$$\forall T \in Ob(C) \; \exists! \; 1^T \in T \to 1$$

let $(t_1, t_2) \in (T \to B \times T \to C) := (p1 \circ T^1, p2 \circ T^1)$ then

$$\forall(t'_1, t'_2) \in (T \to B \times T \to C)$$

$$\exists! x \in (T \to 1) \mid t'_1 = p_1 \circ x \wedge t'_2 = p_2 \circ x$$

but

$$(T \to 1) = \{T^1\} \; \text{ so } \; (t'_1, t'_2) = (p_1 \circ T^1, p_2 \circ T^1)$$
$$\forall(t'_1, t'_2) \in (T \to B \times T \to C);$$

$$(T \to B) = \{p_1 \circ T^1\} \; \forall T \in Ob(C) \implies$$

$$B \text{ terminal } \implies$$

$$B \simeq 1 \implies$$

$$1 = B \times C = B \; \blacksquare$$

$$1 = B \times C \implies B = B \times C$$