components of a larger sample processing device. A reader instrument **1200** is illustrated in perspective view with its housing partially removed in FIGS. **12** and **13**, in cross section in FIG. **14**, and with respect to selected components as seen in FIGS. **15** through **17**.

Size and Housing

[0100] One embodiment of such a portable reader instrument is illustrated in FIG. **12** which illustrates a reader instrument **1200** (similar to reader instrument **100** of FIG. **1**) with its housing **1202** partially removed for better illustrating layout of internal components. Reader instrument **1200** is suitable for the operational needs and constraints of clinical environments. The reader instrument may weigh less than 10 kg, and it typically weighs only 1 to 3 kg, making it easily transportable. The reader instrument may have volume less than 5000 cm^3, and typically has a volume of only 2000 to 3000 cm^3. The reader instrument footprint is similarly small, being less than 500 cm^2, and typically only 200 to 300 cm^2. The reader instrument is small enough to be easily transported and may be stackable on other equipment. To aid in transport, an integral handle **1260** may be formed, as seen in cross section in FIG. **14**. The exterior finishing of housing **1202** may be constructed of stainless steel, protectively coated metal, high durability plastics, or other suitable materials capable of withstanding regular cleaning with commercially available solutions, including but not limited to clinical biocides (e.g., Cavicide™), 70% solution isopropyl alcohol, or 20% solution household bleach (i.e., 2% sodium hypochlorite).

User Interface

[0101] Continuing to refer to FIG. **12**, at least a portion of housing **1202** is angled to allow easy access to a cartridge insertion door and viewing of a user interface **1230**. As shown, the user interface may include a flat panel touchscreen display **1232**, a power/reset button **1234**, and a sound generator (not shown). A user may engage a cartridge (such as cartridge **110** of FIG. **1** or cartridge **300** of FIGS. **3-11**) into reader instrument **1200** by inserting it through an aperture **1250** protected by a door **1252**. Although door **1252** is shown in FIG. **12** as a spring-loaded flap door, it may alternatively be implemented as a sliding door, a loading tray (manual or automatic), a manual flap door, or any other appropriate mechanism to protect aperture **1250** when reader instrument **1200** is not in use and/or to prevent light leakage while the light sources internal to reader instrument **1200** are in operation. Additionally, while FIGS. **2** and **17** show the cartridge partially protruding from the reader instrument during the operation of the reader instrument, it may be desirable in certain applications for the cartridge to be fully enclosed within the reader instrument while the cartridge is being analyzed therein.

[0102] A cartridge holder assembly **1254** physically prevents cartridges from being inserted backwards. Cartridge holder assembly **1254** may include mechanical or electronic components that indicates to the user when a cartridge is fully inserted, such as by audible sound, tactile feedback, display signal, or some combination of above. Cartridge holder assembly **1254** and inserted cartridge are positioned above touchscreen display **1232** in a manner that does not interfere with the operation of touchscreen display **1232** or any other front panel components of user interface **1230**.

[0103] A user may interact with reader instrument **1200** by using touchscreen display **1232**. Touchscreen display **1232** may display analysis results to the user, allow for input of sample and user identifiers to the reader instrument, and allow the user to configure the operation of the reader instrument by choosing options presented on the display. The display may further display status and fault information to the user. The touchscreen may be compatible with a user wearing no gloves (bare fingers), a single layer of gloves, a double layer of gloves, nitrile gloves, or latex gloves, or any other hand protection available to a user.

[0104] In certain embodiments, the display size (measured on diagonal) is between 7 and 11 cm. Display resolution may be QVGA (240×320 pixels) in landscape mode or greater. The display may include RGB color with 16-24 bit depth. The display may be backlit with white light emitting diodes ("LEDs"), cold cathode fluorescent tube lighting, or may be internally lit using organic LED displays, or externally lit using electronic ink, micro-electro-mechanical system ("MEMS") interference display or passively lighted display screens. The user may control the power state of the reader instrument by pushing a button **1234** located on front panel. For example, momentarily pressing button **1234** may power the reader instrument to its normal operational state. The reader instrument may wake if in a low power "sleep" state or do nothing if already powered on. Pressing button **1234** for greater than five continuous seconds may cause the reader instrument to safely power off. Button may be located such that it does not interfere with operation of the touchscreen display or any other front panel components.

[0105] To increase throughput, in an exemplary embodiment, the reader instrument may be configured to produce analysis results after approximately 30 seconds from cartridge insertion to delivery of analysis results to user. These results may be displayed in whole or in part on touchscreen display **1232**. Additionally, the reader instrument may store in internal memory storage two thousand or more analysis results. Such analysis results may include, for example, patient or sample identifier, cartridge lot number, date and time of test, date and time of a linked quality control operation, signal-to-cutoff ratio for all biomarkers, and analysis result (e.g., positive/negative/indeterminate for the presence of antibodies in the sample, and a quantitative output) for all tested analytes. Finally, the user may have the option to store and download measurement results that include full image sequences of the cartridge microarray and any associated cartridge identification information.

[0106] Since a user may wish to use other input devices or support remote usage of the reader instrument, communication with external peripheral devices may be enabled. The reader instrument may have, for example, a USB Type A port that supports an optional barcode reader (compatible with one or both of standard 1-D and 2-D codes) for inputting sample identifiers or user codes. A USB Type A connectors may be located on a rear panel **1262** (FIG. **14**) to support computer-to-computer communication as a slave device. The reader instrument may also allow networked communication with other computer systems connected by Ethernet, and accordingly includes one RJ45 Ethernet connector located on rear panel.

Cartridge Holder Assembly

[0107] Precise positioning and reliable engagement of a cartridge with reader instrument **1200** may be required for