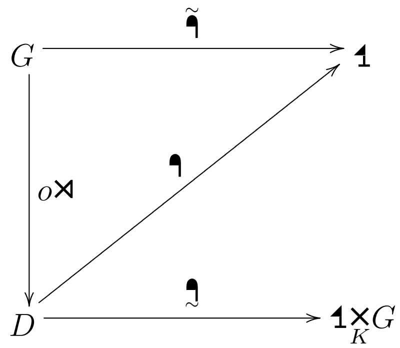
$${}^{x}\underset{\sim}{\daleth} = \gamma_x : {}^{\gamma_x}\tilde{\daleth}$$

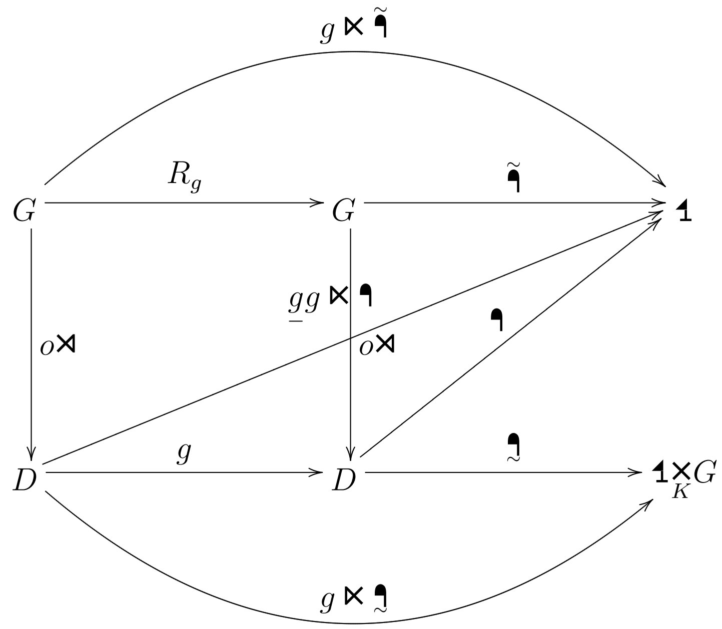
$$\begin{cases} {}^{\gamma_x}\tilde{\daleth} = {}^{o}\underline{\gamma_x}^{\,x}\daleth \\ {}^{g}\tilde{\daleth} = {}^{o}\underline{g}^{\,og}\daleth \end{cases}$$

$$\text{cocycle } x{:}g \in D\times G \to K^{\mathbb{C}} \ni {}^{x}\underline{g}$$



$$1 \ni \begin{cases} {}^{\gamma_x}\tilde{\daleth} = {}_{1/2}^{\;x}B_x{}^{x}\daleth \\ {}^{g}\tilde{\daleth} = {}^{o}\underline{g}^{\,og}\daleth \end{cases} \quad \Longrightarrow {}^{kg}\tilde{\daleth} = {}^{o}\underline{kg}^{\;okg}\daleth = {}^{o}\underline{k}\,{}^{ok}\underline{g}^{\;og}\daleth = {}^{o}\underline{k}\,{}^{o}\underline{g}^{\;og}\daleth = {}^{o}\underline{k}\,{}^{g}\tilde{\daleth}$$

$$1\times(og) \ni \begin{cases} {}^{og}\underset{\sim}{\daleth} = {}^{g}\tilde{\daleth}{:}g = {}^{o}\underline{g}^{\,og}\daleth{:}g \\ {}^{x}\underset{\sim}{\daleth} = {}^{\gamma_x}\tilde{\daleth}{:}\gamma_x = {}_{1/2}^{\;x}B_x{}^{x}\daleth{:}\gamma_x \end{cases}$$



$${}^{y}\overbrace{g \ltimes \tilde{\P}} = {}^{y}\overbrace{R_g \tilde{\P}} = {}^{yg}\tilde{\P} \Longrightarrow {}^{ky}\overbrace{g \ltimes \tilde{\P}} = {}^{ky \cdot g}\tilde{\P} = {}^{k \cdot yg}\tilde{\P} = {}^{o}\underline{k}\,{}^{yg}\tilde{\P} = {}^{o}\underline{k}\,{}^{y}\overbrace{g \ltimes \tilde{\P}}$$

