CLAIMS

What is claimed is:

1. An apparatus, comprising:

a flow cell interface including a flow cell support adapted to have a flow cell positioned thereon;

a temperature control device for the flow cell support;

an infrared sensor;

a stage assembly configured to move the flow cell interface relative to the infrared sensor; and

a controller to command the temperature control device to cause the flow cell support to achieve a temperature value, cause the infrared sensor to measure an actual temperature value of the flow cell support, and calibrate the temperature control device based on a difference between the commanded temperature value and the actual temperature value.

2. The apparatus of claim 1, wherein the temperature control device comprises a thermoelectric cooler.

3. The apparatus of claim 2, wherein the temperature control device further comprises a resistance temperature detector.

4. The apparatus of claim 3, wherein the controller is to calibrate the temperature control device by calibrating the resistance temperature detector.

5. The apparatus of claim 1, further comprising an imaging system, the infrared sensor coupled to the imaging system.

6. The apparatus of claim 5, further comprising a bracket coupling the infrared sensor to the imaging system.

7. The apparatus of any one of claims 1 to 6, wherein the controller is further to calibrate the infrared sensor.

8. The apparatus of any one of claims 1 to 6, further comprising a temperature sensor; wherein the infrared sensor is to measure a first temperature value adjacent to the temperature sensor; the temperature sensor is to measure a second temperature value; and the controller is to calibrate the infrared sensor based on a difference between the first temperature value and the second temperature value.

9. The apparatus of claim 8, wherein the flow cell interface further comprises a flow cell deck carrying the flow cell support, the temperature sensor coupled to the flow cell deck.

10. The apparatus of claim 9, further comprising a printed circuit board coupled to the temperature sensor, the printed circuit board positioned between the temperature sensor and the flow cell deck.

11. The apparatus of claim 8, further comprising a metallic layer covering a surface of the temperature sensor.

12. The apparatus of claim 11, wherein the metallic layer and a surface of the flow cell support have substantially similar emissivity.

13. The apparatus of claim 11, wherein the temperature sensor and the metallic layer are spaced from the flow cell support.

14. The apparatus of claim 11, wherein the metallic layer comprises aluminum.

15. The apparatus of claim 11, further comprising thermally conductive epoxy coupling the temperature sensor and the metallic layer.

16. The apparatus of any one of claims 1 to 6, further comprising a temperature sensor; wherein the infrared sensor is to measure a first temperature value of the flow cell support; the temperature sensor is to measure a second temperature value at the flow cell support; and the controller is to calibrate the infrared sensor based on a difference between the first temperature value and the second temperature value.

17. The apparatus of claim 16, wherein the temperature sensor is coupled to the flow cell support.

18. The apparatus of claim 16, further comprising a printed circuit board coupled to the temperature sensor, the temperature sensor positioned between the flow cell interface and the printed circuit board.

19. The apparatus of any one of claim1 to 6, wherein a surface of the flow cell support comprises a metallic layer.

20. The apparatus of claim 8, wherein the temperature sensor comprises a digital temperature sensor.

21. A method, comprising:

commanding a temperature control device of a system to cause a flow cell interface including a flow cell support adapted to have a flow cell positioned thereon to achieve a temperature value;

moving the flow cell interface relative to an infrared sensor with a stage assembly;

measuring an actual temperature value of the flow cell support using the infrared sensor; and

calibrating the temperature control device based on a difference between the commanded temperature value and the actual temperature value.

22. The method of claim 21, wherein commanding the temperature control device to cause the flow cell support to achieve the temperature value comprises:

commanding a thermoelectric cooler to cause the flow cell support to achieve the temperature value; and

measuring the temperature value with a resistance temperature detector.

23. The method of claim 21, wherein measuring the actual temperature value for the flow cell support using the infrared sensor comprises measuring the actual temperature value for the flow cell support using the infrared sensor while moving the flow cell support relative to the infrared sensor.

24. The method of claim 21, further comprising:

commanding the temperature control device to cause the flow cell support to achieve a second temperature value;

measuring a second actual temperature value of a flow cell disposed on the flow cell support using the infrared sensor;

comparing the second commanded temperature value and the second actual temperature value; and

recalibrating the temperature control device based the comparison.

25. The method of claim 21, further comprising:

causing the system to perform at least a portion of an analysis on one or more samples of interest within a flow cell disposed on the flow cell support;

commanding the temperature control device to cause the flow cell support to achieve a second temperature value;

measuring a second actual temperature value of the flow cell disposed on the flow cell support using the infrared sensor;

comparing the second commanded temperature value and the second actual temperature value; and

recalibrating the temperature control device based the comparison.

26. The method of any one of claims 21 to 25, wherein calibrating the temperature control device is responsive to receiving a command at the controller to calibrate the temperature control device.

27. The method of claim 26, wherein receiving the command at the controller to calibrate the temperature control device comprises receiving the command from a remote computing device.

