The New AGS Phase, Radial and Synchronization Loops[*], E. ONILLON, J.M. BRENNAN, AGS Dept., BNL, Upton, NY 11973 - The AGS Booster and the AGS, as well as the AGS and RHIC, must be synchronized before bunch-to-bucket transfer of the beam. A feedback loop has been designed and an improvement has been made to the AGS phase and radial loops. In both cases, the design uses a state variable representation, leading to either pole placement or a linear quadratic approach, to achieve greater stability and smaller errors. The state variables are: beam phase, frequency and radius; the integral of the difference between the radius and its reference; the phase deviation of the bunch from the synchronous phase. Furthermore, the feedback gains are programmed as a function of the beam energy to keep the same loop performances throughout the acceleration cycle.