

Burnthrough Test Setup Procedure

Summary

The purpose of these tools and corresponding procedures is to aid in making the burner setup, as well as the relationship between the burner and test article, as consistent as possible between participating laboratories.

General Notes:

- Prior to any adjustment, ensure that all internal components are correct (stator, fan, turbulator, and fuel nozzle).
- Dipstick markings are reference only.
- Burner cone face, insulation frame, thermocouple rakes, and calorimeter face are 30 degrees as measured from vertical.
- Reference point for clocking measurement is the center point between the two ignitors.
- Remove any pins that restrain the turbulator to the draft tube. Achieve lockdown via setscrew installed in draft tube, or temporarily using silicone sealant.
- In order to achieve the correct air velocity readings, all flanges should be sealed with high-temp silicone to prevent air leakage (ignitor box, rear face plate, airbox).

Location of Burner Cone; Depth and Clocking of Internal Components

- Set burner cone protrusion by first inserting depth tool into turbulator. Notches on end of tool will allow it to be fully seated against face of turbulator (figure 1).



Figure 1. Depth Tool Seated Against Face of Turbulator (cone removed)

- On opposite end of tool, check burner cone protrusion with straightedge across the cone face both horizontally and vertically. Ensure proper cone depth by observing scribe marks on tool (figure 2).

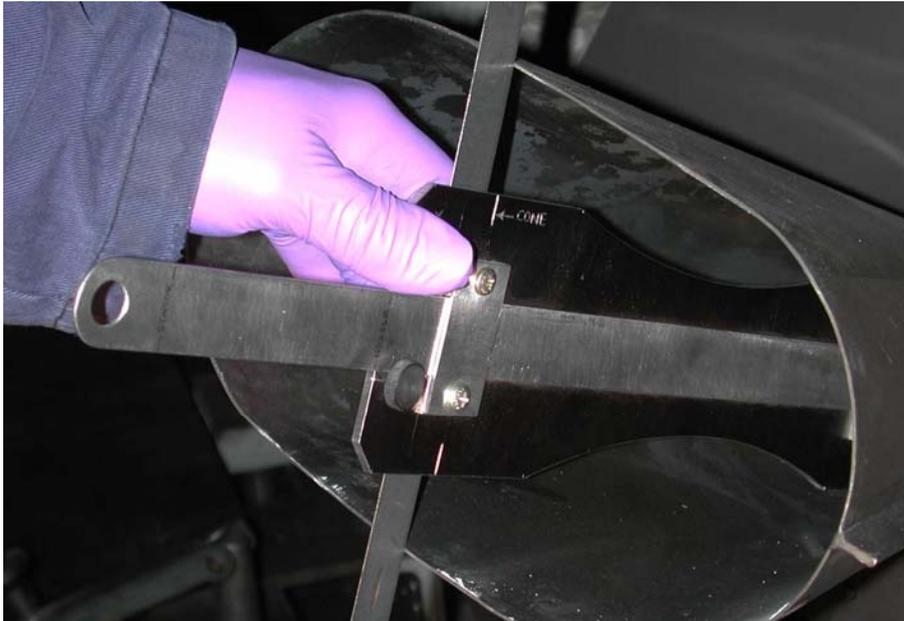


Figure 2. Checking Burner Cone Protrusion

- Measure fuel nozzle depth by seating notched face of tool against turbulator. Slide dipstick into draft tube until it seats on the face of the nozzle (figure 3). Tighten thumb screw on tool and remove. The correct fuel nozzle depth is indicated by the scribe mark on opposite end of dipstick (figure 4).

