CLAIMS

1. A blood collection system comprising:

a flow component comprising a flow channel extending between a first end and a second end of the flow component;

a butterfly needle connected to the first end of the flow component; and

a blood metering device connected to the second end of the flow component, the blood metering device comprising;

a control unit, the control unit including a housing defining a blood flow conduit for blood from a patient to flow therethrough, a valve disposed within the blood flow conduit, the valve adapted to allow the blood from the patient to flow through the blood flow conduit when the valve is in an open position and to stop the blood from the patient from flowing through the blood flow conduit when the valve is in a closed position, and an electronic module disposed within an electronic compartment of the housing, wherein the electronic module includes a printed circuit board for controlling components in the blood metering device, a pressure sensor connected to the printed circuit board, and a user input control;

a barrel configured to align with a neck of a collection vessel for receiving the neck therewithin; and

an adapter including a luer connector at a first end portion thereof for coupling with the control unit and a second end portion thereof for coupling with the barrel.

2. The blood collection system of claim 1, wherein a connection cavity is defined within the housing of the control unit for engaging and coupling with the adapter.

3. The blood collection system of any one of claims 1 and 2, wherein the blood flow conduit defines a passageway therewithin for the blood from the patient to travel therethrough and to the collection vessel.

4. The blood collection system of any one of the preceding claims, wherein a channel is defined in the housing of the control unit and connects the blood flow conduit and a pressure sensor disposed within the electronic compartment of the housing.

5. The blood collection system of claim 4, wherein the channel allows the pressure sensor to measure a gas pressure in the collection vessel when the valve is closed, which stops the blood from flowing through the blood metering device and to the collection vessel.

6. The blood collection system of any one of the preceding claims, wherein the control unit, barrel, and adapter are all connected and in fluid communication with each other such that blood from the patient flows to the collection vessel.

7. A method for determining an accurate blood fill volume in a collection vessel, the method comprising:

providing a blood collection system comprising:

a flow component with a flow channel extending therethrough between a first end and a second end;

a butterfly needle connected to the first end of the flow component; and

a blood metering device connected to the second end of the flow component, the blood metering device comprising;

a control unit, the control unit including a housing defining a blood flow conduit for blood from a patient to flow therethrough, a valve disposed within the blood flow conduit, and an electronic module disposed within an electronic compartment of the housing;

a barrel configured to align with a neck of a blood collection vessel to receive the neck therewithin; and

an adapter including a luer connector at a first end portion thereof for coupling with the control unit and a second end portion thereof for coupling with the barrel;

connecting the blood metering device to the blood collection vessel such that the blood metering device is in fluid communication with the blood collection vessel;

inputting a predetermined fill volume to the blood metering device;

determining a gas pressure in the collection vessel with the valve closed;

determining, based on the inputted predetermined fill volume and determined gas pressure, a target gas pressure in the collection vessel at the predetermined fill volume;

determining, based on the determined target gas pressure, an expected amount of time to reach the predetermined fill volume;

closing the valve when the expected amount of time to reach the predetermined fill volume is reached;

continuously determining a gas pressure in the collection vessel;

continuously comparing the determined gas pressure in the collection vessel with the determined target gas pressure; and

closing the valve when the determined gas pressure is equal to the determined target gas pressure, wherein the determined target gas pressure in the collection vessel indicates that a target volume of blood has entered the collection vessel.

8. The method of claim 7, wherein a channel is defined in the housing of the control unit and connects the blood flow conduit and a pressure sensor disposed within the electronic compartment of the housing.

9. The method of claim 8, wherein the channel allows the pressure sensor to measure the gas pressure in the collection vessel when the valve is closed, which stops the blood from flowing through the blood metering device and to the collection vessel.

10. A blood collection system comprising:

a blood metering device comprising a control unit comprising a flow component comprising a flow channel extending between a first end and a second end, the flow channel having a T-junction disposed in a housing of the control unit, the housing defining a blood flow conduit for blood from a patient to flow therethrough;

a butterfly needle connected to a first end of the flow component of the blood metering device;

a valve disposed between the butterfly needle and the T-junction of the flow channel;

a pressure sensor disposed in a channel adjacent to and in fluid communication with the T-junction; and

wherein the blood metering device further comprises:

an electronic module disposed within an electronic compartment of the housing of the control unit;a barrel configured to align with a neck of a collection vessel for receiving the neck therewithin; and

an adapter including a luer connector at a first end portion thereof for coupling with the control unit and a second end portion thereof for coupling with the barrel.

11. The blood collection system of claim 10, wherein a connection cavity is defined within the housing of the control unit for engaging and coupling with the adapter.

12. The blood collection system of any one of claims 10 or 11, wherein the blood flow conduit defines a passageway therewithin for the blood from the patient to travel therethrough and to the collection vessel.

13. The blood collection system of any one of claims 10-12, wherein the electronic module includes a printed circuit board for controlling components in the blood metering device, the pressure sensor connected to the printed circuit board, and a user input control.

14. The blood collection system of any one of claims 10-13, wherein the channel is defined in the housing of the control unit and connects the blood flow conduit and the pressure sensor.

15. The blood collection system of any one of claims 10-14, wherein the control unit, barrel, and adapter are all connected and in fluid communication with each other such that blood from the patient flows to the collection vessel.

16. The blood collection system of claim 14, wherein the channel allows the pressure sensor to measure a gas pressure at the T-junction.

17. A method for determining an accurate blood fill volume in a collection vessel, the method comprising:

providing a blood collection system comprising:

a flow component comprising a flow channel extending between a first end and a second end, the flow component comprising a T-junction;

a butterfly needle connected to the first end of the flow component;

a valve disposed between the butterfly needle and the T-junction of the flow component;

a pressure sensor connected to the flow component at the T-junction; and

a blood metering device connected to the second end of the flow component, the blood metering device comprising;

a control unit, the control unit including a housing defining a blood flow conduit for blood from a patient to flow therethrough and an electronic module disposed within an electronic compartment of the housing;

a barrel configured to align with a neck of a blood collection vessel to receive the neck therewithin; and

an adapter including a luer connector at a first end portion thereof for coupling with the control unit and a second end portion thereof for coupling with the barrel;

connecting the blood metering device to the blood collection vessel such that the blood metering device is in fluid communication with the blood collection vessel;

inputting a predetermined fill volume to the blood metering device;

determining a target gas pressure in the collection vessel at the predetermined fill volume;

opening the valve to allow blood drawn from a patient to flow;

measuring pressure at the T-junction of the flow component as the blood flows therethrough;

determining gas pressure in the collection vessel based on the measured pressure at the T-junction of the flow component;

comparing the determined gas pressure in the collection vessel with the determined target gas pressure; and

closing the valve when the determined gas pressure is equal to the determined target gas pressure, wherein the determined target gas pressure in the collection vessel indicates that a target volume of blood has entered the collection vessel.

18. The method of claim 17, wherein a channel is defined in the housing of the control unit and connects the blood flow conduit and a pressure sensor disposed within the electronic compartment of the housing.

19. The method of claim 18, wherein the channel allows the pressure sensor to measure the gas pressure at the T-junction.