317(6): <u>Self Consistency of Calculations.</u>

The basic geometry of the homogeneous field equation
is:
$$D_\mu \tilde{T}^{a\mu\nu} := \tilde{R}_\mu{}^{a\mu\nu} \quad - (1)$$
which is the Hodge <u>dual</u> format of the Cartan identity.

Therefore:
$$d_\mu \tilde{T}^{a\mu\nu} := \tilde{R}_\mu{}^{a\mu\nu} - \omega^a{}_{\mu b} \tilde{T}^{b\mu\nu} - (2)$$

as in <u>Note 255 (6)</u>. Here, for each a:

$$\tilde{T}^{\mu\nu} := \begin{bmatrix} 0 & -T^1(sp) & -T^2(sp) & -T^3(sp) \\ T^1(sp) & 0 & T^3(as) & -T^2(as) \\ T^2(sp) & -T^3(as) & 0 & T^1(as) \\ T^3(sp) & T^2(as) & -T^1(as) & 0 \end{bmatrix} - (3)$$

and similarly for $\tilde{R}^a{}_b{}^{\mu\nu}$.

The <u>Gauss Law of Magnetism</u>

In this case:
$$\nabla = 0, \quad - (4)$$

So:
$$\partial_1 \tilde{T}^{a10} + \partial_2 \tilde{T}^{a20} + \partial_3 \tilde{T}^{a30}$$
$$:= \quad V^b{}_1 \tilde{R}^a{}_b{}^{10} + V^b{}_2 \tilde{R}^a{}_b{}^{20} + V^b{}_3 \tilde{R}^a{}_b{}^{30} \quad - (5)$$
$$- \left( \omega^a{}_{1b} \tilde{T}^{b10} + \omega^a{}_{2b} \tilde{T}^{b20} + \omega^a{}_{3b} \tilde{T}^{b30} \right)$$

In eq. (5):

2)

$$\partial_\mu = \left(\frac{1}{c}\frac{\partial}{\partial t}, \nabla\right), \quad -(6)$$

$$V^a_\mu = \left(V^a{}_0, \; -\underline{V}^a\right) - (7)$$

$$\omega^a_{\mu b} = \left(\omega^a{}_{0b}, \; -\underline{\omega}^a{}_b\right) - (8)$$

So eq. (5) becomes:

$$\nabla \cdot \underset{\sim}{T}^a(spin) := \underline{\omega}^a{}_b \cdot \underset{\sim}{T}^b(spin) - \underline{V}^b \cdot \underline{R}^a{}_b(spin)$$

This is the same as Note 255(6), Q.E.D $^{(9)}$.

Now use:

$$\underline{B}^a = A^{(0)} \underset{\sim}{T}^a(spin) - (10)$$

$$\underline{A}^a = A^{(0)} \underline{V}^a \quad - (11)$$

to obtain:
$$\boxed{\nabla \cdot \underline{B}^a := \underline{\omega}^a{}_b \cdot \underline{B}^b - \underline{A}^b \cdot \underline{R}^a{}_b(spin)}$$
$$-(12)$$

This is the same as the Engineering Model QED.

Now remove a indices using:

$$\underline{B} = -\ell_a \underline{B}^a - (13)$$

$$\underline{\omega}_b = -\ell_a \underline{\omega}^a{}_b - (14)$$

$$\underline{R}_b = -\ell_a \underline{R}^a{}_b - (15)$$

3) and use the ECE2 hypothesis:

$$\underline{B}^a_b = W^{(0)} \underline{R}^a_b \text{ (spin)} - (16)$$

So:

$$\underline{\nabla} \cdot \underline{B}^a = \underline{\omega}^a_b \cdot \underline{B}^b - \frac{1}{W^{(0)}} \underline{A}^b \cdot \underline{B}^a_b - (17)$$

and

$$\underline{\nabla} \cdot \underline{B} = \underline{\omega}_b \cdot \underline{B}^b - \frac{1}{W^{(0)}} \underline{A}^b \cdot \underline{B}_b - (18)$$

Finally remove the $b$ indices using:

$$\underline{\nabla} \cdot \underline{B} = \ell_b e^b \underline{\omega} \cdot \underline{B} - e^b \ell_b \frac{\underline{A} \cdot \underline{B}}{W^{(0)}} - (19)$$

where

$$\ell_b e^b = e^b \ell_b = -2 - (20)$$

So

$$\boxed{\begin{aligned} \underline{\nabla} \cdot \underline{B} &= 2\left( \frac{1}{W^{(0)}} \underline{A} - \underline{\omega} \right) \cdot \underline{B} \quad - (21) \\ &= 2\left( \frac{\underline{v}}{r^{(0)}} - \underline{\omega} \right) \cdot \underline{B} \end{aligned}}$$

There is a sign change from UFT 316 but this does not affect the arguments of UFT 317.

