



TRIANGULAR  $\mu$ OS 1.09

for



Manual

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## PART A

# PREPARATIONS

# 1. Introduction

TRIANGULAR  $\mu$ OS is GUI (graphic user interface) operating system for 8-bit Commodore computers. This Manual pertains to TRIANGULAR  $\mu$ OS 1.09 version for Commodore PET equipped with 40 column display.

Package contains files:

- ***TRIANGULAR  $\mu$ OS 1.09 for Commodore PET Users Manual.pdf*** – this manual
- ***TRIANGULAR  $\mu$ OS 1.09.d64*** – image of TRIANGULAR  $\mu$ OS System Disk, which consists of 25 files, which all take 55.19 KB on System Disk (236 disk blocs = 59.00 KB)
- ***TRIANGULAR  $\mu$ OS 1.09 SYSTEM DISK*** – folder containing all System Disk files for convenient use with SD2PET
- ***purple.vpl*** – custom purple color palette for VICE emulator

Goal of creating this system was to develop GUI for 8-bit Commodore computers with lowest amount of memory: that is Commodore PET with at least 4KB of memory.

This software was written in Commodore BASIC language (port of Microsoft BASIC) using CBM prg Studio 4.1.0, and is designed to run on less than 3KB available for BASIC programs available in lowest 4KB model of Commodore PET and will run on any 40 column PET model with bigger amount of memory. Commodore BASIC (an interpreted language similar to JAVA or C# CLI) is default language used in 8-bit Commodore computers and also functions as OS for them. So  $\mu$ OS sits top of BASIC and KERNAL (Commodore's kernel). It is designed to support Basic 1.0 (V1 / Original ROM - this version supports disk drive only in VICE emulator) or 2.0 (V2) and higher editions of Commodore BASIC.  $\mu$ OS works only in text mode, since PET has not any graphic mode.

## 2. What's new

What's new in TRIANGULAR  $\mu$ OS 1.09 for Commodore PET:

- LUNAR LAND is placed in GAMES folder in place of BREAKOUT
- BREAKOUT, RATRUN and MAD BOMBER games added to System Disk as extra (last 2 titles require at least 8 KB of RAM)
- Added SYSTEM DISK folder for use with SD2PET
- Updated documentation

### 3. What you need

In order to run TRIANGULAR  $\mu$ OS, you will need either real 40 column Commodore PET computer with 4 KB of RAM (or more) and disk drive or SD2PET, or Commodore PET emulator like freeware VICE emulator, which is available here:

[vice-emu.sourceforge.io](http://vice-emu.sourceforge.io)

VICE emulator should be configured as 40 column model (model 2001, 3000 or 4000 series). Disk drive that can read 170KB 5.25" diskette (\*.d64 file) must be enabled: recommended CBM 2031 (default). Any KERNAL ROM/BASIC version supporting disk drive or memory size configuration is supported by this  $\mu$ OS.

To achieve purple color in VICE emulator, use custom pallet ***purple.vpl*** file included in this package. This custom pallet was created in PaletteEditor .11, program available here:

[www.lemon64.com/forum/viewtopic.php?t=53176](http://www.lemon64.com/forum/viewtopic.php?t=53176)

## PART B

# HOW TO USE TRIANGULAR $\mu$ OS

## 4. How to use TRIANGULAR $\mu$ OS 1.09

To start using TRIANGULAR  $\mu$ OS insert *TRIANGULAR  $\mu$ OS 1.09.d64* into disk drive and type command: LOAD “\*”,8 or LOAD “UOS”,8 in BASIC and press Return key (or Enter on PC keyboard in case of emulators). System launcher named UOS will check your system. If you are using your drive as device #8, use one of above commands. If you are using different device # then change last number (8) to it (e.g.: LOAD “\*”,9 if you want to use disk drive #9). After successfully loading startup program type RUN (and press Return/Enter) to start  $\mu$ OS.

By doing so whole system starts. Program named UOS is first element of BIOS of this system. It checks if running machine is indeed Commodore PET computer, which BASIC version it is running (V1 or V2 and higher), if this is 40 column version. Next BIOS will check if there are disk drives, detects disks hardware IDs, and if system disk is present, automatically sets boot drive to lowest disk drive # containing matching system disk and load configuration file.