$${}^{y}\overline{\underline{g}g \ltimes \P} = {}^{o}\underline{y}\,{}^{oy}\overbrace{\underline{g}g \ltimes \P} = {}^{o}\underline{y}\,{}^{oy}\underline{g}\,{}^{oy \cdot g}\P = {}^{o}\underline{yg}\,{}^{oyg}\P = {}^{yg}\tilde{\P} = {}^{y}\overbrace{R_g \tilde{\P}}$$

$${}^{g}\overbrace{\dot{k} \ltimes \P} = \dot{k}\,{}^{e}\underline{R_g \ltimes \P}$$

$$\text{LHS} = {}^{0}\partial_t\,{}^{t\mathfrak{e}^{\dot{k}}g}\P = {}^{0}\partial_t\,{}^{t\mathfrak{e}^{\dot{k}}}\overbrace{R_g \ltimes \P} = \text{RHS}$$

$$\mathsf{b} \in \underline{G} \Longrightarrow \mathsf{b}_g = \mathsf{b}\,\underline{R}_g \in \underline{G}_g$$

$$x{:}\mathsf{b} \in D \rtimes \underline{G} \xrightarrow{\rtimes} \underline{D} \ni \mathsf{b}_x$$

$$\mathsf{b}_{og} = \mathsf{b}_g\, o^{g}\underline{\rtimes}$$

$$\overline{{}^{g}\nabla_{\flat_{og}}\P} = \bar{\flat}\;{}^{e}\underline{R_g \ltimes \tilde{\P}}$$

$$\text{LHS} = \overline{{}^{g}\nabla_{\flat_g o^g \underline{\rtimes}}\P} = \flat\,\underline{R}_g\;{}^{g}\underline{\tilde{\P}} - {}^{g}\overbrace{\overset{+}{\flat} \ltimes \tilde{\P}} = \flat\;{}^{e}\underline{R_g \ltimes \tilde{\P}} - \overset{+}{\flat}\;{}^{e}\underline{R_g \ltimes \tilde{\P}} = \underbrace{\flat - \overset{+}{\flat}}\;{}^{e}\underline{R_g \ltimes \tilde{\P}} = \text{RHS}$$

$$ {}^{o}\underline{g}^{-1}\;{}^{y}\overbrace{R_g \ltimes \tilde{\P}} = {}^{og}\underline{y \rtimes g}\;{}^{y}\overbrace{R_g \ltimes o \rtimes \ltimes \P}$$

$$ {}^{y}\overbrace{R_g \ltimes \tilde{\P}} = {}^{yg}\tilde{\P} = {}^{o}\underline{yg}\;{}^{oyg}\P = {}^{o}\underline{gg^{-1}yg}\;{}^{oyg}\P = {}^{o}\underline{g}\;{}^{og}\underline{g^{-1}yg}\;{}^{oyg}\P = {}^{o}\underline{g}\;{}^{og}\underline{y \rtimes g}\;{}^{oyg}\P = \text{RHS}$$

$$ {}^{x}\overbrace{\nabla_{\dot{x}}\P} = \dot{x}\;{}^{x}\underline{\P} - \dot{x} \bullet \overset{*}{\dot{x}} \ltimes {}^{x}\P$$

$$ {}^{y}\overbrace{R_g \ltimes \tilde{\P}} = {}^{yg}\tilde{\P} = {}^{o}\underline{yg}\;{}^{oyg}\P = {}^{o}\underline{yg}\;{}^{y}\overbrace{R_g \ltimes o \rtimes \ltimes \P}$$

$$ \bar{\flat}\;{}^{e}\underline{R_g \ltimes o \rtimes \ltimes \P} = \flat_{-}\;\underline{R}_g o\;{}^{g}\underline{\rtimes}\;{}^{og}\underline{\P} = \flat\,\underline{R}_g o\;{}^{g}\underline{\rtimes}\;{}^{og}\underline{\P} = \dot{x}\;{}^{x}\underline{\P}$$

$$ {}^{o}\underset{\sim}{g}\;{}^{x}\overbrace{\nabla_{\dot{x}}\P} = \overline{{}^{g}\nabla_{\dot{x}}\tilde{\P}} = \overline{{}^{g}\nabla_{\flat_g o^g \underline{\rtimes}}\tilde{\P}} = \bar{\flat}\;{}^{e}\underline{R_g \ltimes \tilde{\P}} = \bar{\flat}\;{}^{e}\underline{{}^{o}\underline{yg}\;{}^{y}\overbrace{R_g \ltimes o \rtimes \ltimes \P}}_{y}$$

