NASA's MESSENGER mission will enter its orbit about Mercury in 2011 and make observations of this magnetosphere during solar maximum when encounters with Interplanetary Coronal Mass Ejections (ICMEs) are most likely. We use the BATS-R-US MHD model, modified to simulate Mercury's magnetosphere, to investigate the response of this small magnetosphere to ICME conditions. Mercury is treated as a sphere with finite conductance, and the spherical simulation grid is set to have an inner boundary just above one \( R_M \). We systematically explore the low Alfvén Mach number regime using series of steady state simulations in which the IMF \( B_z \) is steadily decreased. We further study the effect of different boundary conditions on the magnetosphere solution during such conditions, and contrast those results with comparable simulations during nominal solar wind conditions.