

term-3-0E

$$[[\hat{H}_{t, Ni}^0, \hat{H}_{t, Ni}^+], \hat{H}_{t, Ni}^-] = 0$$

$$[[\hat{H}_{t, Ni}^0, \hat{H}_{t, Ni}^-], \hat{H}_{t, Ni}^+] = 0$$

$$\begin{aligned} [[\hat{H}_{t, Ni}^0, \hat{H}_{t, cross}^{0\oplus}], \hat{H}_{t, cross}^{0\ominus}] = & + X_{iN}^{\sigma\leftarrow 0} X_{jN}^{0\leftarrow\sigma} X_{iR}^{\sigma\leftarrow\sigma} \\ & + X_{iN}^{\sigma\leftarrow 0} X_{jN}^{0\leftarrow\sigma} X_{iR}^{d\leftarrow d} + X_{iN}^{\sigma\leftarrow 0} X_{jN}^{0\leftarrow\sigma} X_{iR}^{-\sigma\leftarrow-\sigma} \\ & + X_{iN}^{\sigma\leftarrow 0} X_{jN}^{0\leftarrow\sigma} X_{iR}^{d\leftarrow d} + X_{iN}^{\sigma\leftarrow 0} X_{iR}^{0\leftarrow 0} X_{jN}^{0\leftarrow\sigma} \\ & + X_{iN}^{\sigma\leftarrow 0} X_{iR}^{-\sigma\leftarrow-\sigma} X_{jN}^{0\leftarrow\sigma} - X_{iN}^{\sigma\leftarrow d} X_{iR}^{-\sigma\leftarrow\sigma} X_{jN}^{d\leftarrow-\sigma} \\ & + X_{iN}^{-\sigma\leftarrow d} X_{iR}^{0\leftarrow 0} X_{jN}^{d\leftarrow-\sigma} - X_{iN}^{-\sigma\leftarrow 0} X_{iR}^{\sigma\leftarrow-\sigma} X_{jN}^{0\leftarrow\sigma} \\ & + X_{iN}^{-\sigma\leftarrow d} X_{iR}^{\sigma\leftarrow\sigma} X_{jN}^{d\leftarrow-\sigma} \end{aligned}$$

$$\begin{aligned} [[\hat{H}_{t, Ni}^0, \hat{H}_{t, cross}^{0\ominus}], \hat{H}_{t, cross}^{0\oplus}] = & + X_{jN}^{\sigma\leftarrow 0} X_{iN}^{0\leftarrow\sigma} X_{iR}^{0\leftarrow 0} \\ & + X_{jN}^{\sigma\leftarrow 0} X_{iN}^{0\leftarrow\sigma} X_{iR}^{-\sigma\leftarrow-\sigma} - X_{jN}^{\sigma\leftarrow 0} X_{iN}^{0\leftarrow-\sigma} X_{iR}^{-\sigma\leftarrow\sigma} \\ & + X_{jN}^{-\sigma\leftarrow d} X_{iN}^{d\leftarrow-\sigma} X_{iR}^{0\leftarrow 0} - X_{jN}^{-\sigma\leftarrow d} X_{iN}^{d\leftarrow\sigma} X_{iR}^{\sigma\leftarrow-\sigma} \\ & + X_{jN}^{-\sigma\leftarrow d} X_{iN}^{d\leftarrow-\sigma} X_{iR}^{\sigma\leftarrow\sigma} + X_{iN}^{0\leftarrow\sigma} X_{iR}^{\sigma\leftarrow\sigma} X_{jN}^{\sigma\leftarrow 0} \\ & + X_{iN}^{0\leftarrow\sigma} X_{iR}^{d\leftarrow d} X_{jN}^{\sigma\leftarrow 0} + X_{iN}^{0\leftarrow\sigma} X_{iR}^{-\sigma\leftarrow-\sigma} X_{jN}^{\sigma\leftarrow 0} \\ & + X_{iN}^{0\leftarrow\sigma} X_{iR}^{d\leftarrow d} X_{jN}^{\sigma\leftarrow 0} \end{aligned}$$