$$ = \bar{\flat}\;{}^{e}\underset{y}{{}^{o}\underset{\sim}{yg}}\;{}^{e}\overbrace{R_g \ltimes o \rtimes \ltimes \P} + {}^{o}\underset{\sim}{g}\;\bar{\flat}\;{}^{e}\underline{R_g \ltimes o \rtimes \ltimes \P} = \overset{\imath\underline{\varrho}}{\overbrace{\bar{\flat}\;{}^{e}\underset{y}{{}^{o}\underline{yg}}}}\;{}^{x}\P + {}^{o}\underset{\sim}{g}\;\overbrace{\dot{x}\;{}^{x}\underline{\P}}$$

$$ {}^{o}\underline{yg} = {}^{o}\underline{gg^{-1}yg} = {}^{o}\underline{g}\;{}^{x}\underline{g^{-1}yg} = {}^{o}\underline{g}\;{}^{x}\underline{y \rtimes g}$$

$$ \bar{\flat}\;{}^{e}\underset{y}{{}^{o}\underline{yg}} = {}^{o}\underline{g}\;\bar{\flat}\;{}^{ex}\underline{\rtimes g} = {}^{o}\underline{g}\;{}^{x}\underline{\bar{\flat}^{e}\rtimes g} = {}^{o}\underline{g}\;{}^{x}\underline{\bar{\flat} \rtimes g}$$

$$ \underbrace{\flat \rtimes g}_{wg} = \flat_w\;{}^{w}\underline{g} \Longrightarrow \overline{\bar{\flat} \rtimes g}_x\;{}^{o}\underline{g} = \overline{\underbrace{\flat \rtimes g}_{wg_o}}^{w} = \overline{\flat_w{}^{w}\underline{g}_o}^{w} = \overline{\underbrace{a - w\overset{*}{a}w}\;{}^{w}\overset{-1}{B}_{-x}\;{}^{x}\overset{1/2}{B}_{x_0}}^{w} = \overline{\underbrace{a - w\overset{*}{a}w}\;{}^{w}\overset{-1}{B}_{-x_0}}^{w}\;{}^{x}\overset{1/2}{B}_x$$

$$ \overline{\bar{\flat} \rtimes g}_x = {}^{0}\underline{\underbrace{a - w\overset{*}{a}w}\;{}^{w}\overset{-1}{B}_{-x}}_{w} = {}^{0}\underline{\underset{=0}{a - w\overset{*}{a}w}}_{w}\;{}^{0}\overset{-1}{B}_{-x} + \underbrace{a - 0\overset{*}{a}0}\;{}^{0}\underline{{}^{w}\overset{-1}{B}_{-x}}_{w}$$

$$ = -a\;{}^{0}\overset{-1}{B}_{-x}\;{}^{0}\underline{{}^{w}B_{-x}}_{w}\;{}^{0}\overset{-1}{B}_{-x} = -a\;{}^{0}\underline{{}^{w}B_{-x}}_{w} = -a\;{}^{0}\underline{\imath + 2w \bullet \overset{*}{x} + Q_w Q_x}_{w} = -2a \bullet \overset{*}{x}$$

$$\mathfrak{t} = \overset{+}{\mathfrak{t}} \times \overset{-}{\mathfrak{t}}$$

$$\mathfrak{b}{:}\mathfrak{t}\ (\nabla ¶) = -\frac{1}{2}\mathfrak{b} \overset{+}{\times}\ \mathfrak{t}$$

$$\underbrace{a - x\overset{*}{a}x} \times \underbrace{b - x\overset{*}{b}x} = a \bullet \overset{*}{b} - b \bullet \overset{*}{a} \in \overset{+}{\mathfrak{t}}$$

$$G \xrightarrow{o\rtimes} D = K \neg G$$

$$G_{\triangle_{\infty}} \mathrm{l} \xleftarrow{\ltimes} G \ltimes G_{\triangle_{\infty}} \mathrm{l}$$

$${}^{g}\overbrace{y \ltimes ¶} = {}^{yg}¶$$

$${}^{g}\overbrace{\mathfrak{b} \ltimes ¶} = {}^{0}\partial_{t}\ {}^{t\mathfrak{e}^{\mathfrak{b}}g}¶$$