If any of above activities were not finished successfully, BIOS will display error message and return to default BASIC mode. If everything went OK, launching screen will appear. By pressing DEL key, you can enter into BIOS SETUP menu, where system parameters and list of detected disk drives will be presented. To change boot device hit highlighted key (A-D) after name of available disk drive. you can also change system time by using T key and entering new time in format HHMMSS or reset system clock by hitting R key. To restart whole system, press E key. To quit this menu, use X key to go back to launch screen. By pressing S key computer exits  $\mu$ OS completely and will go into its standard BASIC mode. When DEL key is not pressed, BIOS continues to launching GUI.

GUI (graphic user interface) is central element of TRIANGULAR  $\mu$ OS. GUI is navigated by pressing number pad keys, which moves arrow-like cursor:

- 2 – down
- 4 – left
- 6 – right
- 8 – up
- 0 – select/click

On bottom of the screen there is task bar with TRIANGULAR logo on center and digital clock on the right. Clicking this logo will open menu where you can select:

- SETTINGS – opens SETTINGS window
- RESTART – restarts TRIANGULAR  $\mu$ OS
- SHUT DOWN – exits to BASIC

In SETTINGS window you can change system time (by clicking on + and – signs to change hours, minutes, seconds). Click on RESET CLOCK button resets system clock. By clicking on one of five tiles on right of PATTERN label you can change system wallpaper pattern. Button APPLY saves wallpaper selection into config file. As in most GUI clicking on X button will close the windows. By doing so without saving, any wallpaper changes are canceled.

On main screen desktop there are 4 icons:

- THIS PET – open window similar to My Computer or This PC on Windows
- OFFICE – opens folder with selection of office suite applications
- GAMES – opens folder with games
- MONITOR – starts memory monitor

THIS PET window contains 2 icons:

- DISK – open program which shows content of disk and starts stored on it programs
- CMD – starts a command prompt program

DISK is program that show disk content and can start programs store on disk. On start it checks disk (it can take a while) and displays System Disk content: disk name and list of files stored on it. By using Cursor up and Cursor down keys you can scroll the disk programs list. you can run selected program by hitting Return/Enter key. In upper area there are labels with disk drives available (8> to 11>) with letters under them (A-D). (Only available disk drives will be displayed here and there should be at least one drive available). By pressing key of available disk drive (A-D) you can display content of that disk. When there no disk in that drive or disk is empty program will display messages: NO DISK! or EMPTY DISK! Use Shift + Delete keys to exit.

CMD is a DOS-like command prompt program that allows you to manage disk content. It accepts one of following commands (disk and file names cannot be longer than 16 characters, ID must be exactly 2 charters long):

- HELP – shows help
- CLR – clears screen
- EXIT – go back to desktop
- RESTART – restarts TRIANGULAR  $\mu$ OS
- BASIC – restarts computer to BASIC
- & – displays basic system info
- @ – displays current device info
- #[devide number] – changes disk drive (8-11 e.g.: #8, #11)
- \$ – show directory (content) of disk
- ↑[filename] – load program (e.g.: ↑SIMCITY)

- ↑ – load first encountered program (similar to LOAD “\*”,8 in BASIC)
- S>[filename ] – deletes file (e.g.: S>SIMCITY)
- R>[new name=old name] – renames file (e.g.: R>NEW NAME=OLD NAME)
- C>[new file=original file] – copies file (e.g.: C>NEW FILE=ORIGINAL FILE)
- N>[disk name<id] – formats disk (ID parameter is optional) (e.g.: N>DISKNAME<ID) -  
I – initialize disk
- V – validates disk
- #1 – load program from cassette tape #1
- #2 – load program from cassette tape #2

MONITOR is program that shows and edit computer memory. Memory cells values are displayed in hexadecimal number system (0-F). Possible commands below (type X in any further prompts to cancel operation):

- HELP – shows help
- CLR – clears screen
- EXIT – go back to desktop
- ENTRY – change memory from given memory address, one byte after one byte  
(additionally, besides X, you can type R to fast repeat previous byte value)
- SHOW – shows memory content starting from given memory address
- FILL – fills specified memory region with given byte value
- COPY – copies specified memory region to another
- GO – executes machine language program

OFFICE folder contains 4 office suite programs:

- WORDS is a word processor. Use Cursor Up or Cursor Down/Return to scroll page. Shift + Return to discard changes in current line. Press Shift + Home to start new file. Home key prints document on printer #4. Use C= key to load document and Shift + C= to save current document to file. Exit by pressing Shift + Delete keys.
- CALC is very simple spreadsheet program. Press number 1 to 7 to enter/change values in that spreadsheet row. Press N to start new file, S to save file, L to load file and P to print. Use X key to exit.
- CONTACTS create and manage contacts information. Press N to enter new contact information, S to save it, L to load contact and P to print. Use X key to exit.
- MATH is a scientific calculator. To add 2 numbers, enter 1<sup>st</sup> number (by pressing Return/Enter key and then entering it). Press + key. Next similarly add 2<sup>nd</sup> number and then again press +. Result is showed on right from RESULT label (near top of screen). Other mathematical functions operate similarly: enter 1 or 2 numbers and press highlighted key in the name of operation listed on screen. Use Shift + Delete keys to exit.

