# Sentinel - Proof Checker - user's manual

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## 1 About Sentinel

Sentinel is a program that checks first order logic proofs written in natural deduction reasoning system.

## 2 Language

### 2.1 Proofs

Proof starts with keyword `goal`, identifier, `":"` and formula which represents a goal. Body of a proof is a sequence of formulas and frames separated by `";"` and surrounded by keywords `proof` and `end`. Last element of the sequnece must be a formula which is equal to a goal. Every proof is ended by a `"."` character.

```
goal Simplification: a ^ b ^ c ^ d => b
proof
  [a ^ b ^ c ^ d : b];
  a ^ b ^ c ^ d => b
end.
```

#### Formulas

Formulas are written using variables, keywords `true` and `false`, operators and quantifiers. Varaible names may only contain alpha-numerical characters. All of the operators are listed in a table below (ordered from biggest to lowest priority).

| Operator | Associativity | Notation |
|---|---|---|
| ~ | None | Prefix |
| ^ | Left | Infix |
| v | Left | Infix |
| => | Right | Infix |
| <=> | Left | Infix |

Quantifiers consist of one of the keywords `All` and `Exists`, variable and formula in curly braces:

```
All x {x v ~x}
Exists y {y v a}
```

**Frames**

Frames are written in square brackets. They are three kinds of frames:

1. Standard frame - used in negation, implication, IFF indroduction and alternative elimination. `[assumption : body]`
2. `All` introduction frame - `[fresh_variable | body]`
3. `Exists` elimination frame - `[fresh_variable | assumption : body]`

Frame body is a sequence of formulas and frames. Similarly like in proof body last element of a sequence must be a formula. Frames must be used directly before conclusions.

## 2.2 Axioms

Axioms consist of keyword `axiom`, `":"`, formula and `"."` character.

```
axiom: ~(p v q) <=> ~p ^ ~q.
```

## 2.3 Comments

```
//Single line comment

/*
  Multi
  line
  comment
*/
```

# 3 Program usage

```
Sentinel input_file [output_file]
```