Texas Instruments Home Computer

Phoenix Chess

COMMAND MODULE

A full featured chess engine for both beginner and advanced players



Programmed by Michael Thomas
Original design by Walid Maalouli
2026

Quick Reference Guide

System Requirements

TI 99/4A Computer
32K Memory Expansion
Disk drive optional for loading/saving games
PIO printer optional for printing the game record

Game Startup

1. Insert the cartridge into the cartridge slot
2. Turn the computer display ON
3. Power ON the Peripheral Expansion Box
4. Switch the TI 99/4A computer ON

Game Keys

[LETTER|NUMBER]	Piece board coordinates
[R]	Redo move entry
[U]	Utility menu

TEXAS INSTRUMENTS **HOME COMPUTER**

PHOENIX CHESS



Have you outgrown Video Chess and are looking for the next challenge? Look no further: Phoenix Chess goes to the next level, offering you a worthy opponent regardless of your skill level. Are you up to the challenge?

Programming:	Michael Thomas Based on original work by Walid Maalouli
Testing and debugging:	Thorsten Czub and Arne Bailliere

Copyright: This game is released under the GNU General Public License v3.0

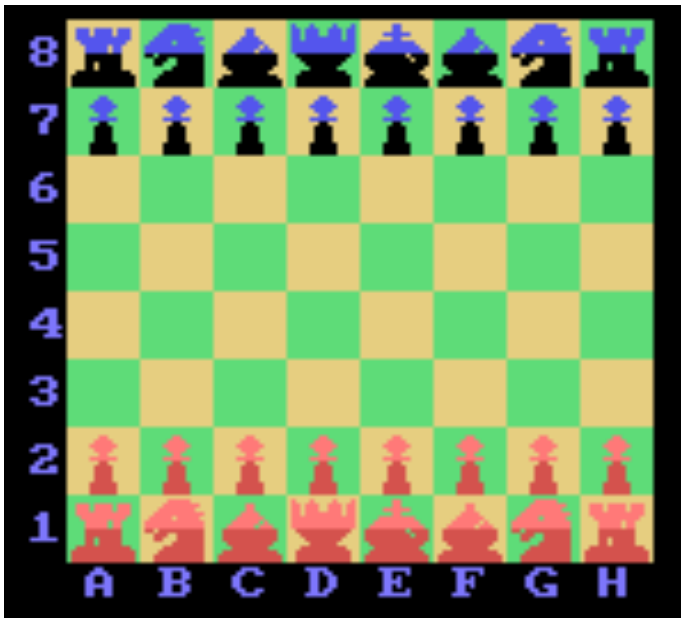
INTRODUCTION

This cartridge version of the original UCSD Pascal Phoenix Chess program enhances and significantly speeds up the original work thanks to a novel Pascal Compiler (StatPascal) developed by Michael Thomas which allowed for the practical conversion of the original UCSD Pascal code to assembly language, resulting in a faster and stronger chess engine as well as a graphical display.

CHESS ENGINE HIGHLIGHTS

- Phoenix chess follows the official chess rules below
  - castling
  - pawn promotion to any piece
  - en-passant capture
- Variable difficulty levels (ply) from 1 - 6
- Quiescence searching where the game tree search depth is selectively increased when piece captures are possible
- Large opening book covering the major opening lines
- Search nodes deepening
- Expanded in-game options

GAME REPRESENTATION



The chess board consists of 64 squares with rows labeled from 1 - 8 and columns labeled from A – H. The squares alternate between light and dark squares, with the white piece on the bottom and the black pieces on the top.