$$\begin{aligned} [[\hat{H}_{t, Ni}^0, \hat{H}_{t, cross}^{+\ominus}], \hat{H}_{t, cross}^{-\oplus}] = & + X_{iN}^{-\sigma\leftarrow d} X_{iR}^{d\leftarrow d} X_{jN}^{d\leftarrow-\sigma} \\ & + X_{iN}^{-\sigma\leftarrow d} X_{iR}^{\sigma\leftarrow\sigma} X_{jN}^{d\leftarrow-\sigma} - X_{iN}^{-\sigma\leftarrow 0} X_{iR}^{\sigma\leftarrow-\sigma} X_{jN}^{0\leftarrow\sigma} \\ & + X_{iN}^{\sigma\leftarrow 0} X_{iR}^{d\leftarrow d} X_{jN}^{0\leftarrow\sigma} - X_{iN}^{\sigma\leftarrow d} X_{iR}^{-\sigma\leftarrow\sigma} X_{jN}^{d\leftarrow-\sigma} \\ & + X_{iN}^{\sigma\leftarrow 0} X_{iR}^{-\sigma\leftarrow-\sigma} X_{jN}^{0\leftarrow\sigma} \end{aligned}$$

$$\begin{aligned} [[\hat{H}_{t, Ni}^0, \hat{H}_{t, cross}^{-\oplus}], \hat{H}_{t, cross}^{+\ominus}] = & + X_{jN}^{\sigma\leftarrow 0} X_{iN}^{0\leftarrow\sigma} X_{iR}^{d\leftarrow d} \\ & - X_{jN}^{\sigma\leftarrow 0} X_{iN}^{0\leftarrow-\sigma} X_{iR}^{-\sigma\leftarrow\sigma} + X_{jN}^{\sigma\leftarrow 0} X_{iN}^{0\leftarrow\sigma} X_{iR}^{-\sigma\leftarrow-\sigma} \\ & + X_{jN}^{-\sigma\leftarrow d} X_{iN}^{d\leftarrow-\sigma} X_{iR}^{d\leftarrow d} + X_{jN}^{-\sigma\leftarrow d} X_{iN}^{d\leftarrow-\sigma} X_{iR}^{\sigma\leftarrow\sigma} \\ & - X_{jN}^{-\sigma\leftarrow d} X_{iN}^{d\leftarrow\sigma} X_{iR}^{\sigma\leftarrow-\sigma} \end{aligned}$$

$$[[\hat{H}_{t, Ni}^0, \hat{H}_{t, R}], \hat{H}_{t, Ni}^0] = 0$$

$$[[\hat{H}_{t, Ni}^0, \hat{H}_{t, R}], \hat{H}_{t, R}] = 0$$

$$[[\hat{H}_{t, Ni}^+, \hat{H}_{t, Ni}^-], \hat{H}_{t, Ni}^0] = 0$$

[illegible]

$$[[\hat{H}_{t, Ni}^+, \hat{H}_{t, cross}^{0\ominus}], \hat{H}_{t, cross}^{-\oplus}] = -X_{iN}^{-\sigma\leftarrow 0} X_{iR}^{\sigma\leftarrow -\sigma} X_{jN}^{0\leftarrow \sigma} \\ + X_{iN}^{\sigma\leftarrow 0} X_{iR}^{d\leftarrow d} X_{jN}^{0\leftarrow -\sigma} + X_{iN}^{\sigma\leftarrow 0} X_{iR}^{-\sigma\leftarrow -\sigma} X_{jN}^{0\leftarrow -\sigma}$$

$$[[\hat{H}_{t, Ni}^+, \hat{H}_{t, cross}^{-\oplus}], \hat{H}_{t, cross}^{0\ominus}] = -X_{iN}^{-\sigma\leftarrow 0} X_{iR}^{\sigma\leftarrow -\sigma} X_{jN}^{0\leftarrow \sigma} \\ + X_{iN}^{\sigma\leftarrow 0} X_{iR}^{d\leftarrow d} X_{jN}^{0\leftarrow -\sigma} + X_{iN}^{\sigma\leftarrow 0} X_{iR}^{-\sigma\leftarrow -\sigma} X_{jN}^{0\leftarrow -\sigma}$$

