1) 121(4): Some Technical Details of the Link between Field and Potential in ECE Theory

The fundamental ECE hypothesis is:

$$A^a_\mu = A^{(0)} q^a_\mu \quad -(1)$$

Now use the definition:

$$q^\mu_a q^a_\nu = \delta^\mu_\nu \quad -(2)$$

where:

$$\left.\begin{array}{l} \delta^\mu_\nu = 1 \text{ if } \mu = \nu, \\ \delta^\mu_\nu = 0 \text{ if } \mu \neq \nu. \end{array}\right\} \quad -(3)$$

It follows that:

$$\begin{aligned} A^\nu_\mu &= A^{(0)} q^\nu_a q^a_\mu \\ &= A^{(0)} \delta^\nu_\mu , \end{aligned} \quad -(4)$$

and:

$$\boxed{A^{\nu\mu} = A^{(0)} g^{\nu\sigma} \delta^\mu_\sigma} \quad -(5)$$

The link between the field and potential is then given by eq. (132) of paper 100:

$$\boxed{F^{\kappa\sigma\mu\nu} = \partial^\mu A^{\kappa\sigma\nu} - \partial^\nu A^{\kappa\sigma\mu} + \omega^{\kappa\sigma\mu}{}_\lambda A^{\lambda\nu} - \omega^{\kappa\sigma\nu}{}_\lambda A^{\lambda\mu}} \quad -(6)$$

Eq. (5) is a useful relation between the

2) potential $A^{\sim\mu}$ in the base manifold and the inverse metric $g^{\sim\sigma}$ in the base manifold. For given spin connection $\omega^{\kappa\mu}{}_{\lambda}$ in the base manifold, the elements of $F^{\kappa\mu\nu}$ may be evaluated. For example:

<u>Coulomb Law</u>

$$\underline{E} = E^{010}\,\underline{i} + E^{020}\,\underline{j} + E^{030}\,\underline{k}, \quad -(7)$$

so:

$$F^{010} = \partial^1 A^{00} - \partial^0 A^{01} + \omega^{01}{}_{\lambda} A^{\lambda 0} - \omega^{00}{}_{\lambda} A^{\lambda 1} \quad -(8)$$

where:

$$A^{00} = A^{(0)} g^{0\sigma} \delta^0_\sigma = A^{(0)} g^{00}, \quad -(9)$$

$$A^{01} = A^{(0)} g^{0\sigma} \delta^1_\sigma = A^{(0)} g^{01} \quad -(10)$$

$$A^{\lambda 0} = A^{(0)} g^{\lambda\sigma} \delta^0_\sigma = A^{(0)} g^{\lambda 0} \quad -(11)$$

$$A^{\lambda 1} = A^{(0)} g^{\lambda\sigma} \delta^1_\sigma = A^{(0)} g^{\lambda 1} \quad -(12)$$

In vector format:

$$\underline{E} = -\underline{\nabla}\phi - \frac{\partial \underline{A}}{\partial t} + \phi\,\underline{\omega} - \omega\,\underline{A} \quad -(13)$$

$$\underline{B} = \underline{\nabla}\times\underline{A} - \underline{\omega}\times\underline{A} \quad -(14)$$