Purpose: A geometric QA tool has been adapted as a routine QA tool for three different types of linear accelerators with integrated kV imaging systems. It quantitatively evaluates geometric accuracy of kV and MV cone beam imaging systems including their coincidence. **Method and Materials:** Three linacs are a Varian Trilogy (Varian Medical Systems, Palo Alto, California, USA), an Elekta Synergy (Elekta, Stockholm, Sweden), and a Brainlab Vero (Brainlab AG, Feldkirchen, Germany). Both the Trilogy and Synergy linacs are equipped with a retractable kV x-ray tube and a flat panel detector. The Vero is based on the MHI-TM2000 (Mitsubishi Heavy Industries, Ltd., Tokyo, Japan). It utilizes a rotating, rigid ring structure integrating a MV x-ray head mounted on orthogonal gimbals, an electronic portal imaging device (EPID), two kV x-ray tubes, and fixed two flat panel detectors. Two QA phantoms were built to suit different field sizes. Projection images of a QA phantom were acquired by MV and kV imaging systems at a series of gantry angles. In-house software was used to analyze projection images and calculate eight geometric parameters for each projection. They are three parameters describing the actual x-ray source position, three parameters describing the position of the detector center, and two parameters describing the detector angular orientation. **Results:** Over 4,300 individual projections have been acquired and analyzed. The Trilogy was calibrated 4 times over a six month period while the Synergy and the Vero were calibrated twice and once, respectively. Quantitative geometric parameters of both MV and kV imaging systems were successfully evaluated. Isocenter consistency of the imaging systems was evaluated. Additionally, the gimbal-based x-ray source positioning of the Vero was examined. **Conclusions:** Geometric accuracies of both MV and integrated kV imaging systems were quantitatively evaluated by this QA tool.