$$[[\hat{H}_{t, Ni}^+, \hat{H}_{t, R}], \hat{H}_{t, Ni}^-] = 0$$

$$[[\hat{H}_{t, Ni}^-, \hat{H}_{t, cross}^{0\oplus}], \hat{H}_{t, cross}^{+\ominus}] = -X_{iN}^{0\leftarrow -\sigma} X_{iR}^{-\sigma\leftarrow -\sigma} X_{jN}^{\sigma\leftarrow 0} \\ + X_{iN}^{0\leftarrow -\sigma} X_{iR}^{-\sigma\leftarrow -\sigma} X_{jN}^{\sigma\leftarrow 0} + X_{iN}^{0\leftarrow \sigma} X_{iR}^{d\leftarrow d} X_{jN}^{\sigma\leftarrow 0}$$

$$[[\hat{H}_{t, Ni}^-, \hat{H}_{t, cross}^{+\ominus}], \hat{H}_{t, cross}^{0\oplus}] = -X_{iN}^{d\leftarrow \sigma} X_{iR}^{\sigma\leftarrow -\sigma} X_{jN}^{-\sigma\leftarrow d} \\ + X_{iN}^{d\leftarrow -\sigma} X_{iR}^{\sigma\leftarrow -\sigma} X_{jN}^{-\sigma\leftarrow d} + X_{iN}^{d\leftarrow -\sigma} X_{iR}^{0\leftarrow 0} X_{jN}^{-\sigma\leftarrow d}$$

$$[[\hat{H}_{t, Ni}^-, \hat{H}_{t, R}], \hat{H}_{t, Ni}^+] = 0$$

$$[[\hat{H}_{t, cross}^{0\oplus}, \hat{H}_{t, cross}^{0\ominus}], \hat{H}_{t, Ni}^0] = +X_{iN}^{0\leftarrow \sigma} X_{iR}^{\sigma\leftarrow -\sigma} X_{jN}^{\sigma\leftarrow 0} \\ + X_{iN}^{0\leftarrow -\sigma} X_{iR}^{\sigma\leftarrow -\sigma} X_{jN}^{-\sigma\leftarrow 0} + X_{iN}^{0\leftarrow \sigma} X_{iR}^{d\leftarrow d} X_{jN}^{\sigma\leftarrow 0} \\ + X_{iN}^{0\leftarrow -\sigma} X_{iR}^{d\leftarrow d} X_{jN}^{-\sigma\leftarrow 0} - X_{iN}^{\sigma\leftarrow 0} X_{iR}^{0\leftarrow 0} X_{jN}^{0\leftarrow \sigma} \\ - X_{iN}^{\sigma\leftarrow d} X_{iR}^{0\leftarrow 0} X_{jN}^{d\leftarrow \sigma} - X_{iN}^{\sigma\leftarrow 0} X_{iR}^{-\sigma\leftarrow -\sigma} X_{jN}^{0\leftarrow \sigma} \\ - X_{iN}^{\sigma\leftarrow d} X_{iR}^{-\sigma\leftarrow -\sigma} X_{jN}^{d\leftarrow \sigma} + X_{iN}^{-\sigma\leftarrow 0} X_{iR}^{\sigma\leftarrow -\sigma} X_{jN}^{0\leftarrow \sigma} \\ + X_{iN}^{-\sigma\leftarrow d} X_{iR}^{\sigma\leftarrow -\sigma} X_{jN}^{d\leftarrow \sigma} - X_{iN}^{\sigma\leftarrow 0} X_{jN}^{0\leftarrow \sigma} X_{iR}^{\sigma\leftarrow -\sigma} \\ - X_{iN}^{\sigma\leftarrow 0} X_{jN}^{0\leftarrow \sigma} X_{iR}^{d\leftarrow d} + X_{jN}^{\sigma\leftarrow 0} X_{iN}^{0\leftarrow \sigma} X_{iR}^{0\leftarrow 0} \\ + X_{jN}^{\sigma\leftarrow 0} X_{iN}^{0\leftarrow \sigma} X_{iR}^{-\sigma\leftarrow -\sigma} - X_{jN}^{-\sigma\leftarrow d} X_{iN}^{d\leftarrow \sigma} X_{iR}^{\sigma\leftarrow -\sigma} \\ - X_{iN}^{-\sigma\leftarrow 0} X_{jN}^{0\leftarrow -\sigma} X_{iR}^{\sigma\leftarrow -\sigma} - X_{iN}^{-\sigma\leftarrow 0} X_{jN}^{0\leftarrow -\sigma} X_{iR}^{d\leftarrow d} \\ - X_{jN}^{-\sigma\leftarrow 0} X_{iN}^{0\leftarrow \sigma} X_{iR}^{\sigma\leftarrow -\sigma} + X_{jN}^{\sigma\leftarrow d} X_{iN}^{d\leftarrow \sigma} X_{iR}^{0\leftarrow 0} \\ + X_{jN}^{\sigma\leftarrow d} X_{iN}^{d\leftarrow \sigma} X_{iR}^{-\sigma\leftarrow -\sigma}$$