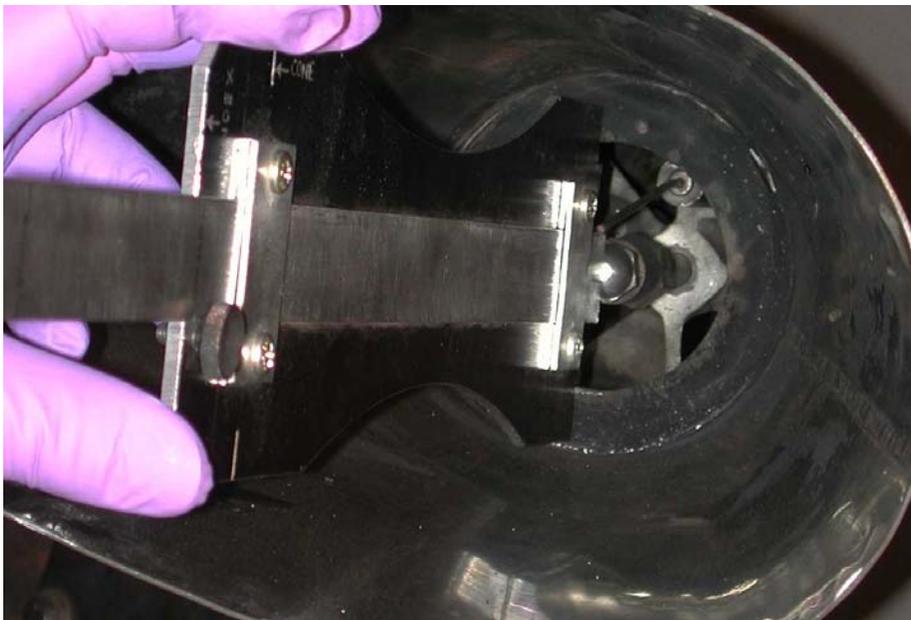


Figure 3: Checking Fuel Nozzle Depth



Figure 4. Scribe Mark for Fuel Nozzle Depth

- Using dipstick as in previous steps, slide in until it bottoms against face of stator (figure 5). Tighten thumb screw and remove. The correct stator depth is indicated by the scribe mark on the tool.

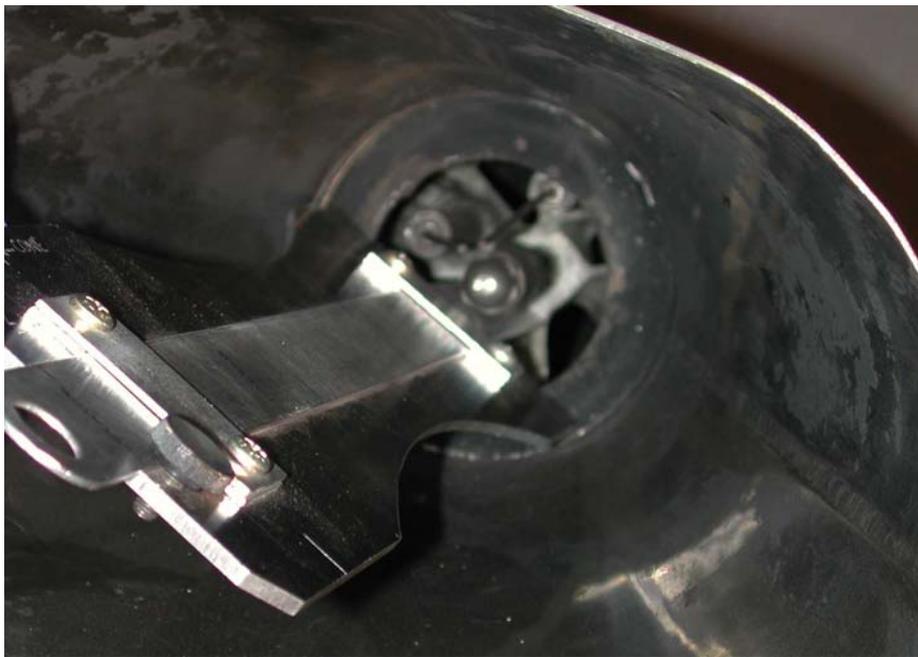


Figure 5. Checking Stator Depth

- Using dipstick, measure ignitor depth by seating notched face of tool against turbulator. Slide dipstick into draft tube until it seats on the face of the ignitors (figure 6). Tighten thumb screw on tool and remove. The correct ignitor depth is indicated by the scribe mark on opposite end of dipstick (figure 7).



