

Supplemental Equations

<u>Ionic Compartment</u>	<u>Rapid Buffer(s)</u>	<u>Modified Equations</u>
Ca_i	CaM SRB	$J_{CaB_{cytosol}} = T\dot{n}C_l + T\dot{n}C_{h_c} + M\dot{y}o_c$ $\beta_{Ca_i} = \left(1 + \frac{B_{max_{CaM}} \cdot \frac{k_{off_{CaM}}}{k_{on_{CaM}}} + \frac{B_{max_{SR}} \cdot \frac{k_{off_{SR}}}{k_{on_{SR}}}}{\left(\frac{k_{off_{CaM}}}{k_{on_{CaM}}} + Ca_i\right)^2 + \left(\frac{k_{off_{SR}}}{k_{on_{SR}}} + Ca_i\right)^2} \right)^{-1}$ $\dot{Ca}_i = \beta_{Ca_i} \cdot \left(-J_{serca} \cdot \frac{V_{sr}}{V_{myo}} - J_{CaB_{cytosol}} + \frac{J_{Ca_{sl}myo}}{V_{myo}} \cdot (Ca_{sl} - Ca_i) \right)$
Ca_j	SLL_j SLH_j	$\beta_{Ca_j} = \left(1 + \frac{B_{max_{SLL_{lowj}}} \cdot \frac{k_{off_{sl_l}}}{k_{on_{sl_l}}} + \frac{B_{max_{SL_{highj}}} \cdot \frac{k_{off_{sl_h}}}{k_{on_{sl_h}}}}{\left(\frac{k_{off_{sl_l}}}{k_{on_{sl_l}}} + Ca_j\right)^2 + \left(\frac{k_{off_{sl_h}}}{k_{on_{sl_h}}} + Ca_j\right)^2} \right)^{-1}$ $\dot{Ca}_j = \beta_{Ca_j} \cdot \left(-I_{Ca_{tot_{junc}}} \cdot \frac{C_{mem}}{V_{junc} \cdot 2 \cdot Frdy} + \frac{J_{Ca_{juncsl}}}{V_{junc}} \cdot (Ca_{sl} - Ca_j) \right. \\ \left. + J_{SR_{Ca_{rel}}} \cdot \frac{V_{sr}}{V_{junc}} + J_{SR_{leak}} \cdot \frac{V_{myo}}{V_{junc}} \right)$
Ca_{sl}	SLL_{sl} SLH_{sl}	$\beta_{Ca_{sl}} = \left(1 + \frac{B_{max_{SLL_{lowsl}}} \cdot \frac{k_{off_{sl_l}}}{k_{on_{sl_l}}} + \frac{B_{max_{SL_{highsl}}} \cdot \frac{k_{off_{sl_h}}}{k_{on_{sl_h}}}}{\left(\frac{k_{off_{sl_l}}}{k_{on_{sl_l}}} + Ca_{sl}\right)^2 + \left(\frac{k_{off_{sl_h}}}{k_{on_{sl_h}}} + Ca_{sl}\right)^2} \right)^{-1}$ $\dot{Ca}_{sl} = \beta_{sl} \cdot \left(-I_{Ca_{tot_{sl}}} \cdot \frac{C_{mem}}{V_{sl} \cdot 2 \cdot Frdy} + \frac{J_{Ca_{juncsl}}}{V_{sl}} \cdot (Ca_j - Ca_{sl}) \right. \\ \left. + \frac{J_{Ca_{sl}myo}}{V_{sl}} \cdot (Ca_i - Ca_{sl}) \right)$

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Ca_{SR}	$Csqn_b$	$\beta_{Ca_{SR}} = \left(1 + \frac{B_{max_{csqn}} \cdot \frac{k_{off_{csqn}}}{k_{on_{csqn}}}}{\left(\frac{k_{off_{csqn}}}{k_{on_{csqn}}} + Ca_{SR} \right)^2} \right)^{-1}$ $\dot{Ca}_{SR} = \beta_{Ca_{SR}} \cdot \left(J_{serca} - \left(J_{SR_{leak}} \cdot \frac{V_{myo}}{V_{SR}} + J_{SR_{Carel}} \right) \right)$
Na_j	Na_{B_j}	$\beta_{Na_j} = \left(1 + \frac{B_{max_{Na_j}} \cdot \frac{k_{off_{Na}}}{k_{on_{Na}}}}{\left(\frac{k_{off_{Na}}}{k_{on_{Na}}} + Na_j \right)^2} \right)^{-1}$ $\dot{Na}_j = \beta_{Na_j} \cdot \left(-I_{Na_{totjunc}} \cdot \frac{C_{mem}}{V_{junc} \cdot Frdy} + \frac{J_{Na_{juncsl}}}{V_{junc}} \cdot (Na_{sl} - Na_j) \right)$
Na_{sl}	$Na_{B_{sl}}$	$\beta_{Na_{sl}} = \left(1 + \frac{B_{max_{Na_{sl}}} \cdot \frac{k_{off_{Na}}}{k_{on_{Na}}}}{\left(\frac{k_{off_{Na}}}{k_{on_{Na}}} + Na_{sl} \right)^2} \right)^{-1}$ $\dot{Na}_{sl} = \beta_{Na_{sl}} \cdot \left(-I_{Na_{totsl}} \cdot \frac{C_{mem}}{V_{sl} \cdot Frdy} + \frac{J_{Na_{juncsl}}}{V_{sl}} \cdot (Na_j - Na_{sl}) \right. \\ \left. + \frac{J_{Na_{slmyo}}}{V_{sl}} \cdot (Na_i - Na_{sl}) \right)$