$$
\begin{aligned}
|\Psi\rangle = & \tfrac{1}{2}\,|0_T 0_A\rangle\,(\alpha\,|0_B\rangle + \beta\,|1_B\rangle) + \tfrac{1}{2}\,|1_T 0_A\rangle\,(\alpha\,|0_B\rangle - \beta\,|1_B\rangle) + \\
& \tfrac{1}{2}\,|0_T 1_A\rangle\,(\alpha\,|1_B\rangle + \beta\,|0_B\rangle) + \tfrac{1}{2}\,|1_T 1_A\rangle\,(\alpha\,|1_B\rangle - \beta\,|0_B\rangle)
\end{aligned}
$$