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Forsyth-Edwards Notation (**FEN**) describes a Chess Position. It is an one-line ASCII-string. **FEN** is based on a system created by Scotsman David Forsyth in the 19th century. Steven Edwards specified the **FEN standard** for computer chess applications as part of the Portable Game Notation [1] .

FEN Syntax

One FEN string or record consists of **six** fields separated by a space character. The first four fields of the FEN specification are the same as the first four fields of the EPD specification.

Terminal and nonterminal symbols *of a variant of* BNF *below are embedded in ' ' resp. .*

```
<FEN> ::=  <Piece Placement>
       ' ' <Side to move>
       ' ' <Castling ability>
       ' ' <En passant target square>
       ' ' <Halfmove clock>
       ' ' <Fullmove counter>
```

Piece Placement

The Piece Placement is determined rank by rank in big-endian *order, that is starting at the 8th rank down to the first rank. Each rank is separated by the terminal symbol '/' (slash). One rank, scans piece placement in* little-endian *file-order from the A to H.*

A decimal digit counts consecutive empty squares, the pieces are identified by a single letter from standard English names for chess pieces as used in the Algebraic chess notation*. Uppercase letters are for white pieces, lowercase letters for black pieces.*

```
<Piece Placement> ::= <rank8>'/'<rank7>'/'<rank6>'/'<rank5>'/'<rank4>'
/'<rank3>'/'<rank2>'/'<rank1>
<ranki>       ::= [<digit17>]<piece> {[<digit17>]<piece>} [<digit17>]
| '8'
<piece>       ::= <white Piece> | <black Piece>
<digit17>     ::= '1' | '2' | '3' | '4' | '5' | '6' | '7'
<white Piece> ::= 'P' | 'N' | 'B' | 'R' | 'Q' | 'K'
<black Piece> ::= 'p' | 'n' | 'b' | 'r' | 'q' | 'k'
```

Side to move

Side to move *is one lowercase letter for either White ('w') or Black ('b').*

```
<Side to move> ::= {'w' | 'b'}
```

Castling ability

If neither side can castle, the symbol '-' is used, otherwise each of four individual castling rights *for king and queen castling for both sides are indicated by a sequence of one to four letters.*

```
<Castling ability> ::= '-' | ['K'] ['Q'] ['k'] ['q'] (1..4)
```

En passant target square

The en passant *target square is specified after a double push of a pawn, no matter whether an en passant capture is really possible or not* [2] [3] [4] *. Other moves than double pawn pushes imply the symbol '-' for this FEN field.*

```
<En passant target square> ::= '-' | <epsquare>
<epsquare>   ::= <fileLetter> <eprank>
<fileLetter> ::= 'a' | 'b' | 'c' | 'd' | 'e' | 'f' | 'g' | 'h'
<eprank>     ::= '3' | '6'
```

Halfmove Clock

The halfmove clock *specifies a decimal number of half moves with respect to the* 50 move draw rule*. It is reset to zero after a capture or a pawn move and incremented otherwise.*

```
<Halfmove Clock> ::= <digit> {<digit>}
<digit> ::= '0' | '1' | '2' | '3' | '4' | '5' | '6' | '7' | '8' | '9'
```

Fullmove counter

The number of the full moves in a game. It starts at 1, and is incremented after each Black's move.

```
<Fullmove counter> ::= <digit19> {<digit>}
<digit19> ::= '1' | '2' | '3' | '4' | '5' | '6' | '7' | '8' | '9'
<digit>   ::= '0' | <digit19>
```

Samples

FEN strings of Starting Position and after 1.e4 c5 2.Nf3:
`rnbqkbnr/pppppppp/8/8/8/8/PPPPPPPP/RNBQKBNR w KQkq - 0 1`
`rnbqkbnr/pppppppp/8/8/4P3/8/PPPP1PPP/RNBQKBNR b KQkq e3 0 1`
`rnbqkbnr/pp1ppppp/8/2p5/4P3/8/PPPP1PPP/RNBQKBNR w KQkq c6 0 2`
`rnbqkbnr/pp1ppppp/8/2p5/4P3/5N2/PPPP1PPP/RNBQKB1R b KQkq - 1 2`

Extensions for Chess Variants

...

See also

- Extended Position Description *(EPD)*
- Forsyth-Edwards Expanded Notation *(FEEN)*
- Portable Game Notation *(PGN)*

Forum Posts

2000 ...

- File name extensions *by* Leen Ammeraal, CCC, *November 14, 2000*
- Making positions in eps *by* Renze Steenhuisen, CCC, *October 27, 2003* » Fen2eps

2005 ...

- contradicting FEN and SMK-FEN *by* Reinhard Scharnagl, CCC, *August 04, 2005*
- fen to fen functions *by* Uri Blass, CCC, *May 21, 2007*

2010 ...

- where FEN is not consistent *by* Reinhard Scharnagl, CCC, *January 06, 2010*
- FEN string *by colin,* CCC, *January 30, 2011*
- No more pseudolegal en passant target foolishness *by* Steven Edwards, CCC, *February 27, 2011*
- What's wrong with this EPD? *by* Jouni Uski, CCC, *March 20, 2011*
- Question about Shredder FEN and X-FEN *by* Harm Geert Muller, CCC, *April 22, 2012*
- Re: Causes for inconsistent benchmark signatures *by* Evert Glebbeek, CCC, *March 27, 2013* » En passant

- The maximum character length of a FEN string *by* Steven Edwards, CCC, *August 24, 2013*
- Is 79 maximal? *by* Louis Zulli, CCC, *July 29, 2014*
- PGN to FEN (with Evaluation)? *by* Steve Maughan, CCC, *December 28, 2014* » Portable Game Notation, Python

2015 ...

- Binary FEN *by* J. Wesley Cleveland, CCC, *July 24, 2015*
- Any tool to convert FEN strings to diagrams? *by Ted Wong,* CCC, *February 15, 2016*
- FEN - Flipper for Windows *by* Matthias Gemuh, CCC, *May 17, 2017* » Color Flipping, EPD

External Links

- Forsyth-Edwards Notation from Wikipedia
- Chess Programming - Chess Board Implementation : A FEN parser *by* Thomas Petzke
- FEN Database *by* Mathieu Pagé
- Gilith - Chess Diagram Maker *by* Joe Leslie-Hurd
  fen2img Chess Diagram Maker *by* Joe Leslie-Hurd
- Chess Diagram Generator
- Chessforeva: 3D chess diagram from FEN » 3D Graphics Board
- Fen2eps *by* Dirk Baechle [5]

References

1. ^ Standard: Portable Game Notation Specification and Implementation Guide *16.1: FEN by* Steven Edwards
2. ^ Re: Arasan test suite update *by* Steven Edwards, CCC, *September 19, 2008*
3. ^ where FEN is not consistent *by* Reinhard Scharnagl, CCC, *January 06, 2010*
4. ^ No more pseudolegal en passant target foolishness *by* Steven Edwards, CCC, *February 27, 2011*
5. ^ Encapsulated PostScript from Wikipedia

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