The enhancement of the Earth's ring current during the main phase of magnetic storms is a dynamic process that is not yet thoroughly understood. In order to clarify those dynamics, we present simulations of idealized magnetic storm main phases in which we vary the convection strength and the plasma sheet density and temperature. Furthermore, we generate four sets of these simulations for comparison: one set in which both the magnetic field and electric fields are steady, one set in which both are computed to be consistent with the plasma configuration, and two sets in which one is steady and the other is computed self-consistently. In the absence of any feedback between the plasma and fields, particle drift paths would be independent of particle phase space densities and ring current energy development is directly proportional to plasma sheet density. The inclusion of feedback between the plasma and fields leads to a weaker-than-linear relationship between plasma sheet density and the resulting ring current energy during a storm main phase. For the electric field, this results from the fact that plasma enhancements in the inner plasma sheet and inner magnetosphere drive stronger Birkeland currents and diminish the cross-tail convection electric field in those regions. For the magnetic field, stronger cross-tail currents cause the magnetic field to become stretched, changing the gradient/curvature drift paths of particles. By contrasting the results of these simulations, we clarify the relative importance of these nonlinear processes for understanding storm-time ring current dynamics.