$$o^{g}\rtimes = og$$

$${}^{o}\underline{g} \in K^{\mathbb{C}}$$

$$\dot{x} \in \underline{D}_{x}$$

$$x = og$$

$$o \rtimes \left(\gamma_{t} g\right) = o\gamma_{t} g = \underbrace{og}\,\underbrace{g^{-1}\gamma_{t} g} = x\,\underbrace{g^{-1}\gamma_{t} g}$$

$$\Longrightarrow \underbrace{\mathfrak{b}\underline{R}_{g}}\, o^{g}\underline{\rtimes} = \underbrace{\mathfrak{b} \rtimes g}_{x} = \dot{x}$$

$$\mathfrak{b}\ {}^{e}\underline{R_{g}\tilde{¶}} = {}^{o}\underline{g}\ {}^{x}\underline{\mathfrak{b} \rtimes g}\ {}^{x}¶ + {}^{o}\underline{g}\ {}^{x}\overbrace{\underbrace{\mathfrak{b} \rtimes g} \ltimes ¶}$$

$$\text{LHS} = {}^{0}\partial_{t}\ {}^{t\mathfrak{e}^{\mathfrak{b}}g}\tilde{¶} = {}^{0}\partial_{t}\ {}^{o}\underline{{}^{t}\mathfrak{e}^{\mathfrak{b}}g}\ {}^{o t\mathfrak{e}^{\mathfrak{b}}g}¶ = {}^{0}\partial_{t}\ {}^{o}\underline{g^{t}\mathfrak{e}^{\mathfrak{b}\rtimes g}}\ {}^{og^{t}\mathfrak{e}^{\mathfrak{b}\rtimes g}}¶ = {}^{0}\partial_{t}\ \overbrace{{}^{o}\underline{g}\ {}^{x}\underline{{}^{t}\mathfrak{e}^{\mathfrak{b}\rtimes g}}\ {}^{x^{t}\mathfrak{e}^{\mathfrak{b}\rtimes g}}¶}$$

$$= {}^{o}\underline{g}\ \overbrace{{}^{0}\partial_{t}\ {}^{x}\underline{{}^{t}\mathfrak{e}^{\mathfrak{b}\rtimes g}}}\ {}^{x}¶ + {}^{o}\underline{g}\ \overbrace{{}^{0}\partial_{t}\ {}^{x^{t}\mathfrak{e}^{\mathfrak{b}\rtimes g}}¶} = {}^{o}\underline{g}\ {}^{x}\underline{{}^{0}\partial_{t}\ {}^{t}\mathfrak{e}^{\mathfrak{b}\rtimes g}}\ {}^{x}¶ + {}^{o}\underline{g}\ \overbrace{{}^{0}\partial_{t}\ {}^{x^{t}\mathfrak{e}^{\mathfrak{b}\rtimes g}}¶} = \text{RHS}$$

$${}^{x}\overbrace{\nabla_{\dot{x}} ¶} = {}^{x}\underline{\bar{\mathfrak{b}} \rtimes g}\ {}^{x}¶ + {}^{x}\overbrace{\underbrace{\bar{\mathfrak{b}} \rtimes g} \ltimes ¶}$$

$$
{}^{o}\underline{g}\;{}^{og}\overbrace{\nabla_{\dot{x}}\P} = {}^{o}\underline{g}\;{}^{x}\overbrace{\nabla_{\dot{x}}\P} = {}^{g}\overline{\nabla_{\dot{x}}\P} = {}^{g}\overline{\nabla_{\flat_g o^g \underline{\rtimes}}\P} = \flat_g\;{}^{g}\underline{\tilde{\P}} - {}^{0}\partial_t\;{}^{\exp t \underbrace{\flat_g{}^{g}\P} \ltimes g}\tilde{\P}
$$

$$
= \flat\,\underline{R}_g\;{}^{g}\underline{\tilde{\P}} - {}^{0}\partial_t\;{}^{\exp t \overset{+}{\flat} \ltimes g}\tilde{\P} = \flat\;{}^{e}\underline{R_g\tilde{\P}} - \overset{+}{\flat}\;{}^{e}\underline{R_g\tilde{\P}} = \overset{-}{\flat}\;{}^{e}\underline{R_g\tilde{\P}} = {}^{g}\overbrace{\overset{-}{\flat} \ltimes \tilde{\P}} = \overset{-}{\flat}\;{}^{e}\underline{R_g \ltimes \tilde{\P}}
$$