We give examples of rank-one transformations that are (weak) doubly ergodic and rigid (so all their Cartesian products are conservative), but with non-ergodic two-fold Cartesian product. We give conditions for rank-one infinite measure-preserving transformations to be (weak) doubly ergodic and for their k-fold Cartesian product to be conservative. We also show that a (weak) doubly ergodic nonsingular group action is ergodic with isometric coefficients, and that the latter strictly implies W-measurable sensitivity.