The Faraday law of induction is calculated by using the indices

$$a = 1, 2, 3 \quad - (22)$$

For $\nu = 1$:

$$d_0 \tilde{T}^{a01} + d_2 \tilde{T}^{a21} + d_3 \tilde{T}^{a31}$$

$$= q_{\,0}^{\,b} \tilde{R}^{a}{}_{b}{}^{01} + q_{\,2}^{\,b} \tilde{R}^{a}{}_{b}{}^{21} + q_{\,3}^{\,b} \tilde{R}^{a}{}_{b}{}^{31} \qquad -(24)$$

$$- \left( \omega^{a}{}_{0b} \tilde{T}^{a01} + \omega^{a}{}_{2b} \tilde{T}^{b21} + \omega^{a}{}_{3b} \tilde{T}^{b31} \right)$$

i.e. :

$$-d_0 T^1(sp) - d_2 T^3(ars) + d_3 T^2(ars)$$

$$= -q_{\,0}^{\,b} R^{a}{}_{b}{}^{1}(sp) + q_{\,2}^{\,b} R^{a}{}_{b}{}^{3}(ars) - q_{\,3}^{\,b} R^{a}{}_{b}{}^{2}(ars)$$

$$+ \omega^{a}{}_{0b} T^{a1}(sp) - \omega^{a}{}_{2b} T^{b3}(ars) + \omega^{a}{}_{3b} T^{b3}(ars)$$

$$\qquad -(25)$$

This means :

$$-\frac{1}{c}\frac{\partial T_x}{\partial t}(sp) - \frac{\partial T_z}{\partial y}(ars) + \frac{\partial T_y}{\partial z}(ars) \qquad -(26)$$

$$= -q_{\,0}^{\,b} R^{a}{}_{bx}(sp) - q_{\,y}^{\,b} R^{a}{}_{bz}(ars) + q_{\,z}^{\,b} R^{a}{}_{by}(ars)$$

$$+ \omega^{a}{}_{0b} T^{a}_{x}(sp) + \omega^{a}{}_{yb} T^{b}_{z}(ars) - \omega^{a}{}_{zb} T^{b}_{y}(ars)$$

Now use :

$$\underline{A} \times \underline{B} = \begin{vmatrix} i & j & k \\ A_x & A_y & A_z \\ B_x & B_y & B_z \end{vmatrix} \qquad -(27)$$

5)

So:

$$(\underline{A} \times \underline{B})_x = A_y B_z - A_z B_y. \quad -(28)$$

It follows that:

$$-\frac{1}{c}\frac{\partial T_x(sp)}{\partial t} - (\underline{\nabla} \times \underline{T}(orb))_x = -v_0^b R^a{}_{bx}(sp) - (\underline{v}^b \times \underline{R}^a{}_b(orb))_x$$

$$+ \omega^a{}_{ob} T^b{}_x(sp) + (\underline{\omega}^a{}_b \times \underline{T}^b)_x \quad -(29)$$

Using similar results for the $y$ and $z$ components it follows that:

$$\boxed{\begin{array}{l} \dfrac{1}{c}\dfrac{\partial \underline{T}^a(sp)}{\partial t} + \underline{\nabla} \times \underline{T}^a(orb) \\[2mm] = v_0^b \underline{R}^a{}_b(sp) + \underline{v}^b \times \underline{R}^a{}_b(orb) \\[2mm] - \omega^a{}_{ob}\underline{T}^b(sp) - \underline{\omega}^a{}_b \times \underline{T}^b(orb) \end{array}} \quad -(29)$$

This is the same as eq. (40) of Note 255(6),

<u>Q.E.D.</u>

Now use:

$$\underline{B}^a = A^{(0)}\underline{T}^a(sp) \quad -(30)$$

$$\underline{E}^a = cA^{(0)}\underline{T}^a(orb) \quad -(31)$$

and

6)

$$A^a_\mu = A^{(0)} V^a_\mu \quad - (32)$$

So:
$$\left(A^a_0, -\underline{A}^a\right) = A^{(0)}\left(V^a_0, -\underline{V}^a\right) - (33)$$

