WHAT IS CLAIMED IS:

1. A respiratory assistance system for providing a flow of gases to a patient, the system comprising:

a first acoustic transmitter positioned at a first position in or near a gases flow path, the first acoustic transmitter configured to transmit a first acoustic signal;

a second acoustic transmitter positioned at a second position in or near the gases flow path, the second acoustic transmitter configured to transmit a second acoustic signal; and

one or more acoustic receivers positioned between the first position and the second position, the one or more acoustic receivers configured to receive the first and the second transmitted acoustic signals,

wherein the acoustic transmitters and the one or more acoustic receivers are in electrical communication with a hardware processor configured to determine one or more characteristics of the gases flow based on the received first and second acoustic signals.

2. The respiratory assistance system of Claim 1, wherein the one or more acoustic receivers comprise two acoustic receivers.

3. The respiratory assistance system of Claim 2, wherein one acoustic receiver is downstream of another acoustic receiver.

4. The respiratory assistance system of any of Claims 1-3, wherein the first and second acoustic transmitters face each other along the gases flow path so that acoustic signals produced by each acoustic transmitter are directed toward the other acoustic transmitter.

5. The respiratory assistance system of any of Claims 1-4, wherein the first and second acoustic transmitters are a matched pair of acoustic transmitters.

6. The respiratory assistance system of any of Claims 1-5, wherein the one or more acoustic receivers are microphones.

7. The respiratory assistance system of any of Claims 1-6, wherein the one or more acoustic receivers are located between and spaced from the first and second acoustic transmitters at a sufficient distance so as to mitigate near-field effects.

8. The respiratory assistance system of any of Claims 1-7, wherein the first and second acoustic transmitters comprises two acoustic transducers configured to act as both acoustic transmitters and receivers.

9. The respiratory assistance system of any of Claims 1-8, wherein the first acoustic transmitter is configured to transmit acoustic signals toward the second position and the second acoustic transmitter is configured to transmit acoustic signals toward the first position.

10. The respiratory assistance system of any of Claims 1-9, wherein the one or more characteristics of the gases flow comprise one or more of a gases concentration or a gases flow rate.

11. The respiratory assistance system of Claim 10, wherein the gases concentration comprises an oxygen concentration, a carbon dioxide concentration, or a heliox concentration.

12. The respiratory assistance system of any of Claims 1-11, wherein the one or more acoustic receivers are located within the gases flow path.

13. The respiratory assistance system of Claim 12, wherein the hardware processor is configured to estimate a temperature of the one or more acoustic receivers to be at the same temperature as a measured temperature of gases in the flow path.

14. The respiratory assistance system of any of Claims 1-13, comprising one or more of a temperature sensor, a pressure sensor, a humidity sensor, and/or a flow rate sensor.

15. The respiratory assistance system of Claim 14, wherein the flow rate sensor is a heated temperature sensing element.

16. The respiratory assistance system of Claim 14 or 15, wherein the hardware processor is configured to be in communication with the one or more of the temperature sensor, the pressure sensor, the humidity sensor, and/or the flow rate sensor and to use outputs of the one or more of the temperature sensor, the pressure sensor, the humidity sensor, and/or the flow rate sensor to determine the one or more characteristics of the gases flow.

17. The respiratory assistance system of any of Claims 14-16, wherein the processor is configured to compensate for a temperature difference between the one or more

acoustic receivers and the gases flow based at least in part on measurements by the temperature sensor when determining the one or more characteristics of the gases flow.

18. The respiratory assistance system of any of Claims 14-16, wherein the processor is configured to compute or adjust a calibration parameter of the acoustic transmitters and/or the one or more acoustic receivers based on a flow rate measured by the flow rate sensor.

19. The respiratory assistance system of any of Claims 1-18, wherein the gases flow path between the first position and the second position comprises a curved flow path.

20. The respiratory assistance system of Claim 19, wherein the gases flow path between the first position and the second position comprises a portion of the flow path having a straight flow path.

21. The respiratory assistance system of any of Claims 1-20, wherein the first and second acoustic transmitters are ultrasonic transmitters.

22. The respiratory assistance system of any of Claims 1-21, further comprising a blower.

23. The respiratory assistance system of Claim 22, wherein the blower is configured to provide a high flow therapy to a patient.

24. The respiratory assistance system of Claim 22 or 23, wherein the first and second acoustic transmitters and the one or more acoustic receivers are comprised within a removable sensor module.

25. The respiratory assistance system of Claim 22 or 23, wherein the blower, the first and second acoustic transmitters, and the one or more acoustic receivers are comprised within a removable blower and sensor module.

26. The respiratory assistance system of Claim 24 or 25, wherein the removable sensor module or blower and sensor module is configured for insertion into a housing of the respiratory assistance system.

27. The respiratory assistance system of Claim 22 or 23, wherein the blower, the first and second acoustic transmitters, and the one or more acoustic receivers are comprised within a non-removable sensor module or blower/sensor module.

28. The respiratory assistance system of any of Claims 24-27, wherein the sensor module or the blower and sensor module comprises a sensing circuit board.

29. The respiratory assistance system of Claim 28, wherein the first and second acoustic transmitters and the one or more acoustic receivers are located on the sensing circuit board.

30. The respiratory assistance system of any of Claims 1-29, wherein the acoustic signal(s) comprise an ultrasonic signal.