ITR Optical Base Alignment Procedure

This procedure can be used to maximize the throughput of the Smart iTR accessory in cases where the accessory is not meeting factory specifications (see table below) due to misalignment of the accessory optics. This procedure should **not** be used to correct for throughput problems caused by a damaged iTR crystal. If the throughput specification cannot be met after this procedure has been completed, the entire accessory and crystal may need to be sent back to the factory for evaluation and repair.

Verification procedure – Collect the performance data

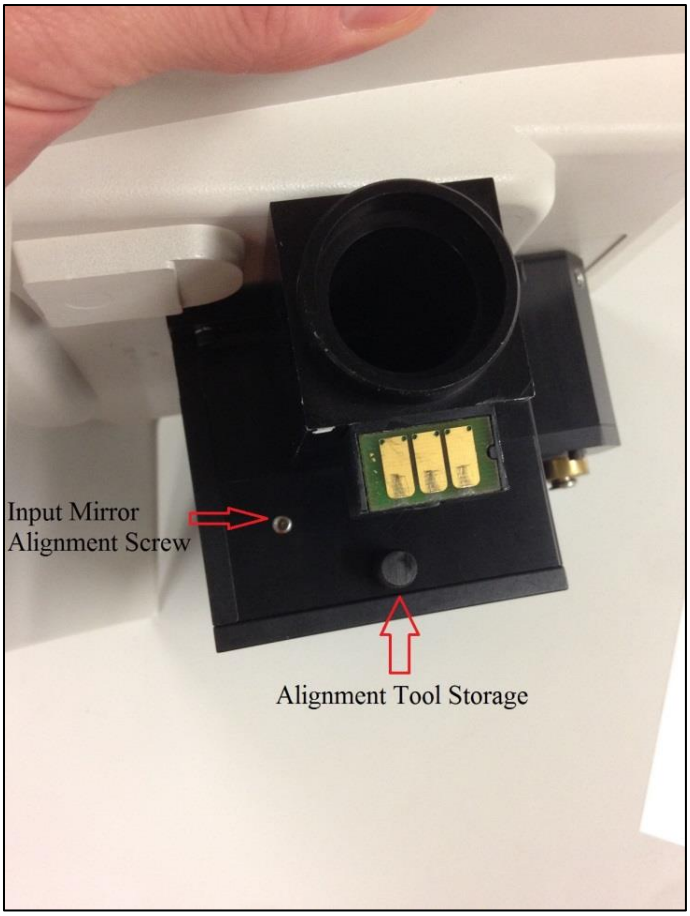
1. Collect open beam background with no accessory in the instrument sample compartment.
2. Insert the Smart iTR accessory into the sample compartment.
3. When prompted that the Smart accessory has been inserted, either click the box labeled “Use Current Background” or cancel message box.
4. Collect 100%T sample measuring accessory throughput.
5. Measure %T at 1000 cm^{-1} for diamond crystals and 2000cm^{-1} for all other crystal materials and compare to the minimum values listed in the table below.
6. If the crystal does not meet the specification, follow the procedure below to adjust the alignment of the mirrors and crystal.

Crystal type	%T Specification (minimum)
Diamond	35%
ZnSe	22%
Ge	25%
AMTIR	22%
Si	22%
Diamond (ruggedized)	25%
ZnSe (3 bounce)	15%
Diamond (3 bounce)	15%
Specular Reflectance	20%

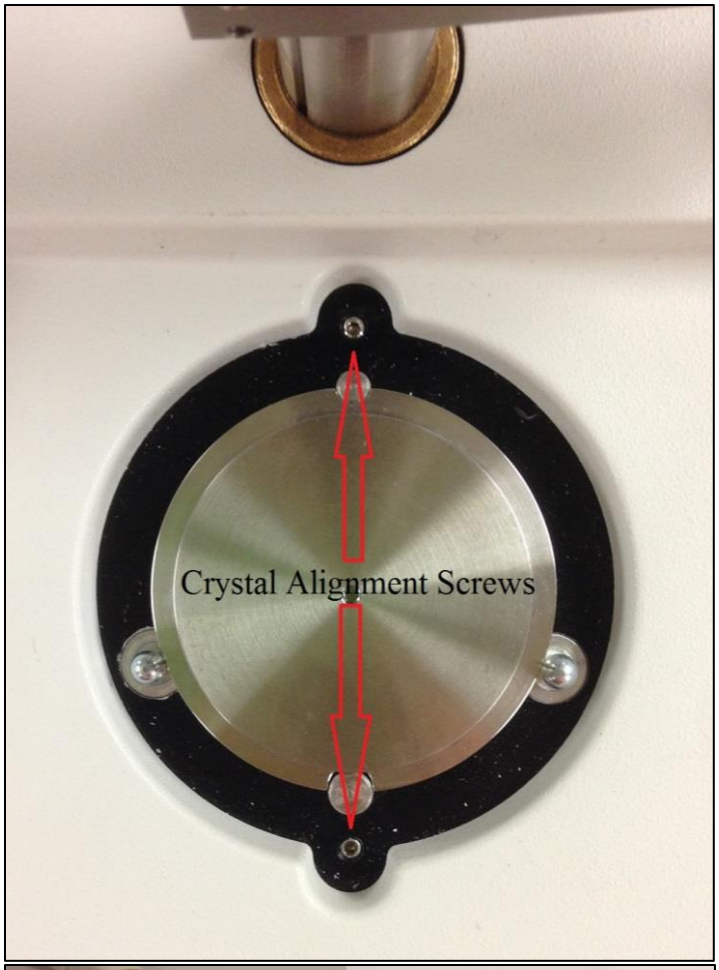
NOTE: All iTR crystals use a ZnSe focusing lens. Therefore, the low-end spectral range cutoff should be around 650cm^{-1}.

