The notion of multiple Ore extension is introduced as a natural generalization of Ore extensions and double Ore extensions. For a PBW-deformation $\mathfrak{B}_q(\mathfrak{sl}(n+1,C))$ of type An quantum group, we explicitly obtain the commutation relations of its root vectors,then show that it can be realized via a series of multiple Ore extensions, which we call a ladder Ore extension of type $(1,2,\cdots,n)$.