$$k_0\left(\eta_{\mathrm{P1}}(t)-\eta_1(t)\right)-\frac{1}{2}M_{\mathrm{P1}}\left(2\left(-\cos(\theta(t)+\psi(t))\sin(\alpha(t))\,\alpha'(t)-\cos(\alpha(t))\sin(\theta(t)+\psi(t))\left(\theta'(t)+\psi'(t)\right)\right)\left(\cos(\theta(t))\,R'(t)-\cos(\theta(t)+\psi(t))\sin(\alpha(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{\mathrm{P1}}(t)\right)\alpha'(t)-R(t)\sin(\theta(t))\,\theta'(t)-\cos(\alpha(t))\sin(\theta(t)+\psi(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{\mathrm{P1}}(t)\right)\left(\theta'(t)+\psi'(t)\right)+\cos(\alpha(t))\cos(\theta(t)+\psi(t))\left({\eta_1}'(t)+{\eta_2}'(t)+{\eta_3}'(t)+{\eta_4}'(t)+{\eta_5}'(t)+{\eta_{\mathrm{P1}}}'(t)\right)\right)+2\cos(\alpha(t))\,\alpha'(t)\left(\cos(\alpha(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{\mathrm{P1}}(t)\right)\alpha'(t)+\sin(\alpha(t))\left({\eta_1}'(t)+{\eta_2}'(t)+{\eta_3}'(t)+{\eta_4}'(t)+{\eta_5}'(t)+{\eta_{\mathrm{P1}}}'(t)\right)\right)+2\left(\cos(\alpha(t))\cos(\theta(t)+\psi(t))\left(\theta'(t)+\psi'(t)\right)-\sin(\alpha(t))\sin(\theta(t)+\psi(t))\,\alpha'(t)\right)\left(\sin(\theta(t))\,R'(t)-\sin(\alpha(t))\sin(\theta(t)+\psi(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{\mathrm{P1}}(t)\right)\alpha'(t)+\cos(\theta(t))\,R(t)\,\theta'(t)+\cos(\alpha(t))\cos(\theta(t)+\psi(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{\mathrm{P1}}(t)\right)\left(\theta'(t)+\psi'(t)\right)+\cos(\alpha(t))\sin(\theta(t)+\psi(t))\left({\eta_1}'(t)+{\eta_2}'(t)+{\eta_3}'(t)+{\eta_4}'(t)+{\eta_5}'(t)+{\eta_{\mathrm{P1}}}'(t)\right)\right)+\frac{1}{2}M_{\mathrm{P1}}\left(-2\cos(\theta(t)+\psi(t))\sin(\alpha(t))\,\alpha'(t)\left(\cos(\theta(t))\,R'(t)-\cos(\theta(t)+\psi(t))\sin(\alpha(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{\mathrm{P1}}(t)\right)\alpha'(t)-R(t)\sin(\theta(t))\,\theta'(t)-\cos(\alpha(t))\sin(\theta(t)+\psi(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{\mathrm{P1}}(t)\right)\left(\theta'(t)+\psi'(t)\right)+\cos(\alpha(t))\cos(\theta(t)+\psi(t))\left({\eta_1}'(t)+{\eta_2}'(t)+{\eta_3}'(t)+{\eta_4}'(t)+{\eta_5}'(t)+{\eta_{\mathrm{P1}}}'(t)\right)\right)-2\cos(\alpha(t))\sin(\theta(t)+\psi(t))\left(\theta'(t)+\psi'(t)\right)\left(\cos(\theta(t))\,R'(t)-\cos(\theta(t)+\psi(t))\sin(\alpha(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{\mathrm{P1}}(t)\right)\alpha'(t)-R(t)\sin(\theta(t))\,\theta'(t)-\cos(\alpha(t))\sin(\theta(t)+\psi(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{\mathrm{P1}}(t)\right)\left(\theta'(t)+\psi'(t)\right)+\cos(\alpha(t))\cos(\theta(t)+\psi(t))\left({\eta_1}'(t)+{\eta_2}'(t)+{\eta_3}'(t)+{\eta_4}'(t)+{\eta_5}'(t)+{\eta_{\mathrm{P1}}}'(t)\right)\right)+2\cos(\alpha(t))\,\alpha'