specific to P_{tet}-circuit

$$P_{tet} \xrightarrow{\beta_1} FlhDC + P_{tet} \tag{1}$$

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specific to P_{flhDC}-circuit

$$P_{flhDC} \xrightarrow{\beta_2} FlhDC + P_{flhDC} \tag{2}$$

$$n_3 FlhDC + P_{fliA} \underset{k_{-3}}{\overset{k_3}{\rightleftharpoons}} (FlhDC)_{n_3} \bowtie P_{fliA} \qquad K_3 = \frac{k_{-3}}{k_3} \tag{3}$$

$$n_4 FlhDC + P_{flhB} \underset{k_{-4}}{\overset{k_4}{\rightleftharpoons}} (FlhDC)_{n_4} \bowtie P_{flhB} \qquad K_4 = \frac{k_{-4}}{k_4} \tag{4}$$

$$(FlhDC)_{n_3} \bowtie P_{fliA} \xrightarrow{\beta_5} FliA + (FlhDC)_{n_3} \bowtie P_{fliA} \tag{5}$$

$$(FlhDC)_{n_4} \bowtie P_{flhB} \xrightarrow{\beta_6} FP3 + (FlhDC)_{n_4} \bowtie P_{flhDC} \tag{6}$$

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specific to P_{tet}-circuit

$$(FlhDC)_{n_4} \bowtie P_{flhB} \xrightarrow{\beta_6} TetR + (FlhDC)_{n_4} \bowtie P_{flhB} \tag{7}$$

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specific to P_{flhDC}-circuit

$$(FlhDC)_{n_4} \bowtie P_{flhB} \xrightarrow{\beta_6} OmpR^* + (FlhDC)_{n_4} \bowtie P_{flhB} \tag{8}$$

$$n_9 FliA + P_{fliA} \underset{k_{-9}}{\overset{k_9}{\rightleftharpoons}} (FliA)_{n_9} \bowtie P_{fliA} \qquad K_9 = \frac{k_{-9}}{k_9} \tag{9}$$

$$n_{10} FliA + P_{flhB} \underset{k_{-10}}{\overset{k_{10}}{\rightleftharpoons}} (FliA)_{n_{10}} \bowtie P_{flhB} \qquad K_{10} = \frac{k_{-10}}{k_{10}} \tag{10}$$

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specific to P_{flhDC}-circuit

$$n_{11} FliA + P_{flhDC} \underset{k_{-11}}{\overset{k_{11}}{\rightleftharpoons}} (FliA)_{n_{11}} \bowtie P_{flhDC} \qquad K_{11} = \frac{k_{-11}}{k_{11}} \tag{11}$$

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specific to P_{flhDC}-circuit

$$(FliA)_{n_{11}} \bowtie P_{flhDC} \xrightarrow{\beta_{12}} FlhDC + (FliA)_{n_{11}} \bowtie P_{flhDC} \tag{12}$$

$$(FliA)_{n_9} \bowtie P_{fliA} \xrightarrow{\beta_{13}} FliA + (FliA)_{n_9} \bowtie P_{fliA} \tag{13}$$

$$(FliA)_{n_{10}} \bowtie P_{flhB} \xrightarrow{\beta_{14}} FP3 + (FliA)_{n_{10}} \bowtie P_{flhB} \tag{14}$$

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specific to P_{tet}-circuit

$$(FliA)_{n_{10}} \bowtie P_{flhB} \xrightarrow{\beta_{14}} TetR + (FliA)_{n_{10}} \bowtie P_{flhB} \tag{15}$$

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specific to P_{flhDC}-circuit

$$(FliA)_{n_{10}} \bowtie P_{flhB} \xrightarrow{\beta_{14}} OmpR^* + (FliA)_{n_{10}} \bowtie P_{flhB} \tag{16}$$

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specific to P_{tet}-circuit

$$aTc + TetR \underset{k_{-17}}{\overset{k_{17}}{\rightleftharpoons}} aTc \bowtie TetR \qquad K_{17} = \frac{k_{-17}}{k_{17}} \tag{17}$$