28. The method of any one of claims 21 to 25, wherein receiving the command at the controller to calibrate the temperature control device comprises receiving user input at a user interface of the system.

29. The method of any one of claims 21 to 25, further comprising calibrating the infrared sensor.

30. The method of claim 29, wherein calibrating the infrared sensor comprises:

measuring a first temperature value adjacent to a temperature sensor carried by the flow cell support using the infrared sensor;

measuring a second temperature value using a temperature sensor; and

calibrating the infrared sensor with a controller based on a difference between the first temperature value and the second temperature value.

31. The method of claim 30, wherein calibrating the infrared sensor comprises:

measuring a first temperature value of the flow cell support using the infrared sensor;

measuring a second temperature value at the flow cell support using a temperature sensor, the temperature sensor being carried by the flow cell support; and

calibrating the infrared sensor with the controller based on a difference between the first temperature value and the second temperature value.

32. The method of claim 29, wherein calibrating the infrared sensor is responsive to receiving a command at the controller to calibrate the infrared sensor.

33. The method of claim 32, wherein receiving the command at the controller to calibrate the infrared sensor comprises receiving the command from a remote computing device.

34. The method of claim 32, wherein receiving the command at the controller to calibrate the infrared sensor comprises receiving user input at a user interface of the system.

35. The method of claim 30, wherein calibrating the infrared sensor comprises generating data associated with the difference between the first temperature value and the second temperature value and calibrating the infrared sensor with the controller based on the data.

36. The method of any one of claims 21 to 25, wherein commanding the temperature control device of the system to cause the flow cell support to achieve the temperature value comprises commanding a first zone of the temperature control device of the system to cause a first zone of the flow cell support to achieve the temperature value and wherein measuring the actual temperature value of the flow cell support using the infrared sensor comprises measuring an actual temperature value of the first zone of the flow cell support.

37. The method of claim 36, wherein calibrating the temperature control device based on a difference between the commanded temperature value and the actual temperature value comprises calibrating a resistance temperature detector of the first zone of the temperature control device based on a difference between the commanded temperature value and the actual temperature value.

38. The method of claim 36, further comprising 1) commanding a second zone of the temperature control device of the system to cause a second zone of the flow cell support to achieve a second temperature value; 2) measuring an actual temperature value of the second zone of flow cell support using the infrared sensor; and 3) calibrating a resistance temperature detector of the second zone of the temperature control device based on a difference between the commanded temperature value and the actual temperature value.

39. A method, comprising:

commanding a temperature control device of a system to cause a flow cell interface including a flow cell support adapted to have a flow cell positioned thereon to achieve a temperature value;

moving the flow cell interface relative to an infrared sensor with a stage assembly;

measuring a plurality of actual temperature value of the flow cell support using the infrared sensor;

determining an average actual temperature value based on the plurality of actual temperature values; and

calibrating the temperature control device based on a difference between the commanded temperature value and the average actual temperature value.

40. An apparatus, comprising:

a flow cell interface including a flow cell support adapted to have a flow cell positioned thereon;

a temperature control device for the flow cell support;

an infrared sensor;

a stage assembly configured to move the flow cell interface relative to the infrared sensor; and

a controller to command the temperature control device to cause the flow cell support to achieve a temperature value, and cause the infrared sensor to measure a plurality of actual temperature values of the flow cell support.

41. The apparatus of claim 40, wherein the controller is to generate a heat map based on the plurality of actual temperature values measured.

42. The apparatus of claim 41, wherein the controller is to diagnosis an error based on the heat map.

43. The apparatus of claim 41, wherein the controller is to calibrate the temperature control device based on the heat map.

44. The apparatus of claim 41, wherein the heat map comprises a 2-D heat map.

45. A method, comprising:

commanding a temperature control device to cause a flow cell interface including a flow cell support adapted to have a flow cell positioned thereon to achieve a temperature value;

moving the flow cell interface relative to an infrared sensor with a stage assembly;

measuring an actual temperature value of a flow cell disposed on the flow cell support using the infrared sensor;

comparing the commanded temperature value and the actual temperature value; and

generating an alert when a difference between the commanded temperature value and the actual temperature value is greater than a threshold.

46. The method of claim 45, further comprising calibrating the temperature control device based on the difference between the commanded temperature value and the actual temperature value.

47. An apparatus, comprising:

a flow cell interface including a flow cell support adapted to have a flow cell positioned thereon;

a temperature control device for the flow cell support;

an infrared sensor;

a temperature sensor;

a stage assembly configured to move the flow cell interface relative to the infrared sensor; and

a controller,

wherein the infrared sensor is to measure a first temperature value adjacent to the temperature sensor; the temperature sensor is to measure a second temperature value; and the controller is to calibrate the infrared sensor based on a difference between the first temperature value and the second temperature value.

48. The apparatus of claim 47, further comprising a flow cell carrying the temperature sensor.

49. The apparatus of claim 48, wherein the flow cell comprises a mock flow cell.