Figure 6. Checking Ignitor Depth

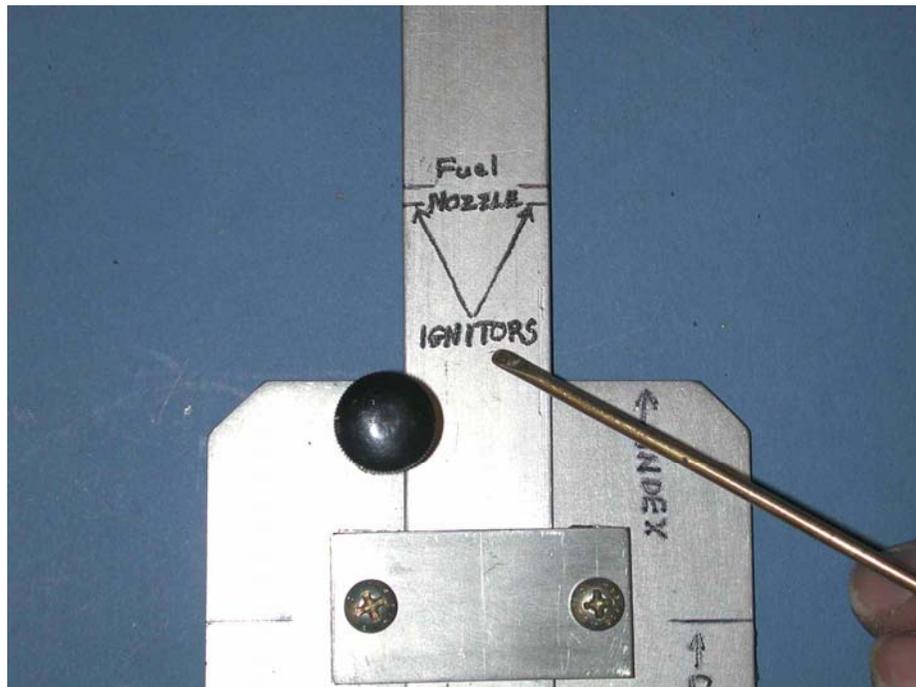


Figure 7: Ignitor Depth Mark

- Center burner faceplate tool over face of burner cone using cam “ears” (figure 8). The cam ears allow for a best fit of the faceplate over the cone, as minor cone distortion is normal. Using silver pencil, transfer centerline from faceplate to burner cone.

