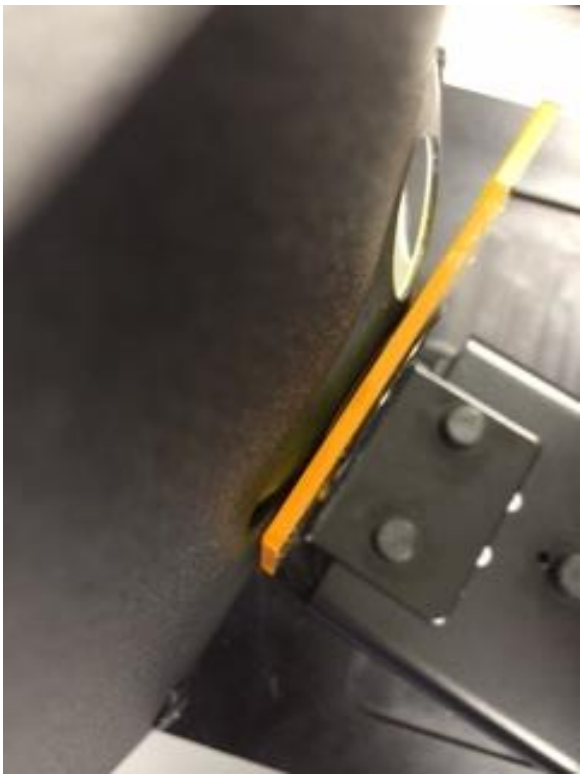
Transmission Measurement – Best Practices

Total Transmission

- A “Total” transmission measurement should be performed when the sample to be measured is hazy or cloudy. A cloudy sample will transmit light at more angles than a sample that is not hazy. A total transmission reading will make certain that all transmitted light is measured for an accurate reading.

Measurements are taken with the sample is held in position using a fixture with a stop plate on the sphere side of the sample, and a spring loaded clamping plate on the side of the sample away from the sphere.



Care should be taken to properly align this fixture so that the stop plate is positioned flush and tight against the opening in the sphere. When setting up for measurements, do not tighten the thumb screws in the fixture until the stop plate has been positioned tight against this opening.

With the Ci7xxx we recommend using a stop plate with all fixture sizes including 25mm.

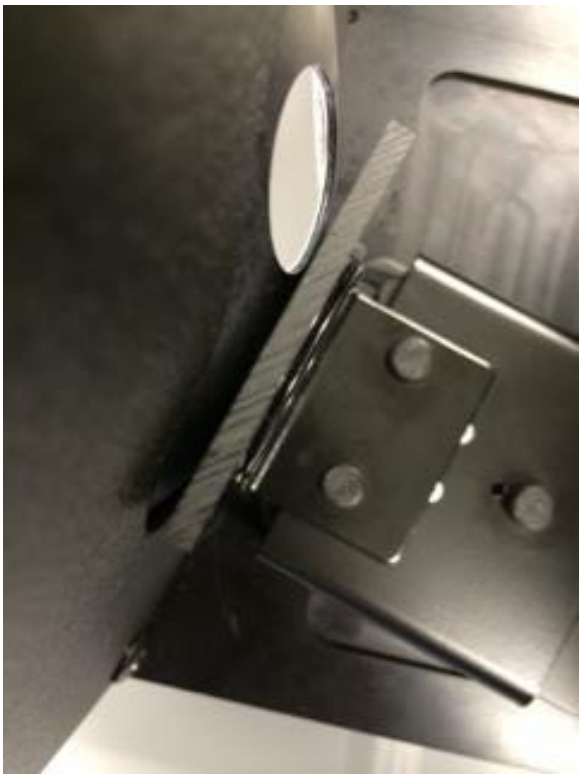
The reflection port should be covered with the 25mm white diffuse coated aperture plate. **DO NOT** use the reflectance 25mm aperture plate which does not have white diffuse coating.

The sample arm must be covered with the white diffuse puck. DO NOT cover the sample arm with the smooth glossy calibration tile, or leave it uncovered.

Total Transmission Calibration

White calibration should be done with the 25mm white diffuse coated aperture plate in place and the sample arm must be covered with the white diffuse puck. **DO NOT** use the smooth glossy calibration tile even though you are calibrating.

