A frequency domain (FD) time-reversal (TR) precoder is proposed to perform physical layer security (PLS) in single-input single-output (SISO) systems using orthogonal frequency-division multiplexing (OFDM) and an artificial noise (AN) signal injection. The AN signal does not corrupt the data transmission to the legitimate receiver but degrades the decoding performance of the eavesdropper. This scheme guarantees the secrecy of a communication towards a legitimate user when the transmitter knows the instantaneous channel state information (CSI) of the legitimate link thanks to the channel reciprocity in time division duplex (TDD) systems but does not know the instantaneous CSI of a potential eavesdropper. Three optimal decoding structures at the eavesdropper are considered in a fast fading (FF) environment depending on the handshake procedure between Alice and Bob. Closed-form approximations of the AN energy to inject in order to maximize the SR of the communication are derived. In addition, the required conditions at the legitimate receiver's end to guarantee a given SR are determined when Eve's signal-to-noise ratio (SNR) is infinite. Furthermore, a waterfilling power allocation strategy is presented to further enhance the secrecy of the scheme. Simulation results are presented to demonstrate the security performance of the proposed secure system.