$Q' \Rightarrow Inv$

$(Q \land y = 1 \land b = x \land i = n) \Rightarrow (Q \land y \cdot b^i = x^n)$

We want to prove: in case LHS formula is true, then RHS formula is also true.

$Q \land y \cdot b^i = x^n$

$1 \cdot x^n = x^n$ ✓ this is true

2. $Inv \land \neg\pi \Rightarrow R$

$(Q \land y \cdot b^i = x^n) \land i \leq 0 \Rightarrow (Q \land y = x^n)$ ✓

As $i \leq 0$ and $i : \mathbb{N}$, then $i = 0$.

$\left.\begin{array}{l} y \cdot b^i = x^n \\ i = 0 \end{array}\right\}$ $y \cdot b^0 = x^n$

$y \cdot 1 = x^n$

3. $Inv \Rightarrow \pi \lor \neg\pi$

$Inv \Rightarrow \underbrace{i > 0 \lor i \leq 0}_{\text{TRUE, as } i : \mathbb{N}}$

4. $Inv \land \pi \Rightarrow t > 0$

$(Q \land y \cdot b^i = x^n \land i > 0) \Rightarrow i > 0$ ✓

In case the LHS formula is true, then $i > 0$ holds.

5. $Inv \land \pi \land t = t_0 \Rightarrow wp(S_0, Inv \land t < t_0)$ for any $t_0 \in \mathbb{Z}$

Now S_0 is a selection - IF statement - with two branches.

It is enough to prove 4 other conditions:

α) $Inv \land \pi \land t = t_0 \Rightarrow \underbrace{(2|i \lor 2\nmid i) \land (2\nmid i \lor 2|i)}$ ✓

TRUE, as $i : \mathbb{N}$, every natural number is either odd or even

β) $Inv \land \pi \land t = t_0 \Rightarrow \underbrace{2|i \lor 2\nmid i}_{\text{TRUE}}$ ✓

γ) $Inv \land \pi \land t = t_0 \land 2|i \Rightarrow wp(i, b := i/2, b^2, Inv \land t < t_0)$

$(\underbrace{Q \land y \cdot b^i = x^n \land i > 0}_{Inv} \land i = t_0 \land 2|i) \Rightarrow (Inv \land t < t_0)^{i \leftarrow i/2,\, b \leftarrow b^2} \land 2|i$

$(Q \land y \cdot (b^2)^{i/2} = x^n \land i/2 < t_0 \land 2|i) =$

$(\underbrace{Q \land y \cdot b^i = x^n}_{Inv ✓} \land i/2 < t_0 \land 2|i)$ ✓

$\left.\begin{array}{l} i : \mathbb{N} \\ i > 0 \\ i = t_0 \end{array}\right\}$ ✓

δ) $Inv \land \pi \land t_0 = t \land 2\nmid i \Rightarrow wp(i, y := i-1, y \cdot b, Inv \land t < t_0)$