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specific to P_{tet}-circuit

$$n_{18} TetR + P_{tet} \underset{k_{-18}}{\overset{k_{18}}{\rightleftharpoons}} (TetR)_{n_{18}} \bowtie P_{tet} \qquad K_{18} = \frac{k_{-18}}{k_{18}} \tag{18}$$

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specific to P_{flhDC}-circuit

$$n_{19} OmpR^* + P_{flhDC} \underset{k_{-19}}{\overset{k_{19}}{\rightleftharpoons}} (OmpR^*)_{n_{19}} \bowtie P_{flhDC} \qquad K_{19} = \frac{k_{-19}}{k_{19}} \tag{19}$$

$$FlhDC \xrightarrow{\gamma_{20}} \emptyset \tag{20}$$

$$FliA \xrightarrow{\gamma_{21}} \emptyset \tag{21}$$

$$FP3 \xrightarrow{\gamma_{22}} \emptyset \tag{22}$$

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specific to P_{tet}-circuit

$$TetR \xrightarrow{\gamma_{23}} \emptyset \tag{23}$$

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specific to P_{flhDC}-circuit

$$OmpR^* \xrightarrow{\gamma_{24}} \emptyset \tag{24}$$

$$(3) \Rightarrow \quad \frac{d[(FlhDC)_{n_3} \bowtie P_{fliA}]}{dt} = \begin{aligned} & k_3[FlhDC]^{n_3}[P_{fliA}] \\ & - k_{-3}[(FlhDC)_{n_3} \bowtie P_{fliA}] \end{aligned} \tag{25}$$

$$\Rightarrow \quad [(FlhDC)_{n_3} \bowtie P_{fliA}]_{eq} = \frac{[FlhDC]^{n_3}}{K_3 + [FlhDC]^{n_3}} \cdot [P^{total}_{fliA}] \tag{26}$$

$$(4) \Rightarrow \quad \frac{d[(FlhDC)_{n_4} \bowtie P_{flhB}]}{dt} = \begin{aligned} & k_4[FlhDC]^{n_4}[P_{flhB}] \\ & - k_{-4}[(FlhDC)_{n_4} \bowtie P_{flhB}] \end{aligned} \tag{27}$$

$$\Rightarrow \quad [(FlhDC)_{n_4} \bowtie P_{flhB}]_{eq} = \frac{[FlhDC]^{n_4}}{K_4 + [FlhDC]^{n_4}} \cdot [P^{total}_{flhB}] \tag{28}$$

$$(9) \Rightarrow \quad \frac{d[(FliA)_{n_9} \bowtie P_{fliA}]}{dt} = \begin{aligned} & k_9[FliA]^{n_9}[P_{fliA}] \\ & - k_{-9}[(FliA)_{n_9} \bowtie P_{fliA}] \end{aligned} \tag{29}$$

$$\Rightarrow \quad [(FliA)_{n_9} \bowtie P_{fliA}]_{eq} = \frac{[FliA]^{n_9}}{K_9 + [FliA]^{n_9}} \cdot [P^{total}_{fliA}] \tag{30}$$

$$(10) \Rightarrow \quad \frac{d[(FliA)_{n_{10}} \bowtie P_{flhB}]}{dt} = \begin{aligned} & k_{10}[FliA]^{n_{10}}[P_{flhB}] \\ & - k_{-10}[(FliA)_{n_{10}} \bowtie P_{fliA}] \end{aligned} \tag{31}$$

$$\Rightarrow \quad [(FliA)_{n_{10}} \bowtie P_{flhB}]_{eq} = \frac{[FliA]^{n_{10}}}{K_{10} + [FliA]^{n_{10}}} \cdot [P^{total}_{flhB}] \tag{32}$$

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specific to P_{flhDC}-circuit

$$(11) \Rightarrow \quad \frac{d[(FliA)_{n_{11}} \bowtie P_{flhDC}]}{dt} = \begin{aligned} & k_9[FliA]^{n_{11}}[P_{flhDC}] \\ & - k_{-11}[(FliA)_{n_{11}} \bowtie P_{flhDC}] \end{aligned} \tag{33}$$

$$\Rightarrow \qquad [(FliA)_{n_{11}} \bowtie P_{flhDC}]_{eq} = \frac{[FliA]^{n_{11}}}{K_{11} + [FliA]^{n_{11}}} \cdot [P^{total}_{flhDC}] \tag{34}$$