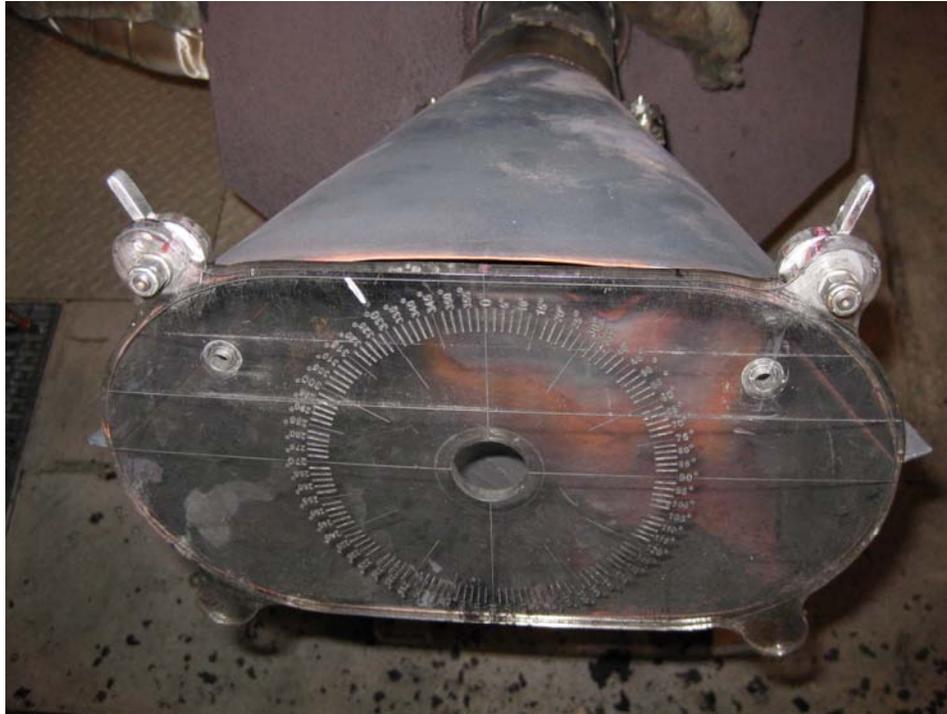


Figure 8: Burner Faceplate Tool on Cone

- Level sample holder stand, paying particular attention to the horizontal stringer that is directly in line with the burner cone.
- Move burner to blanket burn position and check for height using bushing and pointer. Pointer should hit center of target stringer (figure 9).



Figure 9. Setting Burner to Sample Holder Distance Using Bushing and Pointer

- Attach two 4-inch angle clips to burn frame on the outer formers, butting them up to the lower edge of target stringer (figure 10). Attach long angle to faceplate, and with centerlines of cone and faceplate aligned, distance to each angle clip should be equal as shown in figure 11. Rotate burner cone until measurements are equal.



Figure 10. 4-inch Angle Clips Attached to Outer Formers



Figure 11. Measuring Vertical Distance to Centerline Using Long Angle on Faceplate

- Measure from long angle to outer two formers and reposition the burner or the test frame until the two measurements are equal as shown in figure 12. These measurements should be 4-1/2 inches from the former to the faceplate side of the long angle.



Figure 12. Measuring Distance to Outer Formers

- Using center clip on faceplate dropdown tool as a guide, line up center of burner cone with the center of the long leg of the center former (figure 13). Adjust stops on burner rotation platform or rolling sample frame rails to ensure correct position of flame with respect to burner.



Figure 13. Aligning Burner with Center Former Using Drop-Down Tool

Ignitor / Stator Clocking Tool (Figure 14)

- Remove long angle and dropdown tool from faceplate.
- Insert long ignitor locator shaft over ignitors until bottomed out against stator.
- Install burner cone faceplate over shaft, again aligning the index marks.
- Install pointer knob on end of shaft; read ignitor clocking in clockwise degrees.
- Adjust stator to $320^{\circ} \pm 5^{\circ}$. Note: any adjustment of the stator will require removal of the draft tube/cone assembly. Clearly mark the position of the draft tube prior to removal, so that the draft tube can be re-installed in the correct position.