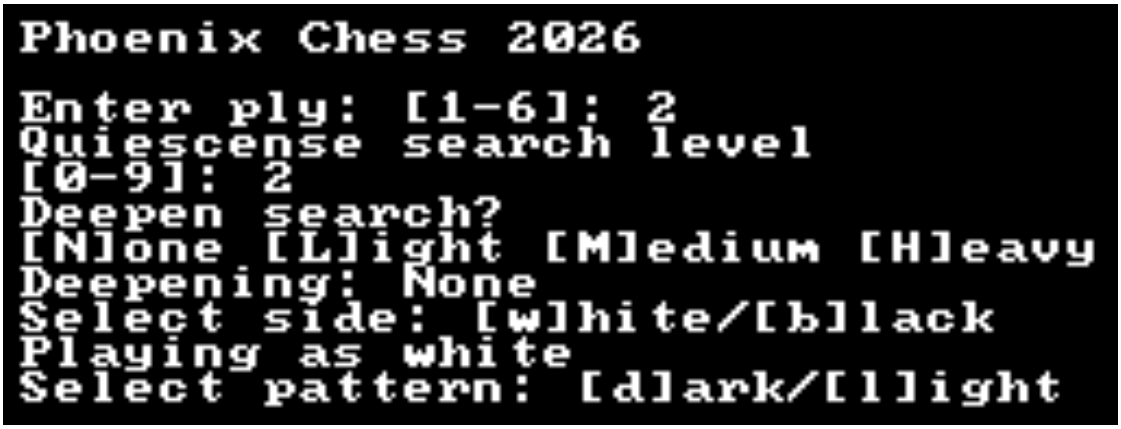
The chess pieces in Row 1 A-E above represent:

- Rook
- Knight
- Bishop
- Queen
- King

The pawn is shown in Row 2.

HOW TO PLAY

When the game launches, you will be presented with a splash screen as the program initializes. Press a key to launch the main program and you will be asked to pick a set of options:



- Ply level: enter a number from 1 to 6. The higher the level, the stronger the engine, but also thinking time increases exponentially. Each ply is a half-move.
- Quiescence search level: This indicates how many *additional plys* the game engine will search when captures are possible on the board. While this option does improve play quality, it also lengthens thinking time significantly. Most useful at lower plys. Enter a number between 0 and 9.
- Search deepening: Sets a node threshold which, if not met at the current ply level, automatically increases the ply level until the threshold is met. Frequently triggered in end games.
- Side to play: The white pieces start first.
- Theme pattern: select between a dark or light display theme.

PLAYING THE GAME



The user interface consists of 4 sections:

1. Three lines of text at the top showing the game title, ply level, move number, color of the current side playing and the quiescence search level (***qs***).

2. The board representation in the middle reflecting the current state of the game.
3. The last move played and either a ***thinking…*** indicator if the engine is searching for a move, or a prompt to enter a move if it's the human player's turn, are displayed on the right.
4. The number of moves evaluated by the engine during the last move and the current game score are shown on the bottom of the screen. Note: if the engine move is from the opening library, then ***Book move*** will be displayed instead.

To enter a move, type the coordinates of the starting square in the format *column*| *row* such as **D5** when the ***from*** prompt is displayed. *No need to press the **Enter** key.* If the selected square contains a valid piece, then the ***to*** prompt will appear asking for a destination square, otherwise you will continue to be prompted for a valid starting square. Enter the destination square as before, and it will only be accepted if it is a valid move. *Should you want to re-enter the whole starting-ending square sequence, then press **R**.* Once the move is accepted, the board display will be updated to reflect it and the computer will immediately start searching for its best move, shown by the ***thinking…*** indicator. Your entered move will be shown next to the ***last move*** indicator *prefixed by the first letter of the moved piece*. Once the engine finds a move, the board display will update accordingly along with the number of positions evaluated and the current game score.

The computer will not accept an invalid move such as:

- moving an opponent's piece
- illegal destination square
- moving a piece which does not take your king out of check if it is currently checked
- castling attempt when the king has already moved, one or more of the interposing squares are under attack or blocked, or if the rook on the side of the castle has already moved

To castle, simply move the king to the new destination square and the rook will be automatically moved accordingly.

The ***check!***, ***checkmate!***, **or** ***stalemate!*** indicators will appear above the last move display depending on the game status. Except for a check situation, the game will end immediately. You can then enter the utility menu by pressing **U** if desired.