Black calibration must be done with the blocker placed against the sphere.



NEVER use the black trap for black calibration when performing Total Transmission calibration.

Direct Transmission

- A “Direct” transmission measurement should be performed when the sample to be measured is clear. A clear sample will transmit light at only one angle, called the "direct component angle". A direct transmission reading will make certain that the light transmitted at this angle is measured for an accurate reading.

Measurements are taken with the sample positioned between the stop and holder towards the lens in the back of the instrument. It does not sit flush against the lens. When measuring with this method the diffuse light is collimated, this means that the light rays are travelling in a parallel fashion as they pass through the sample.

The sample is held in position using a fixture with a stop plate on the lens side of the sample, and a spring loaded clamping plate on the side of the sample away from the lens.

Care should be taken to properly align this fixture so that the pin at the back of the fixture is in the hole closest to the side of the instrument. The will align the sample being measured so that it is parallel to the lens.

When performing Direct Transmission measurements, only the 25mm fixture and aperture plate should be used.

The reflection port should be covered with the 25mm white diffuse coated aperture plate. **DO NOT** use the standard 25mm aperture plate which does not have white diffuse coating.

The sample arm must be covered with the white diffuse puck. DO NOT cover the sample arm with the smooth glossy calibration tile, or leave it uncovered.

Direct Transmission Calibration

White calibration should be done with the 25mm white diffuse coated aperture plate in place and the sample arm must be covered with the white diffuse puck. **DO NOT** use the smooth glossy calibration tile even though you are calibrating.

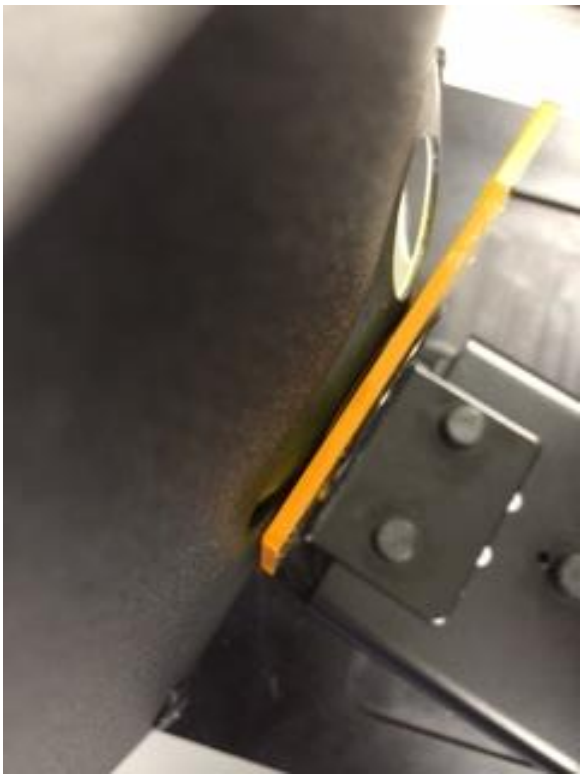
Black calibration must be done with the blocker placed between the stop and holder, positioned toward the lens.

NEVER use the black trap for black calibration when performing Direct Transmission calibration.

R/T (Reflection/Total Transmission measurement)

- R/T measurements provide the ability to compensate for light lost through the sample (as opposed to light absorbed). When using R/T mode for plastic formulation the formulation software will attempt to match opacity of the standard as well as color.

Two measurements are taken to create this value. The first measurement is taken with the sample positioned at the reflection port (reflection measurement). The second measurement is taken with the sample positioned flush against the stop at the back of the sphere (total transmission measurement). When measuring with this method the diffuse light travels through the object from all angles.



When doing the total transmission measurement the sample is held in position using a fixture with a stop plate on the sphere side of the sample, and a spring loaded clamping plate on the side of the sample away from the sphere.

Care should be taken to properly align this fixture so that the sample is positioned flush and tight against the opening in the sphere. When setting up for measurements, do not tighten the thumb screws in the fixture until the sample has been positioned tight against this opening.

The reflection port should be covered with a white diffuse coated aperture plate. **DO NOT** use the reflectance 25mm aperture plate which does not have white diffuse coating.

The sample arm must be covered with the white diffuse puck. **DO NOT** cover the sample arm with the smooth glossy calibration tile, or leave it uncovered.