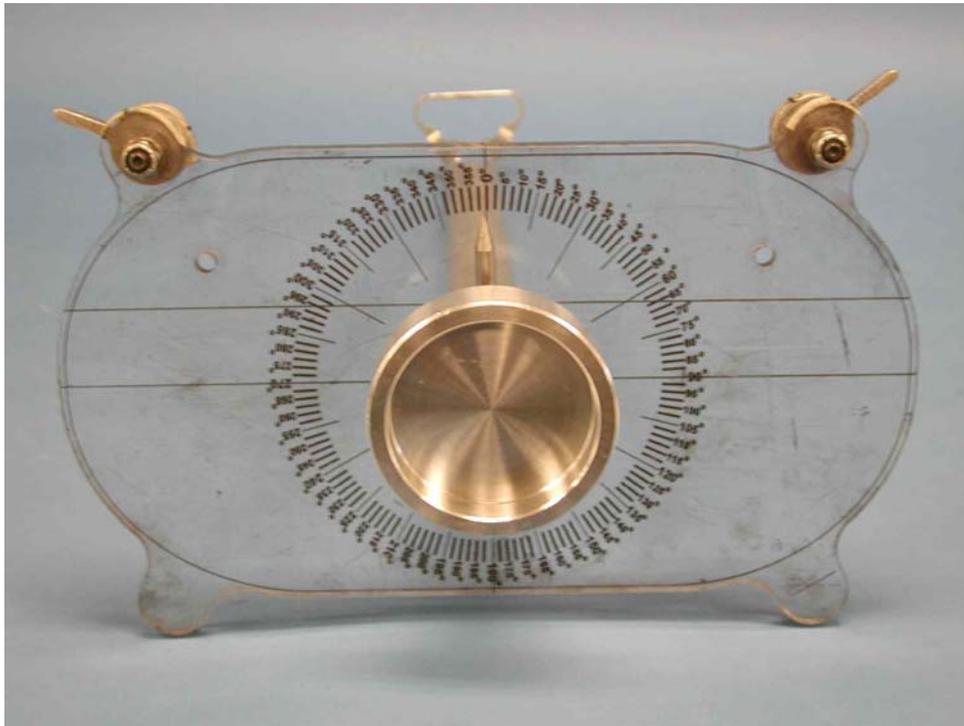


Figure 14: Ignitor / Stator Clocking Tool

Turbulator Clocking Tool (Figure 15)

- Insert short ignitor locator shaft over ignitors until bottomed out against stator.
- Install turbulator clocking tool over shaft. Maneuver pilot plate (on face of disc) into center of turbulator and rotate until tab drops into corresponding notch on edge of turbulator.
- Install pointer and read location; clockwise from “0” is considered positive.
- Squeeze handle to clamp and rotate turbulator to desired position.
- Adjust turbulator to $12.5^\circ \pm 2.5^\circ$ (positive). Note: notch should be approximately in the 6 o'clock position. Apply silicone sealant to temporarily secure the turbulator in the draft tube, to prevent unwanted rotation.



Figure 15. Turbulator Clocking Tool

Thermocouple Rake Setup (Figure 16)

- Locate burner cone faceplate to index mark on burner cone.
- Flip down rake / calorimeter locator.
- The centerline of the thermocouple tips should just contact lower corner of drop-down tool at the appropriate witness lines.
- Adjust thermocouples accordingly.

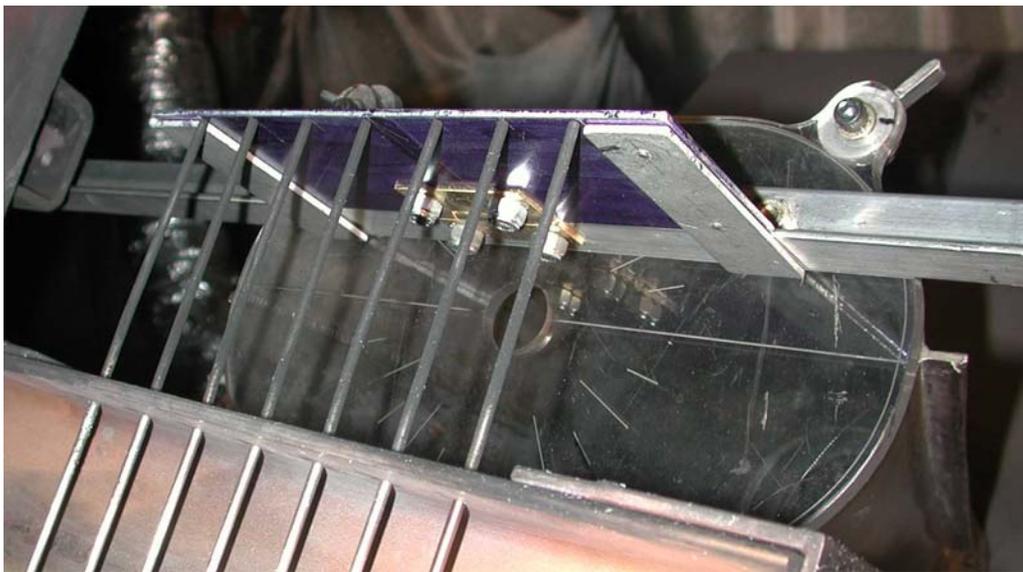


Figure 16: Setting Thermocouple Rake Using Drop-Down Tool

Calorimeter (Figure 17)