$$\begin{aligned}
[[\hat{H}_{t,cross}^{\oplus}, \hat{H}_{t,R}], \hat{H}_{t,cross}^{+\ominus}] = & \eta(\sigma) X_{iN}^{-\sigma\leftarrow-\sigma} X_{iR}^{d\leftarrow-\sigma} X_{jR}^{0\leftarrow-\sigma} \\
& - \eta(\sigma) X_{iN}^{-\sigma\leftarrow\sigma} X_{iR}^{d\leftarrow-\sigma} X_{jR}^{0\leftarrow-\sigma} - X_{iN}^{-\sigma\leftarrow-\sigma} X_{iR}^{d\leftarrow\sigma} X_{jR}^{\sigma\leftarrow d} \\
& + X_{iN}^{-\sigma\leftarrow\sigma} X_{iR}^{d\leftarrow-\sigma} X_{jR}^{\sigma\leftarrow d} + \eta(\sigma) X_{iN}^{-\sigma\leftarrow\sigma} X_{iR}^{\sigma\leftarrow d} X_{jR}^{\sigma\leftarrow 0} \\
& + X_{iN}^{-\sigma\leftarrow\sigma} X_{iR}^{\sigma\leftarrow d} X_{jR}^{d\leftarrow-\sigma} + \eta(\sigma) X_{iN}^{-\sigma\leftarrow-\sigma} X_{iR}^{\sigma\leftarrow d} X_{jR}^{-\sigma\leftarrow 0} \\
& - X_{iN}^{-\sigma\leftarrow-\sigma} X_{iR}^{\sigma\leftarrow d} X_{jR}^{d\leftarrow\sigma} - X_{jR}^{\sigma\leftarrow 0} X_{iR}^{0\leftarrow-\sigma} X_{iN}^{-\sigma\leftarrow-\sigma} \\
& + X_{jR}^{\sigma\leftarrow 0} X_{iR}^{0\leftarrow-\sigma} X_{iN}^{-\sigma\leftarrow\sigma} - \eta(\sigma) X_{jR}^{\sigma\leftarrow 0} X_{iR}^{-\sigma\leftarrow d} X_{iN}^{-\sigma\leftarrow-\sigma} \\
& - \eta(\sigma) X_{jR}^{d\leftarrow-\sigma} X_{iR}^{0\leftarrow\sigma} X_{iN}^{-\sigma\leftarrow-\sigma} + \eta(\sigma) X_{jR}^{d\leftarrow-\sigma} X_{iR}^{0\leftarrow-\sigma} X_{iN}^{-\sigma\leftarrow\sigma} \\
& - X_{jR}^{d\leftarrow-\sigma} X_{iR}^{-\sigma\leftarrow d} X_{iN}^{-\sigma\leftarrow-\sigma} + \eta(\sigma) X_{iR}^{d\leftarrow\sigma} X_{jR}^{0\leftarrow-\sigma} X_{iN}^{-\sigma\leftarrow-\sigma} \\
& - \eta(\sigma) X_{iR}^{d\leftarrow-\sigma} X_{jR}^{0\leftarrow-\sigma} X_{iN}^{-\sigma\leftarrow\sigma} - X_{iR}^{d\leftarrow\sigma} X_{jR}^{\sigma\leftarrow d} X_{iN}^{-\sigma\leftarrow-\sigma} \\
& + X_{iR}^{d\leftarrow-\sigma} X_{jR}^{\sigma\leftarrow d} X_{iN}^{-\sigma\leftarrow\sigma} + \eta(\sigma) X_{jR}^{-\sigma\leftarrow 0} X_{iR}^{\sigma\leftarrow d} X_{iN}^{-\sigma\leftarrow-\sigma} \\
& - X_{jR}^{d\leftarrow\sigma} X_{iR}^{\sigma\leftarrow d} X_{iN}^{-\sigma\leftarrow-\sigma}
\end{aligned}$$