(t)\left(\cos(\alpha(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{\mathrm{P1}}(t)\right)\alpha'(t)+\sin(\alpha(t))\left({\eta_1}'(t)+{\eta_2}'(t)+{\eta_3}'(t)+{\eta_4}'(t)+{\eta_5}'(t)+{\eta_{\mathrm{P1}}}'(t)\right)\right)-2\sin(\alpha(t))\sin(\theta(t)+\psi(t))\,\alpha'(t)\left(\sin(\theta(t))\,R'(t)-\sin(\alpha(t))\sin(\theta(t)+\psi(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{\mathrm{P1}}(t)\right)\alpha'(t)+\cos(\theta(t))\,R(t)\,\theta'(t)+\cos(\alpha(t))\cos(\theta(t)+\psi(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{\mathrm{P1}}(t)\right)\left(\theta'(t)+\psi'(t)\right)+\cos(\alpha(t))\sin(\theta(t)+\psi(t))\left({\eta_1}'(t)+{\eta_2}'(t)+{\eta_3}'(t)+{\eta_4}'(t)+{\eta_5}'(t)+{\eta_{\mathrm{P1}}}'(t)\right)\right)+2\cos(\alpha(t))\cos(\theta(t)+\psi(t))\left(\theta'(t)+\psi'(t)\right)\left(\sin(\theta(t))\,R'(t)-\sin(\alpha(t))\sin(\theta(t)+\psi(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{\mathrm{P1}}(t)\right)\alpha'(t)+\cos(\theta(t))\,R(t)\,\theta'(t)+\cos(\alpha(t))\cos(\theta(t)+\psi(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{\mathrm{P1}}(t)\right)\left(\theta'(t)+\psi'(t)\right)+\cos(\alpha(t))\sin(\theta(t)+\psi(t))\left({\eta_1}'(t)+{\eta_2}'(t)+{\eta_3}'(t)+{\eta_4}'(t)+{\eta_5}'(t)+{\eta_{\mathrm{P1}}}'(t)\right)\right)+2\cos(\alpha(t))\cos(\theta(t)+\psi(t))\left(-\cos(\alpha(t))\cos(\theta(t)+\psi(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{\mathrm{P1}}(t)\right)\alpha'(t)^2+2\sin(\alpha(t))\sin(\theta(t)+\psi(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{\mathrm{P1}}(t)\right)\left(\theta'(t)+\psi'(t)\right)\alpha'(t)-2\cos(\theta(t)+\psi(t))\sin(\alpha(t))\left({\eta_1}'(t)+{\eta_2}'(t)+{\eta_3}'(t)+{\eta_4}'(t)+{\eta_5}'(t)+{\eta_{\mathrm{P1}}}'(t)\right)\alpha'(t)-\cos(\theta(t))\,R(t)\,\theta'(t)^2-\cos(\alpha(t))\cos(\theta(t)+\psi(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{\mathrm{P1}}(t)\right)\left(\theta'(t)+\psi'(t)\right)^2-2\sin(\theta(t))\,R'(t)\,\theta'(t)-2\cos(\alpha(t))\sin(\theta(t)+\psi(t))\left(\theta'(t)+\psi'(t)\right)\left({\eta_1}'(t)+{\eta_2}'(t)+{\eta_3}'(t)+{\eta_4}'(t)+{\eta_5}'(t)+{\eta_{\mathrm{P1}}}'(t)\right)+\cos(\theta(t))\,R''(t)-\cos(\theta(t)+\psi(t))\sin(\alpha(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{\mathrm{P1}}(t)\right)\alpha''(t)-R(t)\sin(\theta(t))\,\theta''(t)-\cos(\alpha(t))\sin(\theta(t)+\psi(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{\mathrm{P1}}(t)\right)\left(\theta''(t)+\psi''(t)\right)+$$

$$\cos(\alpha(t))\cos(\theta(t)+\psi(t))\left(\eta_1''(t)+\eta_2''(t)+\eta_3''(t)+\eta_4''(t)+\eta_5''(t)+\eta_{P1}''(t)\right)\Big) +$$