So
$$A^a_0 = A^{(0)} V^a_0 \quad - (34)$$

and
$$\underline{A}^a = A^{(0)} \underline{V}^a \quad - (35)$$

It follows that:

$$\frac{1}{cA^{(0)}}\frac{\partial \underline{B}^a}{\partial t} + \frac{1}{cA^{(0)}}\underline{\nabla}\times\underline{E}^a =$$

$$- (36)$$

$$\frac{A^b_0}{A^{(0)}} R^a_{\ b}(sp) + \frac{\underline{A}^b}{A^{(0)}} \times \underline{R}^a_{\ b}(orb)$$

$$- \frac{\omega^a_{0b}}{A^{(0)}}\underline{B}^b - \frac{1}{cA^{(0)}}\underline{\omega}^a_{\ b}\times\underline{E}^b$$

$$- (37)$$

i.e.:

$$\boxed{\frac{\partial \underline{B}^a}{\partial t} + \underline{\nabla}\times\underline{E}^a = cA^b_0\, \underline{R}^a_{\ b}(sp) + c\underline{A}^b \times \underline{R}^a_{\ b}(orb) - c\omega^a_{0b}\underline{B}^b - \underline{\omega}^a_{\ b}\times\underline{E}^b}$$

The Engineering model on page 26 is

7)

written as:

$$J = -\omega^{a}{}_{ob} \underline{B}^{b} + \boxed{\underline{\omega}^{a}{}_{b} \times \underline{E}^{b}}$$
$$+ \underline{\Phi}^{b}{}_{o} \cdot \underline{R}^{a}{}_{b(sp)} \boxed{c \underline{A}^{b} \times \underline{R}^{a}{}_{b(ab)}} \quad (38)$$

So $\underline{there}$ is a sign error in the engineering model in the dotted terms. In the engineering model the units of $\omega^{a}{}_{ob}$ are $c$ times larger than in eq. (37)

and

$$\underline{\Phi}^{b}{}_{o} = c\omega^{a}{}_{ob} \quad - (39)$$

In eq. (37) we can now use:

$$\underline{B}^{a}{}_{b} = \overline{W}^{(0)} \underline{R}^{a}{}_{b}(sp) \quad - (40)$$

$$\underline{E}^{a}{}_{b} = c\overline{W}^{(0)} \underline{R}^{a}{}_{b}(ab). \quad - (41)$$

Therefore:

$$\frac{\partial \underline{B}^{a}}{\partial t} + \underline{\nabla} \times \underline{E}^{a} = \frac{c A_{o}^{b}}{W^{(0)}} \underline{B}^{a}{}_{b} + \frac{A^{b}}{W^{(0)}} \times \underline{E}^{a}{}_{b}$$
$$- c\omega^{a}{}_{ob} \underline{B}^{b} - \underline{\omega}^{a}{}_{b} \times \underline{E}^{b} \quad - (42)$$

Now remove the target values using the method given already to find that:

8)
$$\frac{\partial \underline{B}}{\partial t} + \underline{V} \times \underline{E} = 2 \left[ \left( c \omega_o^{\cdot} - \frac{c A_o}{W^{(o)}} \right) \underline{B} \right. \qquad -(43)$$
$$\left. + \left( \underline{\omega} - \frac{\underline{A}^b}{W^{(o)}} \right) \times \underline{E} \right]$$

i.e.
$$\boxed{\frac{\partial \underline{B}}{\partial t} + \underline{V} \times \underline{E} = 2 \left[ c \left( \omega_o - \frac{v_o}{r^{(o)}} \right) \underline{B} \right.}$$
$$\boxed{\left. + \left( \underline{\omega} - \frac{\underline{v}}{r^{(o)}} \right) \times \underline{E} \right]} \qquad -(44)$$

This is the same as in Notes for UFT 316 and UFT 317 QED

The Complete Field Equations
$$\underline{V} \cdot \underline{B} = 2 \underline{B} \cdot \left( \frac{\underline{v}}{r^{(o)}} - \underline{\omega} \right) \qquad -(45)$$

$$\underline{V} \cdot \underline{E} = 2 \underline{E} \cdot \left( \frac{\underline{v}}{r^{(o)}} - \underline{\omega} \right) \qquad -(46)$$

$$\frac{\partial \underline{B}}{\partial t} + \underline{V} \times \underline{E} = 2 \left[ c \left( \omega_o - \frac{v_o}{r^{(o)}} \right) \underline{B} + \left( \underline{\omega} - \frac{\underline{v}}{r^{(o)}} \right) \times \underline{E} \right] -(47)$$

$$\underline{V} \times \underline{B} - \frac{1}{c^2} \frac{\partial \underline{E}}{\partial t} = 2 \left[ \left( \frac{v_o}{r^{(o)}} - \omega_o \right) \frac{\underline{E}}{c} + \left( \frac{\underline{v}}{r^{(o)}} - \underline{\omega} \right) \times \underline{B} \right] -(48)$$