We prove:

$((A \wedge B) \Rightarrow C) \Leftrightarrow ((A \Rightarrow C) \vee (B \Rightarrow C))$ (abc2)

with no assumptions.

Proof by sequent calculus with unit propagation:

$\{\{((A \wedge B) \Rightarrow C) \Leftrightarrow ((A \Rightarrow C) \vee (B \Rightarrow C)), \text{"abc2"}\}\}.$ (G#0)

Equivalence goal (abc2) is proven in both directions.

☑ {1} Direction from left to right: Assume:

$(A \wedge B) \Rightarrow C,$ (A#1)

and prove:

$(A \Rightarrow C) \vee (B \Rightarrow C),$ (G#2)

$\{\{(A \Rightarrow C) \vee (B \Rightarrow C), \text{"G\#2"}\}\}.$ (G#3)

Disjunctive goal (G#2) is split:

$A \Rightarrow C,$ (G#2.1)

$B \Rightarrow C.$ (G#2.2)

$\{\{A \Rightarrow C, \text{"G\#2.1"}\}, \{B \Rightarrow C, \text{"G\#2.2"}\}\}.$ (G#9)

Implicative goal (G#2.1) is split. Assume:

$A,$ (A#14)

and prove:

$C,$ (G#15)

$\{\{C, \text{"G\#15"}\}, \{B \Rightarrow C, \text{"G\#2.2"}\}\}.$ (G#16)

Implicative goal (G#2.2) is split. Assume:

$B,$ (A#23)

and prove:

$C,$ (G#24)

$\{\{C, \text{"G\#15"}\}, \{C, \text{"G\#24"}\}\}.$ (G#25)

Implicative assumption (A#1) is used for Modus Ponens.

☑ {1, 1} First the premise of (A#1) is proven:

$A \wedge B.$ (G#33)

$\{\{A \wedge B, \text{"G\#33"}\}, \{C, \text{"G\#15"}\}, \{C, \text{"G\#24"}\}\}.$ (G#34)

Conjunctive goal (G#33) is decomposed on different proof branches.

☑ {1, 1, 1} Proof of (G#33.1):

$A.$ (G#33.1)

$\{\{A, \text{"G\#33.1"}\}, \{C, \text{"G\#15"}\}, \{C, \text{"G\#24"}\}\}.$ (G#35)

Assumed (A#14) goal (G#33.1): success.

☑ {1, 1, 2} Proof of (G#33.2):

```
B.                                                    (G#33.2)
{{B, "G#33.2"}, {C, "G#15"}, {C, "G#24"}}.            (G#36)
```

Assumed (A#23) goal (G#33.2): success.

☑ {1, 2} Now the conclusion of (A#1) is assumed:

```
C.                                                    (A#32)
```

Assumed (A#32) goal (G#15): success.

☑ {2} Direction from right to left: Assume:

```
(A ⇒ C) ∨ (B ⇒ C),                                    (A#4)
```

and prove:

```
(A ∧ B) ⇒ C,                                          (G#5)
{{ (A ∧ B) ⇒ C, "G#5"}}.                              (G#6)
```

Implicative goal (G#5) is split. Assume:

```
A ∧ B,                                                (A#37)
```

and prove:

```
C,                                                    (G#38)
{{C, "G#38"}}.                                        (G#39)
```

Assumed conjunction (A#37) is split into:

```
A,                                                    (A#37.1)
B.                                                    (A#37.2)
```

Disjunctive assumption (A#4) is used for proof by cases.

☑ {2, 1} Case (A#4.1):

```
A ⇒ C.                                                (A#4.1)
```

Implicative assumption (A#4.1) is used for Modus Ponens.

☑ {2, 1, 1} First the premise of (A#4.1) is proven:

```
A.                                                    (G#60)
{{A, "G#60"}, {C, "G#38"}}.                           (G#61)
```

Assumed (A#37.1) goal (G#60): success.

☑ {2, 1, 2} Now the conclusion of (A#4.1) is assumed:

```
C.                                                    (A#59)
```

Assumed (A#59) goal (G#38): success.

☑ {2, 2} Case (A#4.2):

```
B ⇒ C.                                                (A#4.2)
```

Implicative assumption (A#4.2) is used for Modus Ponens.

☑ {2, 2, 1} First the premise of (A#4.2) is proven:

```
B.
```
(G#63)

```
{{B, "G#63"}, {C, "G#38"}}.
```
(G#64)

Assumed (A#37.2) goal (G#63): success.

☑ {2, 2, 2} Now the conclusion of (A#4.2) is assumed:

```
C.
```
(A#62)

Assumed (A#62) goal (G#38): success.