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specific to P_{tet}-circuit

$$\begin{aligned} (18) \Rightarrow \quad \frac{d[P_{tet}]}{dt} = & \quad - k_{18}[TetR][P_{tet}] \\ & + k_{-18}[(TetR)_{n_{18}} \bowtie P_{tet}] \end{aligned} \tag{35}$$

$$\Rightarrow \qquad [P_{tet}]_{eq} = \frac{K_{18}}{K_{18} + [TetR]^{n_{18}}} \cdot [P^{total}_{tet}] \tag{36}$$

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specific to P_{tet}-circuit

$$\begin{aligned} (17) \Rightarrow \quad \frac{d[TetR]}{dt} = & \quad - k_{17}[TetR][aTc] \\ & + k_{-17}[aTc \bowtie TetR] \end{aligned} \tag{37}$$

$$\Rightarrow \qquad [TetR]_{eq} = \frac{K_{17}}{K_{17} + [aTc]} \cdot [TetR^{produced}] \tag{38}$$

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specific to P_{flhDC}-circuit

$$\begin{aligned} (19) \Rightarrow \quad \frac{d[P_{flhDC}]}{dt} = & \quad - k_{19}[OmpR^* \bowtie HSL]^{n_{19}}[P_{flhDC}] \\ & + k_{-19}[(OmpR^*)_{n_{19}} \bowtie P_{flhDC}] \end{aligned} \tag{39}$$

$$\Rightarrow \qquad [P_{flhDC}]_{eq} = \frac{K_{19}}{K_{19} + [OmpR^*]^{n_{19}}} \cdot [P^{total}_{flhDC}] \tag{40}$$

specific to P_{tet}-circuit

$$(1) \quad and \quad (20) \Rightarrow \quad \frac{d[FlhDC]}{d\,t} = \quad \beta_1[P_{tet}]_{eq} - \gamma_{20}[FlhDC] \tag{41}$$

specific to P_{flhDC}-circuit

$$(2) \quad and \quad (12) \quad and \quad (20) \Rightarrow \quad \frac{d[FlhDC]}{d\,t} = \quad \beta_2[P_{flhDC}]_{eq} + \beta_{12}[(FliA)_{n_{11}} \bowtie P_{flhDC}]_{eq} - \gamma_{20}[FlhDC] \tag{42}$$

$$(5) \quad and \quad (13) \quad and \quad (21) \Rightarrow \quad \frac{d[FliA]}{d\,t} = \quad \beta_5[(FlhDC)_{n_3} \bowtie P_{fliA}]_{eq} + \beta_{13}[(FliA)_{n_9} \bowtie P_{fliA}]_{eq} - \gamma_{21}[FliA] \tag{43}$$

$$(6) \quad and \quad (14) \quad and \quad (22) \Rightarrow \quad \frac{d[FP3]}{d\,t} = \quad \beta_6[(FlhDC)_{n_4} \bowtie P_{flhB}]_{eq} + \beta_{14}[(FliA)_{n_{10}} \bowtie P_{flhB}]_{eq} - \gamma_{22}[FP3] \tag{44}$$

specific to P_{tet}-circuit

$$(7) \quad and \quad (15) \quad and \quad (23) \Rightarrow \quad \frac{d[TetR]}{d\,t} = \quad \beta_6[(FlhDC)_{n_4} \bowtie P_{flhB}]_{eq} + \beta_{14}[(FliA)_{n_{10}} \bowtie P_{flhB}]_{eq} - \gamma_{23}[TetR] \tag{45}$$

specific to P_{flhDC}-circuit

$$(8) \quad and \quad (16) \quad and \quad (24) \Rightarrow \frac{d[OmpR^*]}{dt} = \beta_6[(FlhDC)_{n_4} \bowtie P_{flhB}]_{eq} + \beta_{14}[(FliA)_{n_{10}} \bowtie P_{flhB}]_{eq} - \gamma_{24}[OmpR^*] \tag{46}$$