- Locate burner cone faceplate to index mark on burner cone.
- Flip down rake / calorimeter locator.
- The edge of the drop-down tool should all but contact the calorimeter surface plane. The two witness lines, each $\frac{1}{2}$ inches off of center, should line up with the outer diameter of the calorimeter. The upper, centermost corner of the center clip should be flush and tangent to the top of the calorimeter diameter.
- Adjust calorimeter accordingly.

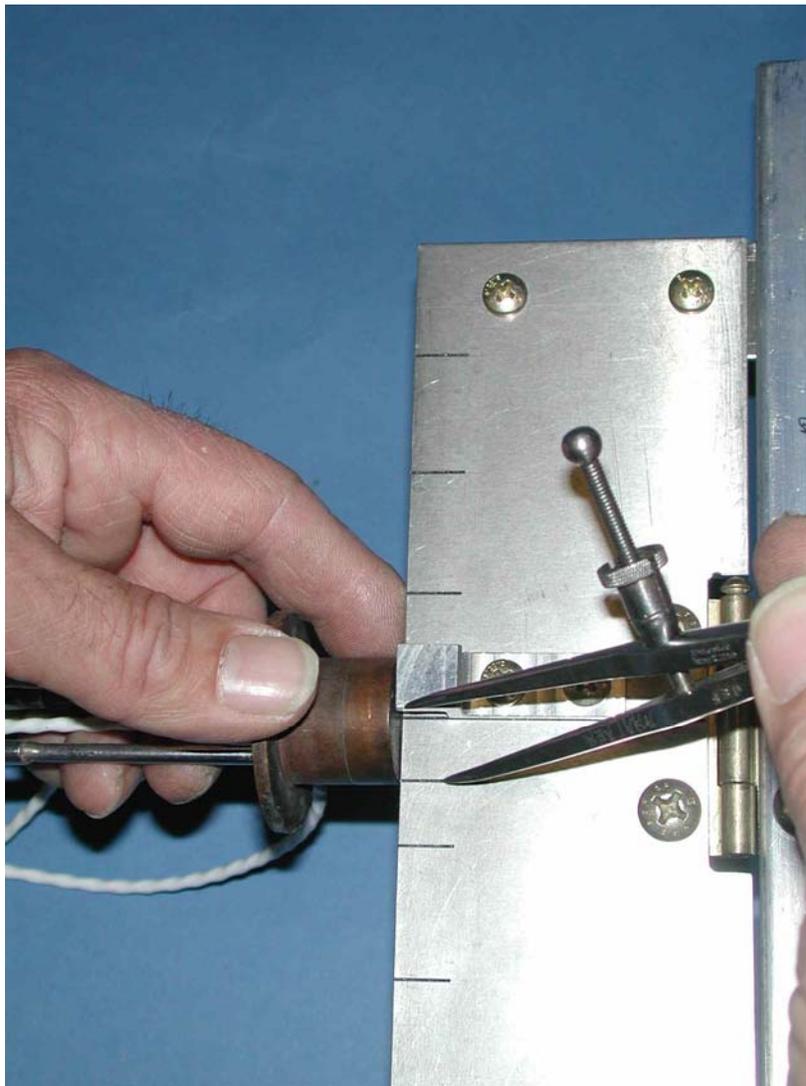


Figure 17: Aligning Calorimeter Using Witness Marks on Drop-Down Tool