UTILITY MENU

When it is the human player's turn to move and the ***from*** prompt is displayed, pressing **U** will display the utility menu on the right side of the screen. Press the appropriate letter next to the option to select it.



- **Load game** : load a previously saved game from disk. Enter the name of the save file and it will load the game and resume where it last left off. Ex: **DSK1.MEPHISTO.SAVE**
- **Save game** : save the current game to disk. Enter the name of the save file and the game will be stored to that file name. Ex: **DSK1.MEPHISTO.SAVE**
- **Backup** : backup 1 *half move*.
- **Forward** : advance the game 1 *half move*.
- **First move** : jump to the first move of the game.
- **Last move** : jump to the last move of the game.

- **Switch sides** : the computer will play your move immediately. Used repeatedly, this function allows you to have the computer play itself.
- **Change ply** : change the game ply between 1 and 6. You will also be prompted to select a new set of quiescence search and node deepening levels.
- **Play** : resume the game at the *currently displayed position*. Any positions beyond that will be lost.
- **Write FEN** : save the current *position* in FEN (Forsyth Edwards Notation) format to disk. Note that it does not save the game *record*. This is useful for preserving interesting positions during a game or for chess problems and can be loaded back using the **load game** option.
- **New game** : start a new game with the currently selected options. The previous game will be lost unless saved first.
- **Setup position** : set up a board position (see the following section for details).
- **Print game** : print the entire game record to date to the *PIO printer*. Type **PIO** at the prompt and press ENTER to start the printing process. The initial position will be printed in FEN format, followed by the game record in standard notation.
- **Exit cart** : Exit the game. You will be prompted to confirm.
- **License** : Displays the game's copyright license.

POSITION SET UP

Position set up allows you to either modify a game in progress or set up a chess problem. If you pick that option from the Utility menu, you will first be asked if you would like to clear the board, and if yes then you will be presented with an empty chessboard. You will then be prompted to place pieces on the board. First select the color by pressing either **W** for white or **B** for black. Next select the type of piece by pressing the appropriate letter (**K, Q, R, N, B, P**). Finally enter the destination square coordinates (column|row: ex. D5). You will then be asked to either **C**onfirm, **R**edo, or **D**elete. **Confirm** places the piece on the board, **Redo** will let you re-enter the destination square, and **Delete** will delete the type of piece indicated on the selected square.

Warning: the computer does not check the legality of the pieces placed on the board, so illegal positions will be accepted but will likely result in strange behavior from the chess engine.

One you have entered all the pieces, press **Q** to end the set up and you will be prompted to indicate if you want to allow castling, which side will be playing first, and the starting turn number. From there, the game will proceed as usual.

TECHNICAL COMMENTS

- Phoenix Chess is the only chess engine for the early microcomputers that makes use of 64-bit bitboards to represent the chessboard, a process made easier by the fact that the TI 99/4A was the only 16-bit computer of the era. This allowed for much more efficient board evaluations than otherwise would have been possible. The drawback was that every single 64-bit board operation required 4 sequential 16-bit operations on the TI, which adversely affected performance.

- The engine processes about 11 nodes per second. While this seems fast, one has to keep in mind that the number of nodes increases exponentially with the ply level, and even with efficient pruning can lead to thousands of positions being evaluated. Thinking times vary according to the ply level selected, and range from **1-2 seconds** for ply 1, **10-20 seconds** for ply 2, **2-3 minutes** for ply 3, **20-30 minutes** for ply 4, and **hours** for plys 5 and 6. *Adding quiescence searching and node deepening levels considerably lengthens these thinking times, and therefore is best limited to plys less than 4*. For higher plys, accelerated emulation is recommended for practical play.

- The estimated ELO level of the engine is around 1400 based on games played against many different legacy chess computers and software engines as tested by Thorsten Czub. This is very respectable and should provide a decent challenge to most amateur chess players.

NOTES

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