Alignment screw locations

There are four alignment screws on the iTR accessory. Two are located on either side of the base optics cover, while the other two are accessible at the top of the crystal plate. The two screws on the side are adjusted with a $^{3}/_{32}$ inch Alignment Tool that is self-contained and threaded in the lower right side of the black accessory base optics cover. Two additional smaller $^{1}/_{16}$ inch screws are located on top of the accessory. These screws are located at the 12:00 and 6:00 positions around the crystal perimeter. The screws can be accessed by removing the black cover covering the crystal. See pictures below for locations of adjustment screws and Alignment Tool storage.


Input Mirror
Alignment Screw
Alignment Tool Storage


Output Mirror Alignment Screw


Crystal Alignment Screws


Alignment Tool
SMART iTR

Alignment Procedure

The alignment process will involve making small adjustments to the alignment screws and then reinserting the accessory to assess the effect of the change. This will be an iterative process to maximize the signal strength.

1. From the OMNIC Edit menu, choose the Options command. Select the Collect tab and uncheck the box in the upper right for “Survey bench and Smart accessory”. Click OK.
2. Open Experiment Setup and select the Bench tab. Above the white box on the left side that displays the interferogram signal, select the option button for “Peak to Peak”. Note the Peak to Peak value listed above the white box.
3. Remove the accessory from the FTIR and turn over. Hold the crystal to prevent it from falling out. Unthread the alignment tool on the right side of the optics box. Insert the tool into the hex head screw of the input mirror on the right side, next to the threaded storage location.
4. Make a small adjustment to the input mirror, noting the magnitude and direction of the adjustment (i.e. $^1/_8$ turn clockwise).
5. Reinsert the Smart iTR into the sample compartment, allow the signal to stabilize and compare the new value to the one noted in Step 2. If the signal went up, continue in the same direction. If the signal went down, turn the screw the other direction.
6. Maximize the interferogram amplitude on right side input mirror by repeating Steps 3 – 5.
7. Repeat Steps 3 – 5, this time adjusting the left side output mirror alignment screw to maximize the signal.
8. Once the input and output mirrors have been maximized, remove the black crystal plate. The fit around the crystal is tight, so hold down crystal with your thumb while removing the black plate.
9. Use a $^1/_{16}$ inch hex wrench and adjust the tilt of the crystal by turning the top two screws to maximize the interferogram amplitude.
10. Repeat the crystal performance test.
11. From the OMNIC Edit menu, choose the Options command. Select the Collect tab and check the box in the upper right for “Survey bench and Smart accessory”. Click OK.

Alignment procedure for more than one crystal type

If unable to achieve %T specification for all crystals, try walking both the input and output mirrors one way or the other to a different mirror location to find a new maximum position for more than one crystal.

1. Maximize interferogram for one crystal using the procedure above. Note the Peak to Peak value.
2. Switch to the other crystal and again note the Peak to Peak value.
3. Proceed with this procedure using the lowest throughput crystal.
4. Use two $^{3}/_{32}$ inch hex wrenches at the same time, one for input mirror and one for output mirror.
5. Make small adjustments to both the input and output screws at the same time. Adjust the input mirror screw $^{1}/_{8}$ turn clockwise (CW) and then adjust output mirror screw $^{1}/_{8}$ turn counterclockwise (CCW).
6. If the interferogram signal decreases in amplitude, reverse both screw adjustments.
7. Continue making small adjustments until the signal is maximized.
8. Periodically, swap in the other crystal to make sure a significant amount of throughput is not lost.
9. Find a balance to maximize the signal on both crystals.
10. Repeat the crystal performance test with both crystals.