electronics architecture is distributed across two components of the apparatus: the Analyzer **2100** and a Heater unit **2102**. The Analyzer apparatus as further described herein contains, for example, an Optical Detection Unit **2108**, a Control Board **2114**, a Backplane **2112**, and a LCD Touchscreen **2110**. The Control Board includes a Card Engine **2116** further described herein, and Compact Flash memory **2118**, as well as other components. The Heater Assembly includes a Heater Board **2104** and a Heater Mux Board **2106**, both further described herein.

[0106] In one embodiment, the Card Engine electronics module **2116** is a commercial, off the shelf "single board computer" containing a processor, memory, and flash memory for operating system storage.

[0107] The optional LCD+Touchscreen electronics module **2110** is a user interface, for example, driven through a touchscreen, such as a 640 pixel by 480 pixel 8 inch LCD and 5-wire touchscreen.

[0108] The Compact Flash electronics module **2118** is, for example, a 256 megabyte commercial, off the shelf, compact flash module for application and data storage. Other media are alternatively usable, such as USB-drive, smart media card, memory stick, and smart data-card having the same or other storage capacities.

[0109] The Backplane electronics module **2112** is a point of connection for the removable heater assembly **2102**. Bare PC boards with two connectors are sufficient to provide the necessary level of connectivity.

[0110] The Control Board electronics module **2114** supports peripherals to the Card Engine electronics module **2116**. In one embodiment, the peripherals include such devices as a USB host+slave or hub, a USB CDROM interface, serial ports, and ethernet ports. The Control Board **2114** can include a power monitor with a dedicated processor. The Control Board may also include a real time clock. The Control Board may further include a speaker. The Control Board **2114** also includes a CPLD to provide SPI access to all other modules and programming access to all other modules. The Control Board includes a programmable high voltage power supply. The Control Board includes a Serial-Deserializer interface to the LCD+Touchscreen electronics module **2110** and to the Optical Detection Unit electronics module **2108**. The Control Board also includes module connectors.

[0111] In the exemplary embodiment, the optical detection unit electronics module **2108** contains a dedicated processor. The optical detection unit **2108** contains a serializer-deserializer interface. The optical detection unit **2108** contains LED drivers. The optical detection unit also contains high gain-low noise photodiode amplifiers. The optical detection unit can have power monitoring capability. The optical detection unit can also be remotely reprogrammable.

[0112] The Heater Board electronics module **2104** is preferably a glass heater board. The Heater Board has PCB with bonding pads for glass heater board and high density connectors.

[0113] In one embodiment, the heater mux ('multiplex') board electronics module **2106** has 24 high-speed ADC, 24 precision current sources, and 96 optically isolated current drivers for heating. The heater mux board has the ability to time-multiplex heating/measurement. The heater mux board has multiplexer banks to multiplex inputs to ADC, and to multiplex current source outputs. The heater mux board has a FPGA with a soft processor core and SDRAM. The heater mux board has a Power Monitor with a dedicated processor. The Heater Mux Board can be remotely reprogrammable.

[0114] In another embodiment, control electronics can be spread over four different circuit board assemblies. These include the MAIN board: Can serve as the hub of the Analyzer control electronics and manages communication and control of the other various electronic sub-assemblies. The main board can also serve as the electrical and communications interface with the external world. An external power supply (12V DC/10A; UL certified) can be used to power the system. The unit can communicate via 5 USB ports, a serial port and an Ethernet port. Finally, the main board can incorporate several diagnostic/safety features to ensure safe and robust operation of the Analyzer.

[0115] MUX Board: Upon instruction from the main board, the MUX board can perform all the functions typically used for accurate temperature control of the heaters and can coordinate the collection of fluorescence data from the detector board.

[0116] LCD Board: Can contain the typical control elements to light up the LCD panel and interpret the signals from the touch sensitive screen. The LCD/touch screen combination can serve as a mode of interaction with the user via a Graphical User Interface.

[0117] Detector Board: Can house typical control and processing circuitry that can be employed to collect, digitize, filter, and transmit the data from the fluorescence detection modules.

[0118] Certain software can be executed in each electronics module. The Control Board Electronics Module executes, for example, Control Board Power Monitor software. The Card Engine electronics module executes an operating system, graphical user interface (GUI) software, an analyzer module, and an application program interface (api). The Optical Detection Unit electronics module executes an optics software module. The Heater Mux Board electronics module executes dedicated Heater Mux software, and Heater Mux Power Monitor software. Each of the separate instances of software can be modular and under a unified control of, for example, driver software.

[0119] The exemplary electronics can use Linux, UNIX, Windows, or MacOS, including any version thereof, as the operating system. The operating system is preferably loaded with drivers for USB, Ethernet, LCD, touchscreen, and removable media devices such as compact flash. Miscellaneous programs for configuring the Ethernet interface, managing USB connections, and updating via CD-ROM can also be included.

[0120] In the embodiment of FIG. **17**, the analyzer module is the driver for specific hardware. The analyzer module provides access to the Heater Mux Module, the Optical Detection Unit, the Control Board Power Monitor, the Real Time Clock, the High Voltage Power Supply, and the LCD backlight. The analyzer module provides firmware programming access to the Control Board power monitor, the Optical Detection Unit, and the Heater Mux Module.

[0121] The API provides uniform access to the analyzer module driver. The API is responsible for error trapping, and interrupt handling. The API is typically programmed to be thread safe.

[0122] The GUI software can be based on a commercial, off-the-shelf PEG graphics library. The GUI can use the API to coordinate the self-test of optical detection unit and heater assembly. The GUI starts, stops, and monitors test progress.