GAMES folder offers 4 game titles (instructions inside every game):

- SIMCITY – create and develop your city. Press R, C or I key to place Residential, Commercial or Industrial zones. Use Space to build a road. Roads are essential since only zone segments with road adjacent to it can develop into used one and bring revenue to city
- STAR WARS X-Wing vs TIE Fighter – fabulous Star Wars themed space shooter. Shoot down 20 TIE Fighter to discover Darth Vader greatest secret. Move by using keys 2,4,6,8. Shoot by pressing Spacebar.
- SNAKES – play game of snakes with second human player or computer opponent
- LUNAR LAND – lunar lander simulator

3 additional games can be run from CMD (up arrow + game name) or DISK programs:

- RATRUN – great 3D maze game (requires at least 8 KB of RAM)
- MAD BOMBER – fly aircraft and drop bomb and enemy position (requires at least 8 KB of RAM)
- BREAKOUT – superb PET edition of this famous game. Press 4 or 6 to move bar

# APPENDICES

## A. Support & Legal note

More information about TRIANGULAR  $\mu$ OS for Commodore PET or other computers system is available on TRIANGULAR  $\mu$ OS website, where you can download SDK, report bug or get help: [triangular-uos.blogspot.com](http://triangular-uos.blogspot.com)

### LEGAL NOTE:

TRIANGULAR  $\mu$ OS is free and open software which you can freely copy, share and edit but give credit to creators of  $\mu$ OS (especially 3rd party games creators).

## B. Changelog

### **TRIANGULAR $\mu$ OS 1.09 for Commodore PET [31-08-2023]:**

- LUNAR LAND is placed in GAMES folder in place of BREAKOUT
- BREAKOUT, RATRUN and MAD BOMBER games added to System Disk as extra (last 2 titles require at least 8 KB of RAM)
- Added SYSTEM DISK folder for use with SD2PET
- Updated documentation

### **TRIANGULAR $\mu$ OS 1.08 for Commodore PET [31-07-2023]:**

- SETTINGS saving button name changed to APPLY
- Visual discrepancies corrected.  $\mu$ OS is geared more toward BASIC 2.0 and later versions
- Filenames convention changed from filename>ext[ension] to standard filename.ext[ension] e.g. uos>cfg to uos.cfg
- WORDS file extension changed to .txt
- Improved, bug fixed and cleaned code
- Code transferred to CBM prg Studio, code is more consolidated and 3.5 KB smaller
- SDK package includes 20 source code .bas files, 1 Machine Language .prg file (BREAKOUT), 1 .cfg file, 1 empty disk .d64 file and two spreadsheet files .xlsx with system data

### **TRIANGULAR $\mu$ OS 1.05/PET for Commodore PET [29-06-2022]:**

- Config file contains system key
- UOS/BIOS error messages system improved
- DISK text program is placed in THIS PET and shows disk content and can start programs
- SETTINGS can properly cancel changes and other bugfixes
- Improvements, bugfixes and cleaned code from redundant parts in all programs produced very stable version
- Simple SDK added

### **TRIANGULAR $\mu$ OS 1.04/PET for Commodore PET [21-06-2022]:**

- Operating system name changed to TRIANGULAR  $\mu$ OS
- Launching program and config file names changed
- 8 KB version removed (since it is slower than 4 KB version)
- GUI: windows have black close buttons
- Taskbar window name moved to left side of TRIANGULAR logo orb
- Click/select key changed to 0 (zero)
- DESKTOP renamed to GUI
- Icons are updated
- THIS PC window is renamed to THIS PET and adds DISK icon which can load a program from disk
- SETTINGS now have SAVE button for saving settings and time change buttons rearranged
- CMD is greatly overhauled with commands syntax similar to DOS Wedge/JiffyDOS and added function for listing directory of disk content
- MONITOR is improved
- WORDS instead of WORD – this is completely new word processor
- SIMCITY game added in place of LUNAR LAND
- Other games have slightly different menu keys
- Games from 8 KB version removed
- Improvements and bugfixes

