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We study the inverse problem for versal deformation rings of Galois representations which asks which complete local commutative Noetherian rings can arise as such versal deformation rings. We also study the inverse inverse problem which, given a versal deformation ring R , is to find all groups Γ and representations V of Γ such that R is the versal deformation ring of V . A main tool in our approach of these problems is to study extension groups Γ of finite groups G by abelian p -groups and to employ the spectral sequence which relates the cohomology of Γ to that of G . (Received August 03, 2010)