$$\varphi_1 \,\mathtt{R}\, \varphi_2 \overset{\mathtt{n}}{=} \neg(\neg\varphi_1 \,\mathtt{U}\, \neg\varphi_2)$$

$$\overset{\mathtt{dsc}}{=} \neg(\neg\varphi_1 \,\mathtt{U}\, (\neg\varphi_2 \,\wedge\, (\neg\varphi_1 \,\vee\, sing)))$$

$$\overset{\mathtt{t}}{=} \neg(\neg\boxed{\varphi_1}\,\mathtt{U}\,(\neg\boxed{\varphi_2} \,\wedge\, (\neg\boxed{\varphi_1} \,\vee\, sing) \,\wedge\, alive))$$