A computational study of two-phase viscoelastic systems in a capillary tube with a sudden contraction/expansion\textsuperscript{1} METIN MURADOGLU, DAULET IZBASSAROV, Koc University — Two-phase viscoelastic systems are computationally studied in a pressure-driven tube with a sudden contraction and expansion using a finite-difference/front-tracking method. The effects of viscoelasticity in drop and bulk fluids are investigated including high Weissenberg and Reynolds number cases up to $Wi = 100$ and $Re = 100$. The FENE-CR model is used to account for the fluid viscoelasticity. Extensive computations are performed to examine drop dynamics for a wide range of parameters. It is found that viscoelasticity interacts with drop interface in a non-monotonic and complicated way, and the two-phase viscoelastic systems exhibit very rich dynamics especially in the expansion region. At high $Re$, the drop undergoes large deformation in the contraction region followed by shape oscillations in the downstream of the expansion. For a highly viscous drop, a re-entrant cavity develops in the contraction region at the trailing edge which, in certain cases, grows and eventually causes encapsulation of ambient fluid. The re-entrant cavity formation is initiated at the entrance of the contraction and is highly influenced by the viscoelasticity. The effects of viscoelasticity are reversed in the constricted channel: Viscoelasticity in drop/continuous phase hinders/enhances format

\textsuperscript{1}The authors are grateful to the Scientific and Technical Research Council of Turkey (TUBITAK) for the support of this research through Grant 112M181 and Turkish Academy of Sciences (TUBA).