$$\begin{array}{c}
\underline{U} \\
\\
\hat{B}
\end{array}
\iff
\begin{array}{c}
\hat{U} = (\hat{I} \otimes \hat{B})(\hat{A} \otimes \hat{I}) \\
= \hat{A} \otimes \hat{B}
\end{array}$$