Refutation of the Löwenheim–Skolem theorem

We assume the apparatus and method of Meth8/VL4, with the designated proof value of $\top$. The 16-valued proof table is row-major and horizontal.

LET $p, q, r, s$: $\kappa$ lc_kappa, $M, N, \sigma$ lc_sigma;
$\sim$ Not; $\&$ And; $+$ Or; $>$ Imply, greater than; $<$ Not Imply, less than;
$=$ Equivalent; $\Diamond$ Not Equivalent; $\#$ necessity, for every; $\%$ possibility, for one;
$(p@p)$ 0, zero; $(s>(p@p)) |\sigma|; (q>(p@p)) |M|; (r>(p@p)) |N|; $\neg(p<q) (p\geq q)$.

From: en.wikipedia.org/wiki/Löwenheim–Skolem_theorem

In its general form, the Löwenheim–Skolem theorem states that for every signature $\sigma$, every infinite $\sigma$-structure $M$, and every infinite cardinal number $\kappa \geq |\sigma|$, (1.1)

$\#(s&((s&q)&(~(p<(s>(p@p))))))$ ; $\text{FF} \text{FF} \text{FF} \text{FF}$ (1.2)

there is a $\sigma$-structure $N$ (2.1)

$\% (s&r)$ ; $\text{CC} \text{CC} \text{CC} \text{TT}$ (2.2)

such that $|N| = \kappa$ and

if $\kappa < |M|$ then $N$ is an elementary substructure of $M$; [and/or]
if $\kappa > |M|$ then $N$ is an elementary extension of $M$. (3.1)

$(((r>(p@p))=p)\&(>((q>(p@p))>(q<r))) [\&,+] ((p>(q>(p@p))>(q>r))))$ ; $\text{FT} \text{FT} \text{TF} \text{FT} \text{TF}$ (3.2)

Eqs. 1.1 implies 2.1. (4.1)

$\#(s&((s&q)&(~(p<(s>(p@p))))))>\% (s&r)$ ; $\text{TT} \text{TT} \text{TT} \text{TT}$ (4.2)

Eqs. (1.1 implies 2.1) implies 3.2. (5.1)

$(\#(s&((s&q)&(~(p<(s>(p@p))))))>\% (s&r)) >$
$(\text{FT} \text{FT} \text{TF} \text{FT} \text{TF} \text{TF})$ (5.2)

Eq. 1.2 as rendered is not tautologous, and not contradictory.

Eq. 4.1 is not tautologous due to one $\Diamond$ falsity value.

Eq. 4.2 is not tautologous, and the same result table as Eq. 3.2.

This means the Löwenheim–Skolem theorem is refuted.