

# OFFICIAL SCCA CLUB RACING PROCEDURES FOR USING THE WHISTLER COMPRESSION RATIO TESTER

**Description:** The Whistler measures combustion chamber size using acoustic principals. This measurement is combined with the number of cylinders and total displacement of the engine to calculate the compression ratio.

**What is included:** The Whistler, threaded spark plug adapters, whistle probe with air tubes, power transformer, and calibration bottle.

**Additional Equipment Required:** The Whistler requires a 120 volt power source, a compressed air source and an accurate instrument to measure engine temperature (through a spark plug hole if possible). An air blower nozzle is needed to eliminate gasoline vapors from the combustion chamber. Appropriate tools are needed to rotate the engine slowly.

### Procedure

1. Remove the lid from Whistler box.
2. Remove the spark plug adapters, whistle probe with air tubes, power transformer, and calibration bottle from the box.
3. Position the Whistler near the engine.
4. Connect the power cord and whistle probe tubes to the Whistler. Note: the tube with the black marking connects to the fitting with the black washer.
5. Confirm the Whistler calibration with the supplied calibration bottle.

The calibration bottle simulates the combustion chamber of a 350 cubic inch V8 engine. The inside of the bottle must be clean and dry. Each bottle is marked with the effective Compression Ratio (CR) reading that should be displayed by the Whistler (not all bottles have the same effective CR). The steps to confirm calibration are the same as those to measure an engine except that some input values are supplied by the user. Refer to the engine test steps below:

Set the number of cylinders to 8 (power-on default) as described in step 8

Measure the air temperature (Fahrenheit) inside the bottle and enter it as described in step 9. (For calibration, ambient temperature is adequate if the bottle is also at ambient.)

Set displacement to 350 (power-on default) as described in step 10

Perform steps 11-13.

Insert the probe into the top of the calibration bottle so it seats against the “cork” and hold it without obstructing the back of the probe or severely bending the hoses. (minor kinks are not a problem as long as the air supply is not cut off)

If everything is setup and entered correctly the Whistler should display the CR indicated on the bottle. It is normal for the reading to fluctuate between two adjacent values. If the display does not match the CR for the bottle, recheck the air flow indicator and all input values carefully. If the reading is still off by a tenth or two, the temperature measurement

is the most likely source of error. If necessary, adjust the input temperature up or down by as much as 5 degrees to achieve the correct CR reading. Note the adjustment amount and direction so it can be applied when testing engines. If calibration is still off, the testing cannot proceed until the cause is found and corrected.

6. Prepare the car for measurement:

Remove any convenient spark plug (removing several will make it easier to rotate the engine precisely)

Rotate the engine to about 10 degrees before Top Dead Center (compression stroke) for a cylinder with spark plug removed.

Purge any remaining gasoline vapors in the combustion chamber with compressed air and the air blower nozzle. (Several manual rotations of the engine should expel the vapors if an air nozzle is not available.)

7. Determine correct spark plug adapter and install it in place of the spark plug (minimal torque is required).

8. Set the leftmost switch (4, 6, 8) to the correct number of cylinders. (Engines having a different numbers of cylinders is possible with simple calculations to scale the displacement up or down)

9. Set the center switch (CR, TEMP) to the down position (TEMP) and enter the temperature using the rightmost switch (UP, DN). The temperature should be measured inside the cylinder. **Note: Temperature is critical and can change quickly in a hot engine. After step 13 below, it may be necessary to insert the Whistler probe and allow the air temperature to stabilize for a minute or two. Then, remove the probe and measure the temperature again and adjust the Whistler input accordingly.**

10. Set the center switch (CR, TEMP) to the middle position and enter the displacement of the engine in cubic inches using the rightmost switch (UP, DN).

11. Set the center switch (CR, TEMP) to the upper most setting (CR).

12. Connect air supply to Whistler.

13. Adjust the SCFH as indicated in the glass tube to 20. The large black knob is the main regulator for course adjustments. Use the small knob to fine-tune and maintain a reading of 20 SCFH.

Note: The Whistler must be level during this adjustment with the column perpendicular to the ground. If the number deviates 20 by more than + or - 1.5 during sampling, the Whistler calculations will be incorrect. Adjust the air flow and repeat the test.

14. Insert whistle probe into spark plug adapter so it seats firmly.

15. The engine should already be close to TDC on the compression stroke. Rotate the engine very slowly towards TDC. The CR reading should start to increase. As TDC is approached, pause briefly after each small movement to let the CR reading stabilize (piston motion will distort the reading). The CR display will peak at TDC then start to fall

again. Record the highest reading as Compression Ratio. Note: Do not assume the timing marks on the engine are correct; they rarely are.

### Remember

- Be sure the whistle probe is contacting the spark plug adapter while taking readings. This can be difficult to know with some engines but is critical to accurate readings.
- Do not block air exiting from the back of the whistle probe or severely kink the lines.
- Rotate the engine very slowly and pause while taking readings. The largest reading displayed indicates top dead center.
- The most accurate readings are obtained from a cold engine since there is less chance of error in determining ambient cylinder temperature compared to that in a 160-200 degree cylinder.
- Make sure the air flow ball stays at 20 while testing. Use the small knob to fine tune if the air supply fluctuates.
- If the reading is still suspect, low or high, repeat the calibration check.

### Troubleshooting

Very low or no reading from the Whistler:

- Make sure the engine is at Top Dead Center with the valves in the closed position (compression stroke).
- Valves may be stuck open or bent: try another cylinder
- Check whistle probe tubes for severe bends or kinks

### Acknowledgement by Competitor

This is a three-page document. I acknowledge that all the above procedures were performed as specified and that the result of this test was recorded accurately.

_____ Class & Car Number	_____ Event (sanction #)
_____ Competitor Signature	_____ Date
_____ Tech Inspector or Steward Signature	_____ Date