MODULE *DieHard*

EXTENDS *Integers*

VARIABLES big, The number of gallons of water in the 5 gallon jug.
$small$ The number of gallons of water in the 3 gallon jug.

$Init \triangleq \land big = 0$
$\land small = 0$

$FillSmall \triangleq \ \land small' = 3$
$\land big' = big$

$FillBig \triangleq \ \land big' = 5$
$\land small' = small$

$EmptySmall \triangleq \ \land small' = 0$
$\land big' = big$

$EmptyBig \triangleq \ \land big' = 0$
$\land small' = small$

$Min(m, n) \triangleq \text{IF } m < n \text{ THEN } m \text{ ELSE } n$

$SmallToBig \triangleq \text{LET } poured \triangleq Min(big + small, 5) - big$

$\text{IN} \quad \land big' = big + poured$
$\land small' = small - poured$

$BigToSmall \triangleq$
$\text{LET } poured \triangleq Min(big + small, 3) - small$
$\text{IN} \quad \land big' = big - poured$
$\land small' = small + poured$

$Next \triangleq \lor FillSmall$
$\lor FillBig$
$\lor EmptySmall$
$\lor EmptyBig$
$\lor SmallToBig$
$\lor BigToSmall$

$TypeOK \triangleq \land small \in 0 \,..\, 3$
$\land big \in 0 \,..\, 5$
