ponents may also include a wash buffer chamber and the plurality of fluid conduits further includes an additional fluid conduit connected to the wash buffer chamber, wherein the additional fluid conduit is proximal to the third fluid conduit and distal to the first fluid conduit. Referring to FIG. **39**, distribution conduit, **3901**, is interconnected to a plurality of fluid conduits, **3902**. The fluid conduits may include a T-junction, **3904**. In the embodiment depicted in FIG. **39**, the plurality of fluid conduits includes a first conduit (**3906**) that leads to an air vent and on the opposite side of the distribution conduit; there is a second conduit (**3908**) that leads to a detection chamber. The plurality of fluid conduits may also include a third fluid conduit (**3905**) that leads to a wash buffer chamber and an additional conduit, **3907**, that leads to a collection chamber, wherein the third fluid conduit and the additional conduit are positioned in between the conduits leading to the detection chamber and the conduit leading to the air vent.

[0297] FIG. **38** shows detailed schematic (FIG. **38***a*) and solid model (FIG. **38***b*) views of collection component **3726** and illustrates an approach to collecting small volume samples that may include bubbles, while ensuring that the bubbles are removed and that a defined volume of liquid is collected. The collection component includes a collection chamber, **3810** and a sensing chamber, **3820**. The collection chamber connects to i) input conduit **3830** that connects to the top of the collection chamber proximal to a wall of the chamber, ii) output conduit **3840** that connects to the bottom of the collection chamber and iii) sensing conduit **3850** which is a tube that extends down from the top of the collection chamber to a pre-defined height in the chamber. In one embodiment, fluid is introduced into the collection chamber via the input conduit and contacted with a baffle (**3815**) and the wall of the collection chamber to constrain bubbles within the liquid. The sensing chamber connects to the sensing conduit at the top of the sensing chamber proximal to a wall of the chamber and to a vent through conduit **3860** (which also connects to the top of the sensing chamber. The operation is illustrated in FIGS. **38** (*c*)-(*e*). Pulling vacuum on the collection component vent while opening the extraction buffer vent (see FIG. **37**) pulls extraction buffer through the sample chamber (and a swab head in the sample chamber, if present), then through conduit **3830** and into the collection chamber where bubble-free liquid collects on the bottom of the chamber. When the liquid level reaches the sensing conduit any additional sample is then transferred through the sensing conduit to the sensing chamber. In one embodiment, the liquid volume in the collection chamber is about 125 uL and the air volume is about 250 uL, i.e., the approximate ratio of the liquid volume in the collection chamber to the air head space is about 1:2. An optical sensor **3824** (which may be in the cartridge reader processing the cartridge) is adapted to detect the presence of liquid in the sensing chamber and thereby to indicate that the collection chamber has a sufficient amount of sample. The collected sample may then be drawn from the collection chamber through conduit **3840**, e.g., by sealing the extraction buffer chamber air vent and pulling vacuum from one of the waste chamber vents while opening the collection component vent to the atmosphere (or, alternatively, by applying positive pressure to the collection component vent to drive fluid toward one of the waste chamber vents). In one embodiment, the waste chamber(s) included in the assay cartridge is configured as described above and depicted in FIG. **38**. Accordingly, if liquid introduced into the collection chamber contains bubbles, the liquid transferred through the outlet conduit is substantially free of bubbles.

[0298] As shown in FIGS. **32**, **33** and **37**, cartridges **3200** and **3700**, preferably, employ many of the same design features as preferred embodiments of cartridge **900** and/or **1400** such as use Z-transitions, laminar construction, electrode arrays, bridge segments, and the like. As shown in FIG. **33** for cartridge **3200**, the cartridges preferably, have a two part design. Advantageously, this design allows the sample chamber to be constructed from two sections and simplifies the manufacture of the curved/angled elongated chamber. As shown in FIG. **33** for cartridge **3200**, the cartridges **3200** may also comprises a bar code **3295** or other identifying feature that can, e.g., identify the assay panel carried out on the cartridge, the cartridge lot, the time of manufacture, the expiration date, cartridge specific calibration data, the sample source, etc.

[0299] The fluidic components are preferably adapted and configured to form a fluidic system that can be selectively controlled via a cartridge reader instrument. The cartridge reader **2300** is schematically depicted in FIG. **23** and preferably incorporates various subsystems for performing the predetermined assay. The cartridge reader is shown holding a cartridge **2390** which may be supplied separately. As depicted, the cartridge reader preferably includes the cartridge handler **2315**, the fluidic handler **2340** and the assay electronics **2330** subsystems. Together these subsystems are preferably controlled by an electronic control system **2310** responsible, generally, for directing the cartridge handler subsystem to load and position the cartridge within the reader, for controlling/coordinating the introduction/movement of fluids throughout the fluidic network and for directing the assay electronics to perform the assay measurement. The cartridge reader is preferably packaged as a single self-contained unit. In preferred embodiments employing luminescence based assays, a smaller light-tight region is incorporated within the overall cartridge reader housing. This allows the luminescence based assay to be performed within the light tight enclosure to ensure that the readings are not affected by ambient light. Preferably, electronic components and other heat-generating components are located outside of the light tight enclosure.

[0300] The cartridge handler subsystem preferably includes a motor to draw the cartridge into the cartridge housing and selectively position the cartridge within the cartridge reader; e.g., position the cartridge under a sensor/detector **2335**. In one preferred embodiment, retraction of the cartridge within the cartridge reader housing may be mechanically coupled to one or more mechanisms within the cartridge reader for synchronized/coordinated operation of the linked mechanisms. For example, the retraction of the cartridge may be mechanically coupled to: the mechanism for closing the door **2325** to the light tight enclosure after the cartridge has entered the chamber; the assay electronics subsystem (described in greater detail below) to allow the cartridge reader's electrical contacts **2330** to engage the cartridge's electrical contacts, i.e., be placed into electrical contact with the electrode array's electrode contacts; the fluidic handler subsystem's (described in greater detail below) fluidic manifold **2340** to engage the cartridge's fluid ports, i.e., be placed into fluidic communication with the cartridge's fluidic ports (e.g., establishing a pressure seal between the cartridge's fluidic ports and the fluid manifold); and/or the fluid handler subsystem's reagent module breaking mecha-