The Second Cohomology of Current Algebras of General Lie Algebras

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Abstract. Let $A$ be a unital commutative associative algebra over a field of characteristic zero, $\mathfrak{f}$ a Lie algebra, and $\mathfrak{z}$ a vector space, considered as a trivial module of the Lie algebra $\mathfrak{g} := A \otimes \mathfrak{f}$. In this paper, we give a description of the cohomology space $H^2(\mathfrak{g}, \mathfrak{z})$ in terms of easily accessible data associated with $A$ and $\mathfrak{f}$. We also discuss the topological situation, where $A$ and $\mathfrak{f}$ are locally convex algebras.