R/T correlation - Ci7X00 to Ci7000A

Testing has shown that to achieve the best correlation between a Ci7600 or Ci7800 to a Ci7000A the following combinations of transmission port, stops, and aperture plates should be used:

- 25mm transmission port, with 25mm stop and 25mm aperture plate with white diffuse coating

  or

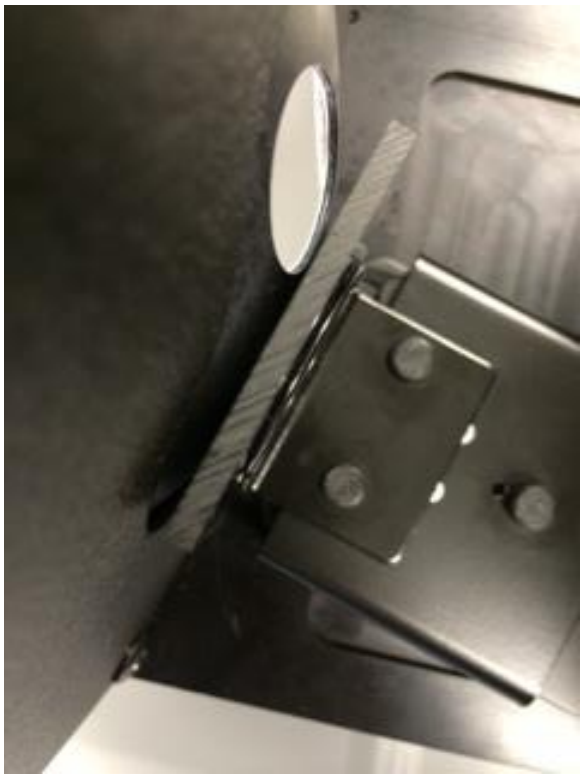
- 17mm transmission port, with 17mm stop and 17mm aperture plate with white diffuse coating

R/T Calibration

Total Transmission Calibration

White calibration should be done with the 25mm white diffuse coated aperture plate in place and the sample arm must be covered with the white diffuse puck. **DO NOT** use the smooth glossy calibration tile even though you are calibrating.

Black calibration must be done with the blocker placed between the stop and holder, positioned toward the sphere.



NEVER use the black trap for black calibration when performing total transmission calibration.

Reflection Calibration

Reflection calibration should be done with the 25mm white diffuse coated aperture plate in place and the sample arm must be covered with the smooth glossy calibration tile.

Liquid Transmission Measurement

- Liquids may be measured using either total transmission or direct transmission
- Be very careful with placement of the cuvette, make certain it is positioned square and flush to the sphere opening if using total transmission or parallel to the lens if using the direct transmission technique
- Make sure the cuvette is positioned centered over the opening in the sphere or lens
- Perform white calibration with cuvette and clear liquid in the sample holder
- The clear liquid should be the base of whatever material you are working with
- When performing black calibration the blocker should be positioned between the cuvette and the opening in the sphere (total) or lens (direct)

Haze Measurement

- Note: To obtain a true haze measurement requires a haze meter (ASTM D1003). It is possible, however, to use a sphere geometry spectrophotometer capable of transmission measurements to obtain an index, known as correlated haze, with good correlation to a haze meter.
- The sample to be measured is placed in the Ci7xxx against the sphere, the same as when doing a total transmission measurement
- To calibrate use the 25mm white diffuse coated aperture plate, white diffuse puck and black trap positioned at the reflectance port.
- Two readings are then taken
    - One with the reflection port covered with the 25mm white diffuse coated aperture plate. **DO NOT** use the reflectance 25mm aperture plate which does not have white diffuse coating. The sample arm must be covered with the white diffuse puck. **DO NOT** cover the sample arm with the smooth glossy calibration tile, or leave it uncovered.
    - The second reading is taken with the black trap positioned over the reflection port

Important items to remember with transmission measurement

- Never use the black trap for black calibration (except when performing Haze measurements
- Always make certain that the sample is flush and parallel to the opening in the sphere or the lens
- If diffuse white tile gets soiled, it must be replaced
- Close the transmission compartment cover when measuring
- Use aperture plates with white diffuse coating
- Use tile with white diffuse coating, not smooth glossy calibration tile