Ultracold fermion cooling cycle using heteronuclear Feshbach resonances M.A. MORALES, University of Illinois at Urbana-Champaign, N. NYGAARD, J.E. WILLIAMS, CHARLES W. CLARK, National Institute of Standards and Technology — Ideal gas models have given much insight into the physics of dilute fermion gases that can form into bosonic molecules via a Feshbach resonance, and have even given good quantitative agreement with the molecular and Bose-Einstein condensate fractions observed in recent experiments. [1] We develop such a model for a harmonically -trapped ideal gas with three components: bosonic atoms, fermionic atoms, and a fermionic diatomic molecule produced by a Feshbach resonance involving the two atomic species. Such systems have been produced in recent experiments. [2,3] We map out the phase diagram for this three-component mixture in chemical and thermal equilibrium. Considering adiabatic association and dissociation of the molecules, we identify a possible cooling cycle, which in ideal circumstances can yield an exponential increase of the phase-space density.