Maxwell's Equations.

The basic equations of MHD are really just a subset of Maxwell's equations:

$$\frac{\partial \mathbf{B}}{\partial t} = -\nabla \times \mathbf{E} \tag{1}$$

$$\nabla \times \mathbf{B} = \mu_{\mathbf{0}}\mathbf{J} + [\mu_{\mathbf{0}}\epsilon_{\mathbf{0}}\frac{\partial \mathbf{E}}{\partial \mathbf{t}}] \tag{2}$$

$$\mathbf{J} = \sigma(\mathbf{E} + \mathbf{v} \times \mathbf{B}) \tag{3}$$

$$\nabla \cdot \mathbf{B} = \mathbf{0} \tag{4}$$

where $\mathbf{E}$ = electric field, $\mathbf{B}$ = magnetic field, $\mathbf{J}$ = current density and $\mathbf{v}$ = fluid velocity. The terms ϵ_0, μ_0 (permeability) and σ (electrical conductivity) are constants and we neglect the term in the square brackets since we only consider very low speeds.