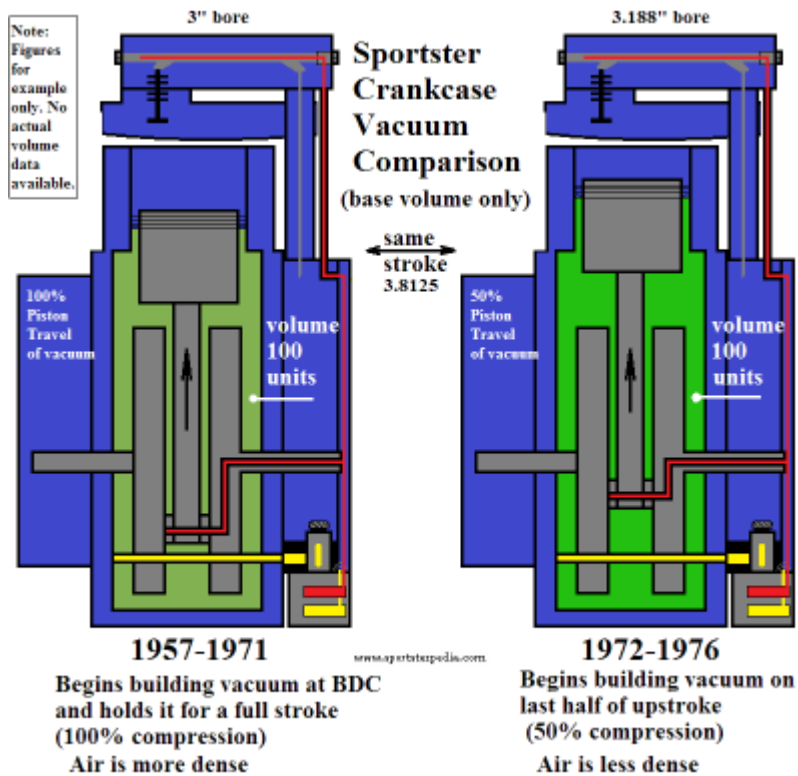
1977-present Sportster Crankcase Pressure Cycle

One crank rev shown, front cylinder, w trailings from rear cylinder

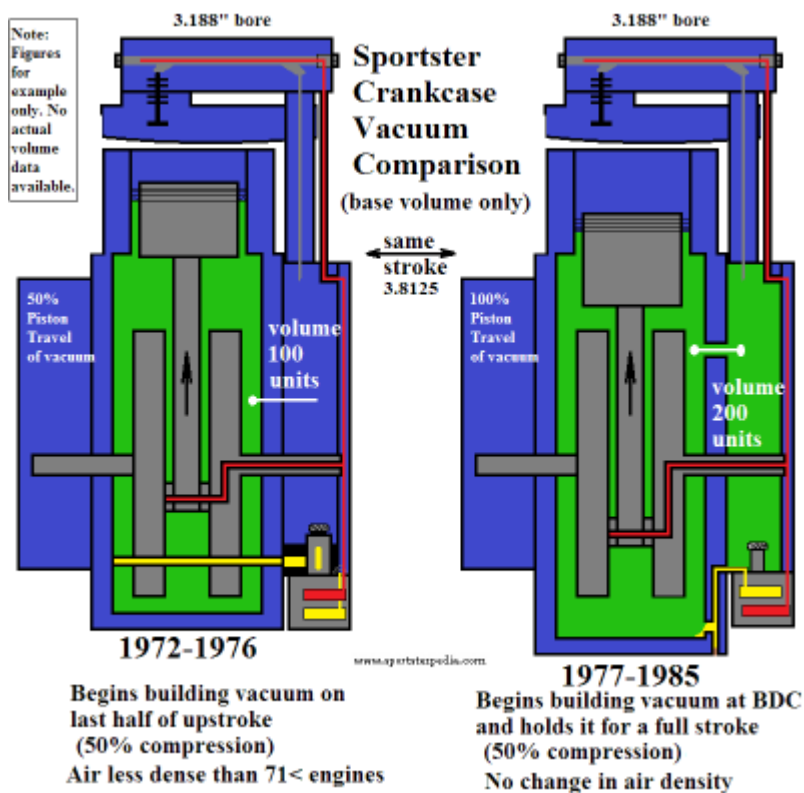


22)

Comparing Amount of Vacuum Created



23)



24)

Go To Technical Menu

1) 2) 3) 4) 5) 6)

photo by Dr Dick of the XLFORUM

<https://www.xlforum.net/forum/sportster-motorcycle-forum/sportster-motorcycle-era-specific-and-model-specific/ironhead-sportster-motorcycle-talk-1957-1985/122424-breather-diagrams/page3?t=1204854&page=3>

7) 8) 9)

thefrenchowl of the XLFORUM

<https://www.xlforum.net/forum/sportster-motorcycle-forum/sportster-motorcycle-era-specific-and-model-specific/ironhead-sportster-motorcycle-talk-1957-1985/200928-ih-crankcase-pressure-and-engine-breathing/page2?t=2077939&page=2>

10)

Dr Dick of the XLFORUM

<https://www.xlforum.net/forum/sportster-motorcycle-forum/sportster-motorcycle-era-specific-and-model-specific/ironhead-sportster-motorcycle-talk-1957-1985/122424-breather-diagrams?t=1204854>

11)

Documentation provided by needspeed of the XLFORUM

<https://www.xlforum.net/forum/sportster-motorcycle-forum/sportster-motorcycle-era-specific-and-model-specific/ironhead-sportster-motorcycle-talk-1957-1985/4946239-breather-timing-with-engine-installed/page5#post4946707>

12) 13) 14) 15)

1972-2003 XR-750 Service Manual pg 27

16) 17) 18)

photos by Dr Dick of the XLFORUM

<https://www.xlforum.net/forum/sportster-motorcycle-forum/sportster-motorcycle-era-specific-and-model-specific/ironhead-sportster-motorcycle-talk-1957-1985/112326-a-photo-catalog-of-ironhead-parts/page14?postcount=204#post2437070>

19) 20) 21) 22) 23) 24)

drawing by Hippysmack

From:

<http://mail.sportsterpedia.com/> - **Sportsterpedia**

Permanent link:

<http://mail.sportsterpedia.com/doku.php/techtalk:ref:engmech07g>

Last update: **2025/06/10 23:28**

