Subsurface water content is an important state variable in hydrological systems. Established methods to measure subsurface water content have a small support scale which causes scaling problems in many applications. Time-lapse relative gravimetry can give an integrated measure of soil water storage changes over tens to hundreds of cubic meters. The use of time-lapse gravimetry in hydrology has until recent years been limited by the large efforts required to obtain precise and accurate gravity data at the 1μGal (10⁻⁸ms⁻²) scale. A typical modern relative gravimeter, the Scintrex CG-5, has a sensitivity of 1μGal, corresponding to a layer of 0.024 m of water in an infinitely extended horizontal sheet. For gravity surveys using relative gravity meters, the precision is highly dependent on the methods used to operate the gravimeter in the field. Systematic errors, which are difficult to detect, can lead to a loss of accuracy. As a performance test of a CG-5 for applications of time-lapse gravity in hydrology, we have measured the change in water storage in an indoor basin. The experiment was designed to resemble a field application, e.g. a pumping test, a forced infiltration experiment or alluvial aquifer storage change along intermittent rivers, so that the results can be applied to field experiments. The use of a 20m by 30m rectangular basin with a known water volume resulted in complete control over the instrument accuracy. Precisions of 3μGal and accuracies of