Normal form of your dynamical system

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Specified dynamical system

$$\dot{x}_1 = \epsilon\varepsilon(x_1 y_1 \rho - x_1 \kappa \rho^2 - y_1 \lambda \rho + y_1 + \kappa\lambda\rho^2 - \lambda\rho)$$

$$\dot{y}_1 = \varepsilon(-x_1 y_1 \rho + x_1 \kappa \rho^2) - y_1$$

Time dependent coordinate transform

$$y_1 = \epsilon\varepsilon^2(-X_1 Y_1^2 \rho^2 + X_1 \kappa^2 \rho^4 + Y_1^2 \lambda \rho^2 - Y_1^2 \rho - \kappa^2 \lambda \rho^4 + \kappa\lambda\rho^3) - \varepsilon^2 X_1^2 \kappa \rho^3 + \varepsilon X_1 \kappa \rho^2 + Y_1$$

$$x_1 = \epsilon^2\varepsilon^2(1/2 X_1 Y_1^2 \rho^2 - 1/2 Y_1^2 \lambda \rho^2 + 1/2 Y_1^2 \rho - Y_1 \kappa \rho^2 + Y_1 \lambda \rho^2) + \epsilon\varepsilon^2(X_1^2 Y_1 \rho^2 - X_1 Y_1 \lambda \rho^2 + X_1 Y_1 \rho) + \epsilon\varepsilon(-X_1 Y_1 \rho + Y_1 \lambda \rho - Y_1) + X_1$$

Result normal form DEs

$$\dot{Y}_1 = \epsilon^2\varepsilon^3(-Y_1 \kappa^2 \rho^4 + Y_1 \kappa \lambda \rho^4) + \epsilon\varepsilon^3(2 X_1^2 Y_1 \kappa \rho^4 - 2 X_1 Y_1 \kappa \lambda \rho^4 + 2 X_1 Y_1 \kappa \rho^3) + \epsilon\varepsilon^2(-X_1 Y_1 \kappa \rho^3 + Y_1 \kappa \lambda \rho^3 - Y_1 \kappa \rho^2) - \varepsilon X_1 Y_1 \rho - Y_1$$

$$\dot{X}_1 = \epsilon^2\varepsilon^3(X_1^2 \kappa^2 \rho^5 - 2 X_1 \kappa^2 \lambda \rho^5 + X_1 \kappa^2 \rho^4 + X_1 \kappa \lambda \rho^4 + \kappa^2 \lambda^2 \rho^5 - \kappa^2 \lambda \rho^4 - \kappa \lambda^2 \rho^4 + \kappa \lambda \rho^3) + \epsilon\varepsilon^3(-X_1^3 \kappa \rho^4 + X_1^2 \kappa \lambda \rho^4 - X_1^2 \kappa \rho^3) + \epsilon\varepsilon^2(X_1^2 \kappa \rho^3 - X_1 \kappa \lambda \rho^3 + X_1 \kappa \rho^2) + \epsilon\varepsilon(-X_1 \kappa \rho^2 + \kappa \lambda \rho^2 - \lambda \rho)$$