Fluorescence excitation spectra, at resolution 0.02 cm$^{-1}$, in the system $\tilde{A} \leftarrow \tilde{X}$ were recorded for acetaldehyde in a supersonic jet. We performed full rotational analysis of bands with torsional vibrational quanta up to 4. Torsional levels from near the methyl torsional barrier to beyond that barrier are assigned. Torsional sublevel A below the torsional barrier is fitted as an asymmetric rotor but the resulting value of rotational parameter $A$ is affected significantly by the torsional motion. For the E sublevel, K doublet states split significantly with torsional quantum number $v_t$. Anomalous transitions to A sublevels are observed arising from interaction of torsion and rotation. The positions of A and E sublevels at high $v_t$ state cannot be fitted with the program involving only interaction of torsion and rotation. For $v_t = 0$-2 states the A/E splitting is reversed from those in the levels with excitation in acetyl hydrogen wagging; interaction with inversion varies the splitting of torsional sublevels and the K structures.

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