Moving normal Shock.

We know that

$$V_2 = W_s\left(1 - \frac{u_2}{u_1}\right)$$

$$= W_s\left(1 - \frac{\rho_1}{\rho_2}\right)$$

$$= a_1 M_1 \left(1 - \frac{1}{\rho_2/\rho_1}\right)$$

$$= a_1\left(\frac{\gamma+1}{2\gamma}\frac{p_2}{p_1} + \frac{\gamma-1}{2\gamma}\right)^{1/2}\left(1 - \frac{\left(\frac{\gamma+1}{\gamma-1}\right) + \frac{p_2}{p_1}}{\left(\frac{\gamma+1}{\gamma-1}\right)\left(\frac{p_2}{p_1}\right)+1}\right)$$

Now, $M_2 = \frac{V_2}{a_2} = \left(\frac{V_2}{a_1}\right)\left(\frac{a_1}{a_2}\right)$

$$\therefore M_2 = \left(\left(\frac{\gamma+1}{2\gamma}\right)\left(\frac{p_2}{p_1}\right) + \frac{\gamma-1}{2\gamma}\right)^{1/2}\left[1 - \frac{\frac{\gamma+1}{\gamma-1} + \frac{p_2}{p_1}}{\left(\frac{\gamma+1}{\gamma-1}\right)\left(\frac{p_2}{p_1}\right)+1}\right]\left[\frac{\frac{\gamma+1}{\gamma-1} + p_1/p_2}{\frac{\gamma+1}{\gamma-1} + \frac{p_2}{p_1}}\right]^{1/2}$$

This comes from $\frac{a_1}{a_2} = \sqrt{\frac{T_1}{T_2}}$.

For weak shock, as $\frac{p_2}{p_1} \to 1$,

$W_s \to a_1$ & $V_2 \to 0$ & $M_2 \to 0$

For strong shock, as $\frac{p_2}{p_1} \to \infty$,

$W_s \to \infty$ & $V_2 \to \infty$ & $M_2 = \sqrt{\frac{2}{\gamma(\gamma-1)}}$

Now, lets see what happens to P_{02}/P_{01} ?

(In earth ref. frame)

$$\frac{P_{02}}{P_{01}} = \frac{P_{02}}{P_1} = \frac{P_{02}}{P_2} \cdot \frac{P_2}{P_1}$$

$$\therefore \frac{P_{02}}{P_{01}} = \left(1 + \frac{\gamma-1}{2} M_2^2\right)^{\gamma/(\gamma-1)} \cdot \frac{P_2}{P_1}$$

This means that $\frac{P_{02}}{P_{01}} \geq 1$ (Always!!)

$$\frac{T_{02}}{T_{01}} = \frac{T_{02}}{T_1} = \frac{T_2 + \frac{V_2^2}{2C_p}}{T_1} = \frac{T_2}{T_1} + \frac{V_2^2}{2\gamma R T_1}(\gamma-1)$$

$$= \frac{T_2}{T_1} + \left(\frac{V_2}{a_1}\right)^2 \cdot \frac{\gamma-1}{2}$$

$$\therefore \frac{T_{02}}{T_{01}} = \frac{\frac{\gamma+1}{\gamma-1} + \frac{P_2}{P_1}}{\frac{\gamma+1}{\gamma-1} + \frac{P_1}{P_2}} + \left(\frac{\gamma-1}{2}\right)\left[\left(\frac{\gamma+1}{2\gamma}\frac{P_2}{P_1} + \frac{\gamma-1}{2\gamma}\right)\left(1 - \frac{\frac{\gamma+1}{\gamma-1} + \frac{P_2}{P_1}}{\left(\frac{\gamma+1}{\gamma-1}\right)\left(\frac{P_2}{P_1}\right)+1}\right)^2\right]$$

This is not équal to 1, because we are in earth fixed ref. In the shock ref. frame, this will be 1.