mechanism, e.g., a frame positioned on the ampoule breaking mechanism. The surface of the cam may be circular and comprises a tab protruding from the surface.

[0031] In one embodiment, the assay cartridge comprises two ampoules and the ampoule breaking mechanism is configured to break the two ampoules serially or in parallel. The ampoule breaking mechanism may be configured to break the two ampoules serially or in parallel. The ampoule breaking mechanism may include a plurality of ampoule release mechanisms, each ampoule breaking mechanism comprises a first ampoule release mechanism and a second ampoule release mechanism, wherein the first ampoule release mechanism comprises a first hammer element in coordination with a first cam on a control axle and the second ampoule release mechanism comprises a second hammer element in coordination with a second cam on the control axle. The first and second cams may be located in different relative rotational positions in the ampoule breaking mechanism, and the first and second cams are configured to engage the first and second hammer elements at different times during the rotation of the control axle. Alternatively, the first and second cams are located in approximately the same relative rotational positions in the ampoule breaking mechanism, and the first and second cams are configured to engage the first and second hammer elements at approximately the same time during the rotation of the control axle.

[0032] The invention also provides a method of using a cartridge reader configured to analyze an assay conducted in an assay cartridge, the cartridge reader comprising (a) a enclosure comprising a mounting frame configured to align the cartridge with one or more reader components located within the enclosure; (b) a cartridge tray mounted to a rail configured to move the tray in and out of the enclosure, wherein the cartridge tray comprises an alignment guide configured to selectively control movement of the mounting frame; and (c) an actuator to move the cartridge tray along the rail, the method comprising the steps of: (i) inserting the assay cartridge into the cartridge tray; (ii) moving the cartridge tray into the enclosure; (iii) moving the cartridge tray within the enclosure to cause the mounting frame to be lowered relative to the cartridge tray for cartridge processing; (iv) moving the cartridge tray within the enclosure to cause the mounting frame to move along with the cartridge tray, wherein the cartridge tray and the mounting frame remain in vertical and horizontal alignment for cartridge processing by the one or more reader components. The mounting frame may include an engagement pin and rollers, wherein the rollers are received by tracks on each side of the mounting frame, and the alignment guide comprises a vertical tab and the vertical tab contacts the engagement pin during movement of the cartridge tray, and the moving steps (iii) further comprises contacting the vertical tab and the engagement pin to cause the mounting frame to translate along the tracks in coordination with the cartridge tray. In one embodiment, the tracks comprise at least one downward sloping region and a flat region and the moving step (iii) comprises moving the cartridge tray within the sloping region, and the moving step (iv) comprises moving the cartridge tray within the flat region. The alignment guide may include a vertical tab configured to engage with (a) a groove in the mounting frame, (b) the engagement pin in the mounting frame, and (c) a notch in the alignment guide, the notch positioned adjacent to the vertical tab, such that the method further comprises the step of coordinating the translation of the mounting frame and the cartridge tray prior to step (iii).

[0033] The cartridge reader may further include a locking mechanism comprising a spring loaded rotating latch, a first pin configured to engage with the assay cartridge, and a second pin configured to engage with a notch on the assay cartridge, wherein the inserting step (i) comprises moving the assay cartridge into the cartridge tray to contact the first pin, causing the latch to rotate and the second pin to engage with the notch. In one embodiment, the spring loaded rotating latch comprises a spring and the inserting step (i) further comprises causing the spring to resist the rotation of the latch. Still further, the inserting step (i) further comprises reducing the resistance of the spring as the second pin engages with the notch. The latch may further include a tab and the locking mechanism further comprises an optical sensor, wherein the tab is configured to cover the optical sensor when the locking mechanism is engaged and the inserting step (i) further comprises detecting an optical signal from the optical sensor to confirm that the assay cartridge is engaged by the locking mechanism.

[0034] The one or more reader components may include the photodiode assembly and the photodiode assembly comprises a traveler block including positioning pins extending from the traveler block, the positioning pins being configured to couple motion of the mounting frame to the lateral motion of the traveler block, wherein one or more of the moving steps (iii) and (iv) further comprise moving the mounting frame in coordination with the traveler block. The one or more of the moving steps (iii) and (iv) may further comprise coupling motion of the mounting frame to the lateral motion of the traveler block. The photodiode assembly may also comprise an alignment component to align at least one photodiode with a region on the assay cartridge and one or more of the moving steps (iii) and (iv) further comprise aligning the at least one photodiode with a region of the assay cartridge. The at least one photodiode may be mounted to the traveler block, the traveler block being configured to horizontally translate along a guide cylinder mounted in the photodiode assembly and the moving step (iv) further comprises translating, horizontally, along the guide cylinder to align the at least one photodiode with the region of the assay cartridge.

[0035] Moreover, the one or more reader components may comprise an ampoule breaking mechanism configured to break an ampoule within the assay cartridge and the method further comprises (v) breaking the ampoule within the assay cartridge. The ampoule breaking mechanism may include a hammer element coupled to a spring and the hammer is held under a spring force, the hammer, the breaking step (v) comprises (i) rotating the hammer around a hammer axle, and (ii) raising and lowering the hammer relative to the assay cartridge. The ampoule breaking mechanism may include a plurality of ampoule breaking mechanisms and the assay cartridge comprises a plurality of ampoules, wherein the breaking step (v) comprises breaking the plurality of ampoules in series or in parallel. The plurality of ampoule breaking mechanisms may include a plurality of hammer elements. In one embodiment, the plurality of ampoule breaking mechanisms comprises a first ampoule breaking mechanism and a second ampoule breaking mechanism, wherein the first ampoule breaking mechanism comprises a first hammer element in communication with a first cam on a control axle and the second ampoule breaking mechanism comprises a