in FIG. **3**, as well as their respective connectivities, is exemplary and not intended to be limiting.

[0063] A processor **980**, such as a microprocessor, is configured to control functions of various components of the system as shown, and is thereby in communication with each such component. In particular, processor **980** is configured to receive data about a sample to be analyzed, e.g., from a sample reader **990**, which may be a barcode reader, an optical character reader, or an RFID scanner (radio frequency tag reader). For example, the sample identifier can be a handheld bar code reader. Processor **980** can be configured to accept user instructions from an input **984**, where such instructions may include instructions to start analyzing the sample, and choices of operating conditions.

[0064] Processor **980** can also be configured to communicate with an optional display **982**, so that, for example, information including but not limited to the current status of the system, progress of PCR thermocycling, and any warning message in case of malfunction of either system or cartridge, as well as results of analysis, are transmitted to the display. Additionally, processor **980** may transmit one or more questions to be displayed on display **982** that prompt a user to provide input in response thereto. Thus, in certain embodiments, input **984** and display **982** are integrated with one another.

[0065] Processor **986** can be optionally further configured to transmit results of an analysis to an output device such as a printer, a visual display, or a speaker, or a combination thereof, the transmission being either directly through a directly dedicated printer cable, or wirelessly, or via a network connection.

[0066] Processor **980** is still further optionally connected via a communication interface such as a network interface to a computer network **988**. The communication interface can be one or more interfaces selected from the group consisting of: a serial connection, a parallel connection, a wireless network connection and a wired network connection such as an ethernet, firewire, cable connection, or one using USB connectivity. Thereby, when the system is suitably addressed on the network, a remote user may access the processor and transmit instructions, input data, or retrieve data, such as may be stored in a memory (not shown) associated with the processor, or on some other computer-readable medium that is in communication with the processor. The computer network connection may also permit extraction of data to a remote location, such as a personal computer, personal digital assistant, or network storage device such as computer server or disk farm. The apparatus may further be configured to permit a user to e-mail results of an analysis directly to some other party, such as a healthcare provider, or a diagnostic facility, or a patient.

[0067] Although not shown in FIG. **3**, in various embodiments, input **984** can include one or more input devices selected from the group consisting of: a keyboard, a touch-sensitive surface, a microphone, a track-pad, and a mouse. A suitable input device may further comprise a reader of formatted electronic media, such as, but not limited to, a flash memory card, memory stick, USB-stick, CD, or floppy diskette. An input device may further comprise a security feature such as a fingerprint reader, retinal scanner, magnetic strip reader, or bar-code reader, for ensuring that a user of the system is in fact authorized to do so, according to, for example, pre-loaded identifying characteristics of authorized users. An input device may additionally—and simultaneously—function as an output device for writing data in connection with sample analysis. For example, if an input device is a reader of formatted electronic media, it may also be a writer of such media. Data that may be written to such media by such a device includes, but is not limited to, environmental information, such as temperature or humidity, pertaining to an analysis, as well as a diagnostic result, and identifying data for the sample in question.

[0068] Additionally, in various embodiments, the apparatus can further comprise a data storage medium configured to receive data from one or more of the processor, an input device, and a communication interface, the data storage medium being one or more media selected from the group consisting of: a hard disk drive, an optical disk drive, or one or more removable storage media such as a CD-R, CD-RW, USB-drive, and a flash card.

[0069] Processor **980** is further configured to control various aspects of sample diagnosis, as follows in overview, and as further described in detail herein. The system is configured to operate in conjunction with a complementary cartridge **994**, such as a microfluidic cartridge. The cartridge is itself configured, as further described herein, to receive one or more samples 996 containing one or more polynucleotides in a form suitable for amplification and diagnostic analysis. The cartridge has dedicated regions within which amplification, such as by PCR, of the polynucleotides is carried out when the cartridge is situated in the apparatus.

[0070] The microfluidic cartridge is received by a receiving bay **992** configured to selectively receive the cartridge. For example, the receiving bay and the microfluidic cartridge can be complementary in shape so that the microfluidic cartridge is selectively received in, e.g., a single orientation. The microfluidic cartridge can have a registration member that fits into a complementary feature of the receiving bay. The registration member can be, for example, a cut-out on an edge of the cartridge, such as a corner that is cut-off, or one or more notches that are made on one or more of the sides. By selectively receiving the cartridge, the receiving bay can help a user to place the cartridge so that the apparatus can properly operate on the cartridge. The receiving bay can also be configured so that various components of the apparatus that can operate on the microfluidic cartridge (heat sources, detectors, force members, and the like) are positioned to properly operate on the microfluidic cartridge. In some embodiments, the apparatus can further include a sensor coupled to the processor, the sensor configured to sense whether the microfluidic cartridge is selectively received.

[0071] The receiving bay is in communication with a heater unit **998** that itself is controlled by processor **980** in such a way that specific regions of the cartridge, such as individual sample lanes, are independently and selectively heated at specific times during amplification and analysis. The processor can be configured to control application of heat to the individual sample lanes, separately, in all simultaneously, or in groups simultaneously.

[0072] The heat source can be, for example, a contact heat source such as a resistive heater or a network of resistive heaters, or a Peltier device, and the like. The contact heat source can be configured to be in direct physical contact with one or more distinct locations of a microfluidic cartridge received in the receiving bay. In various embodiments, each contact source heater can be configured to heat a distinct location having an average diameter in 2 dimensions from about 1 millimeter (mm) to about 15 mm (typically about 1