440   (resettable variable)   A resettable variable is defined as follows.   There are three new
       names: *value* (of type X), *set* (a procedure with one parameter of type X), and *reset*
       (a program). Here are the axioms:

       $value' = x \iff set\ x$

       $value' = value \iff set\ x.\ reset$

       $reset.\ reset = reset$

       Implement this data structure, with proof.

After trying the question, scroll down to the solution.

§   Let *value*: X be a user's variable, and let *old*: X be an implementer's variable.

      $set \; = \; \langle x\!:\! X \cdot \; old := value. \;\; value := x \rangle$

      $reset \; = \; value := old$

Proof:

      $(value' = x \; \Longleftarrow \; set \; x)$

$=$ $(value' = x \; \Longleftarrow \; old := value. \;\; value := x)$

$=$ $(value' = x \; \Longleftarrow \; old' = value \land value' = x)$

$=$ $\top$

      $(value' = value \; \Longleftarrow \; set \; x. \;\; reset)$

$=$ $(value' = value \; \Longleftarrow \; old := value. \;\; value := x. \;\; value := old)$

$=$ $(value' = value \; \Longleftarrow \; old' = value' = value)$

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      $(reset. \; reset \; = \; reset)$

$=$ $(value := old. \; value := old \; = \; value := old)$

$=$ $\top$