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The Benjamin-Ono (BO) equation describes the weakly nonlinear evolution of one-dimensional interface waves in a dispersive medium. It is an integrable system with a known inverse scattering transform and is often viewed as a prototypical problem for the study of multi-dimensional integrable systems and Riemann-Hilbert problems with a non-local jump condition. In this talk, we propose a construction for the scattering data of the BO equation with a rational initial condition, under mild restrictions. The construction procedure consists in building the Jost function solutions explicitly to recover from these the reflection coefficient, eigenvalues, and phase constants. For this class of initial conditions, all of these steps are explicit and the recovery of the scattering data can be done by using the analyticity properties of the Jost functions. We finish by showing that this procedure validates certain well-known formal results obtained in the zero-dispersion limit. This work can be seen as a significant extension of Kodama, Ablowitz, and Satsuma's who only considered specific Lorentzian initial conditions to obtain the location of the eigenvalues. (Received January 28, 2014)