### **TRIANGULAR OS 1.03 for Commodore PET [27-02-2022]:**

- System now have 4KB and 8KB modes – launcher will choose which one to boot into
- 8KB mode has consolidated code of GUI into one program, as well as STAR WARS is consolidated, BIOS is combined with TRIANGULAR OS launcher, CMD with its HELP, MONITOR with its HELP
- Fixed bug in disk detection system
- Few minor bugfixes
- 2 new games (RATRUN & MAD BOMBER) only for 8KB mode (in replacement of SNAKES and LUNAR LAND)

### **TRIANGULAR OS 1.02 for Commodore PET [06-02-2022]:**

- Minor visual changes across the board (mostly highlighted key letters)
- Launch program renamed to TRIANGULAR OS
- TRIANGULARS OS and BIOS has improved disk drive detection system. Drive database expanded (include SD2PET /experimental/). Loads OS>CFG file with wallpaper settings.
- BIOS Setup Menu added option to exit to BASIC
- SETTINGS saves wallpaper settings in OS>CFG file
- CMD has fixed drive change mechanism. Minor bugfixes.
- OFFICE apps visual revision and many bugfixes
- GAMES minor visual changes and bugfixes

### **TRIANGULAR OS 1.01 for Commodore PET [16-01-2022]:**

- First version to have manual
- Various minor improvements done in system launching program
- BIOS has fixed launching logo position
- GUI memorizes cursor position in-between of loading modules plus has minor bugfixes
- CMD has many bugfixes
- MONITOR fixed serious bug preventing user from running machine language programs
- OFFICE apps can now properly load and save data on disk
- STAR WARS added music in intro and outro. Game engine now don't reset system clock
- SNAKES has AI opponent fixed and minor esthetic changes
- LUNAR LAND received minor esthetic changes

### **TRIANGULAR OS 1.00 for Commodore PET [24-12-2021]:**

- Starting procedure changed: TRIANGULAR disk detecting program -> BIOS (Launching screen combined with BIOS Setup Menu) -> DESKTOP (GUI)
- System Registry utilizes Datasette buffer memory to store status of TRIANGULAR OS
- BIOS checks if there are disk drives #8 - #11, detecting mechanism is improved and disk drive type detection is added, system key file is introduced
- BIOS Setup Menu displays drives and can change BOOT drive and restart system
- DESKTOP is streamlined and icons redesigned
- START Menu is placed on center of task bar and is displayed just as TRIANGULAR logo and have SETTINGS, RESTART and SHUT DOWN options
- SETTINGS (renamed CONTROL PANEL) can change desktop wallpaper from 5 patterns
- MY COMPUTER is renamed THIS PC and its disk icon now opens CMD program
- CMD (renamed DOS) can change operating disk (#8 - #11) plus some improvements
- OFFICE apps have minor improvements
- MONITOR is heavily reworked and improved, operates on HEX values.
- GAMES icon in place of STAR WARS icon opens folder with 4 games: STAR WARS X-Wing vs TIE Fighter, SNAKES, LUNAR LAND and BREAKOUT

### **TRIANGULAR OS 1.00 BETA for Commodore PET [2016 to 24-10-2021]:**

- System supports 1 cassette recorder: device #1 and only 1 disk drive: device #8
- BIOS have implemented simple PET type detection and it detects if there is disk drive #8
- BIOS Setup Menu is accessed with DEL key where you can change or reset system time
- Starting procedure: BIOS -> TRIANGULAR DOS -> Launch screen -> DESKTOP (GUI)
- DESKTOP (GUI) contains wallpaper, task bar on which are located: clock (right bottom), START Menu with TRIANGULAR logo (left bottom) and 4 icons: MY COMPUTER, OFFICE, STAR WARS and MONITOR
- Mouse pointer is PETSCII arrow character operated by 2, 4, 6, 8 key and 5 to click
- START Menu has CONTROL PANEL, RESTART, EXIT TO DOS and QUIT TO BASIC options
- CONTROL PANEL can change time and reset system clock
- MY COMPUTER contains cassette and disk icon which can load first encountered program (equivalent of LOAD for cassette icon and LOAD "\*",8 for disk icon)
- OFFICE contains 4 office suite programs: WORD a word processor, CALC spreadsheet, CONTACTS contact manager and MATH calculator
- STAR WARS brings fabulous STAR WARS X-Wing vs TIE Fighter game
- MONITOR is a very simple memory monitor program, operates on decimal numbers