Commissioning beam data for the convolution/superposition photon dose calculation algorithm on a commercial three-dimensional radiation treatment planning (3-D RTP) system (ADAC Pinnacle[3]) can be a difficult and time-consuming task. Sixteen parameters, along with spectral weights representing a discrete energy spectrum must be fit to sets of central-axis depth doses and off-axis profiles for a large number of field sizes. The present paper proposes a beam-commissioning methodology that is relatively rapid and provides a set of beam parameters that generates an accurate beam model in addition to being physically reasonable. The methodology begins by automatically generating a single set of beam parameters that gives an approximate fit to relative dose distributions for all beams, open and wedged, in a data set. A limited number of parameters are adjusted small amounts to give accurate beam models for four open-beam field sizes and three wedged-beam field sizes. Beam parameters for other field sizes are interpolated and validated against measured beam data. A complete set of parameters can be generated in approximately a week's time. The parameters yield calculated relative doses that match measured relative doses in a water phantom to within 0.5 – 1.0% along the central axis and 2% along beam profiles for a range of field sizes from 4 x 4 to the largest field size available. While the methodology is specific to the particular treatment planning system, the approach may be generalizable to other implementations of the dose model in other treatment planning systems.