## CLAIMS

1. A method, comprising:

coupling a flow cell having a first channel and a second channel to a flow cell interface;

moving a first sample valve of one or more sample valves of a sample loading manifold assembly to a first position to fluidically couple a first sample reservoir of a sample cartridge to an outlet of the first channel of the flow cell;

pumping a first sample of interest from the first sample reservoir into the first channel of the flow cell through the outlet of the first channel;

wherein an inlet of the first channel is fluidically connected to a waste reservoir via a central valve when the central valve is in a first position;

moving the first sample valve of the one or more sample valves of the sample loading manifold assembly to a second position to fluidically disconnect the first sample reservoir of the sample cartridge and to fluidically connect the outlet of the first channel with the waste reservoir;

moving the central valve to a second position to fluidically couple a reagent reservoir with the first channel and the second channel of the flow cell;

pumping a first volume of reagent through the inlet of the first channel and into the waste reservoir; and

pumping a second volume of reagent through the inlet of the second channel and into the waste reservoir.

2. The method of claim 1, wherein pumping the first sample of interest from the first sample reservoir into the first channel of the flow cell includes moving the first sample of interest from the sample cartridge to a corresponding sample port of the sample loading manifold assembly, out of an associated pump port of the sample loading manifold assembly, and into a pump-channel fluidic line of a pump manifold assembly, and moving the first sample of interest from the pump-channel fluidic line, through the associated pump port, and through a corresponding flow cell port of the sample loading manifold assembly, each flow cell port being coupled to a corresponding port of the flow cell interface and associated with one of the channels of the plurality of channels of the flow cell.

3. The method of any one of the preceding claims, wherein moving the first sample valve of the one or more sample valves to the first position includes fluidically coupling a port of a sample cartridge interface and a corresponding pump and moving the first sample valve of the one or more sample valves to the second position includes fluidically coupling the corresponding pump and the first channel of the plurality of channels of the flow cell.

4. The method of any one of the preceding claims, further comprising operating one or more of a plurality of pumps to individually control fluid flow for each channel of the plurality of channels of the flow cell.

5. The method of any one of the preceding claims, further comprising flowing the first sample of interest out of the first channel of the flow cell and into an auxiliary waste fluidic line, the auxiliary waste fluidic line being upstream of the flow cell and fluidically coupled to the central valve and the waste reservoir.

6. The method of any one of the preceding claims, further comprising flowing a reagent through a shared reagent fluidic line to the plurality of channels of the flow cell and subsequently flowing another regent through a dedicated reagent fluidic line to the plurality of channels of the flow cell.

7. An apparatus, comprising:

a flow cell interface coupled to a flow cell, the flow cell having a plurality of channels and a front and a rear;

a central valve and an auxiliary waste fluidic line coupled to the central valve and a waste reservoir, the central valve coupled to the flow cell interface and movable between a first position fluidically connecting an inlet of the plurality of channels to the auxiliary waste fluidic line and a second position fluidically connecting a reagent reservoir and the plurality of channels;

a sample cartridge interface coupled to a sample cartridge; and

a sample loading manifold assembly positioned between the flow cell interface and the sample cartridge interface and comprising:

a body carrying a plurality of sample valves and defining a plurality of sample ports and a plurality of flow cell ports, each sample port coupled to a corresponding port of the sample cartridge interface via a sample fluidic line, each flow cell port coupled to a corresponding port of the flow cell interface and associated with one of the plurality of channels of the flow cell via a flow cell fluidic line, wherein each of the sample valves are movable between a first position fluidically connecting a corresponding sample port and a corresponding outlet of the plurality of channels and a second position fluidically coupling the corresponding outlet of the plurality of channels and the waste reservoir;

wherein the samples of interest are loaded into the channels of the flow cell from the rear of the flow cell.

8. The apparatus of claim 7, wherein the sample valves are operable to individually load each channel of the plurality of channels of the flow cell.

9. The apparatus of any one of claims 7 - 8, further comprising a plurality of pumps and wherein the body of the sample loading manifold assembly further defines a plurality of pump ports, each pump port being coupled to one of the pumps of the plurality of pumps via a pump-channel fluidic line.

10. The apparatus of claim 9, wherein each sample valve is operable to fluidly communicate a port of the sample cartridge and a corresponding pump of the plurality of pumps and to fluidly communicate a pump of the plurality of pumps and a corresponding channel of the plurality of channels of the flow cell.

11. The apparatus of any one of claims 9 – 10, wherein the pumps are operable to individually control fluid flow for each channel of the plurality of channels of the flow cell.

12. The apparatus of any one of claims 9 – 11, further comprising a pump manifold assembly comprising the pumps and a cache, further comprising a bypass valve and a bypass fluidic line coupling the bypass valve and the cache.

13. The apparatus of claim 12, further comprising a shared line valve, a plurality of dedicated reagent fluidic lines, and a shared reagent fluidic line, the shared reagent fluidic line coupling the shared line valve and the central valve and adapted to flow one or more reagents to the flow cell, each dedicated reagent fluidic line coupling the bypass fluidic line and the central valve and adapted to flow toward the flow cell.

14. The apparatus of any one of claims 12 – 13, wherein the pump manifold assembly carries a plurality of pump valves and a cache valve and includes a plurality of pump-channel fluidic lines, a plurality of pump fluidic lines, a shared fluidic line, a cache fluidic line, and a primary waste fluidic line, the cache fluidic line being coupled to and between the cache and the cache valve, each pump valve being coupled to a corresponding pump-channel fluidic line, a corresponding pump fluidic line, and the shared fluidic line, the cache valve being coupled to the cache fluidic line, the primary waste fluidic line, and the shared fluidic line.

15. The apparatus of claim 14, wherein the pump valves and the pumps are operable to individually control fluid flow for each channel of the plurality of channels of the flow cell and the pump valves, the cache valve, and the pumps are operable to control fluid flow between the bypass fluidic line and the shared fluidic line.

16. The apparatus of claim 15, wherein the pump valves, the cache valve, and the pumps are operable to control fluid flow between the shared fluidic line and the primary waste fluidic line.