$$2\sin(\alpha(t))\Big(-\sin(\alpha(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{P1}(t)\right)\alpha'(t)^2 +$$
$$2\cos(\alpha(t))\left(\eta_1'(t)+\eta_2'(t)+\eta_3'(t)+\eta_4'(t)+\eta_5'(t)+\eta_{P1}'(t)\right)\alpha'(t) +$$
$$\cos(\alpha(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{P1}(t)\right)\alpha''(t) +$$
$$\sin(\alpha(t))\left(\eta_1''(t)+\eta_2''(t)+\eta_3''(t)+\eta_4''(t)+\eta_5''(t)+\eta_{P1}''(t)\right)\Big) + 2\cos(\alpha(t))\sin(\theta(t)+\psi(t))$$
$$\Big(-\cos(\alpha(t))\sin(\theta(t)+\psi(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{P1}(t)\right)\alpha'(t)^2 -$$
$$2\cos(\theta(t)+\psi(t))\sin(\alpha(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{P1}(t)\right)\left(\theta'(t)+\psi'(t)\right)\alpha'(t) -$$
$$2\sin(\alpha(t))\sin(\theta(t)+\psi(t))\left(\eta_1'(t)+\eta_2'(t)+\eta_3'(t)+\eta_4'(t)+\eta_5'(t)+\eta_{P1}'(t)\right)\alpha'(t) -$$
$$R(t)\sin(\theta(t))\,\theta'(t)^2 - \cos(\alpha(t))\sin(\theta(t)+\psi(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{P1}(t)\right)$$
$$\left(\theta'(t)+\psi'(t)\right)^2 + 2\cos(\theta(t))\,R'(t)\,\theta'(t) + 2\cos(\alpha(t))\cos(\theta(t)+\psi(t))\left(\theta'(t)+\psi'(t)\right)$$
$$\left(\eta_1'(t)+\eta_2'(t)+\eta_3'(t)+\eta_4'(t)+\eta_5'(t)+\eta_{P1}'(t)\right) + \sin(\theta(t))\,R''(t) - \sin(\alpha(t))\sin(\theta(t)+\psi(t))$$
$$\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{P1}(t)\right)\alpha''(t) + \cos(\theta(t))\,R(t)\,\theta''(t) +$$
$$\cos(\alpha(t))\cos(\theta(t)+\psi(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{P1}(t)\right)\left(\theta''(t)+\psi''(t)\right) +$$
$$\cos(\alpha(t))\sin(\theta(t)+\psi(t))\left(\eta_1''(t)+\eta_2''(t)+\eta_3''(t)+\eta_4''(t)+\eta_5''(t)+\eta_{P1}''(t)\right)\Big)\Big) +$$
$$\Big(\mu\, M_{P1}\Big(2\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{P1}(t)\right)\sin^2(\alpha(t)) + 2\cos(\alpha(t))\cos(\theta(t)+\psi(t))$$
$$\left(\cos(\theta(t))\,R(t)+\cos(\alpha(t))\cos(\theta(t)+\psi(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{P1}(t)\right)\right) + 2$$
$$\cos(\alpha(t))\sin(\theta(t)+\psi(t))$$
$$\left(R(t)\sin(\theta(t))+\cos(\alpha(t))\sin(\theta(t)+\psi(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{P1}(t)\right)\right)\Big)\Big)\Big/$$
$$\Big(2\Big(\sin^2(\alpha(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{P1}(t)\right)^2 +$$
$$\left(\cos(\theta(t))\,R(t)+\cos(\alpha(t))\cos(\theta(t)+\psi(t))\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{P1}(t)\right)\right)^2 +$$
$$\left(R(t)\sin(\theta(t))+\cos(\alpha(t))\sin(\theta(t)+\psi(t))\right.$$
$$\left.\left(L_0+\eta_1(t)+\eta_2(t)+\eta_3(t)+\eta_4(t)+\eta_5(t)+\eta_{P1}(t)\right)\right)^2\Big)^{3/2}\Big) = -c_0\left(\dot\eta_{P1}-\dot\eta_1\right)$$