TRIANGULAR μOS 1.10/VIC

for

Commodore VIC-20

User's Manual

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PART A

PREPARATIONS

1. Introduction

TRIANGULAR µOS is GUI (graphic user interface) operating system for 8-bit Commodore computers. This User's Manual pertains to TRIANGULAR µOS 1.10/VIC version for Commodore VIC-20.

Package contains files:

- *TRIANGULAR µOS 1.10-VIC for Commodore VIC-20 Manual.pdf* – this manual
- *TRIANGULAR µOS 1.10-VIC.d64* – image of TRIANGULAR µOS System Disk containing 20 files, which take 44.64 KB (192 disk blocs = 48.00 KB on disk)
- *TRIANGULAR uOS 1.10-VIC Documents.d64* – empty formatted µOS Documents disk image for documents
- *TRIANGULAR uOS 1.10-VIC Documents.zip* – archived µOS Documents disk

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. Later it was expanded for Commodore VIC-20 with at least standard unexpanded 5KB of memory.

This software was written in Commodore BASIC language (port of Microsoft BASIC) using CBM prg Studio 3.14.0, and is designed to run on at least unexpanded 5KB model of Commodore VIC-20 and will run on any model with higher amount of memory expansion. TRIANGULAR µOS is designed to support BASIC 2.0 (V2) and works only in color text mode. Commodore BASIC (a runtime interpreted language similar in basic concept to JAVA RTM or C# CLI) is default language used in 8-bit Commodore computers and also functions as their OS and user interface. Similarly, to early Microsoft Windows (1.0 to 3.11), µOS sits atop of BASIC and KERNAL (Commodore's kernel) and Commodore DOS. It uses Commodore DOS implemented in Commodore disk drives or 3rd party solutions in order to load its parts, load/save settings and documents, perform operations on floppy disks and communicate with disk drive(s).

2. What's new

What's new in TRIANGULAR μOS 1.10/VIC for Commodore VIC-20:

- Support for Commodore VIC-20 with at least 5KB and it's 22 column 8 color text mode
- New colorful loader for inter-loading operations
- BIOS Setup menu offers option to enable/disable Datasette
- BIOS Setup supports separate Work disk drive for storing system apps documents
- BIOS improvements and bugfixes
- GUI cursor is joystick operated and can move diagonally
- GUI windowed environment uses custom color background and title bar
- Up arrow button added to task bar (placed right of clock) to go back to main desktop screen
- SETTINGS is split into two apps: SETTINGS which can change time plus work disk and printer options and COLORS which can change colors of GUI elements.
- DISK is now windows & cursor operated. Changed disk content display mechanism.
- CMD Introduced improved mechanism for displaying success or error of performed operation. Minor review of command syntax (I> and V> instead of I and V). Bugfixes.
- APPS folder instead of OFFICE, contains WORDS, MATH, MONITOR, SYNTH
- MATH calculator revamped, simplified and cursor operated
- MONITOR have blue background. Command SHOW displays 2 hex digits instead of 4. HELP consolidated. Minor bugfixes.
- 4 new games: SIMCITY, STAR WARS X-Wing vs TIE-Fighter (new version), BREAKOUT (new version), NEED4VIC
- Various other bugfixes and improvements
- Empty and formatted disk image called TRIANGULAR uOS 1.10-VIC Documents in .d64 and archived .zip file formats added for use as Work disk

3. What you need & Support

In order to run TRIANGULAR μOS, you need real Commodore VIC-20 computer with 5 or more KB of RAM and disk drive and joystick to operate cursor.

You can also use freeware VICE emulator, which is available here:
https://vice-emu.sourceforge.io

VICE could be used with any memory configuration. Disk drive that can read 170KB 5.25¨ diskette (.d64 file) must be enabled: recommended CBM 1540 (default). Also, you should enable joystick. You can easily configure it as Numpad keys:

- Up (8), Down (2), Left (4), Right (6)
- You can move diagonally e.g., Up-Left (7)
- 0 or right Ctrl: Fire (click/select)

SUPPORT:

For more information, to report bug or to get help go to links listed below.

For this version of TRIANGULAR μOS there is SDK pack available containing additional refences and source code in .bas file format. Check DENIAL or Lemon64 release post in links listed below to download this SDK pack.

TRANGULAR μOS for Commodore VIC-20 on DENIAL forum:
http://www.sleepingelephant.com/ipw-web/bulletin/bb/viewtopic.php?f=2&t=10352&sid=ee655bec6f816e3a2d01193a21ae27a9

TRANGULAR μOS for Commodore VIC-20 on Lemon64 forum:
https://www.lemon64.com/forum/viewtopic.php?t=78834

TRIANGULAR YouTube channel:
https://www.youtube.com/channel/UCdnynTqbM8S6mc0EUXY58Gg/

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HOW TO USE TRIANGULAR µOS

4. How to use TRIANGULAR μOS 1.10/VIC

To start using TRIANGULAR μOS insert *TRIANGULAR μOS 1.10-VIC.d64* disk 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 μOS.

Now system starts. Program named UOS is first element of BIOS of this system. It checks if running machine is indeed Commodore VIC-20 computer, how much memory it has installed in and checks screen memory. Next BIOS checks if there are any disk drives, detects their 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 more than one System Disks are inserted in multi disk drive machine you can boot into higher device # drive by using F1 [#8] - F4 [#11] keys).

If any of above system checks weren't finished successfully, BIOS will display error message and return to default BASIC mode. If everything went OK, launching screen will appear. By pressing F1 key, you can enter BIOS SETUP menu, where system parameters and list of detected disk drives will be presented. To change Boot Drive or Work Drive hit highlighted key (F1 - F8) displayed after name of available disk drive*. You can also change system time by using T key and entering new time in format HH:MM:SS or reset system clock by hitting R key. To continue without saving changes (besides time clock which is changed dynamically) and go back to launch screen press E key. To save changes and restart μOS use S key. By pressing B key computer shuts down μOS completely and will go into its standard BASIC mode. When F1 key is not pressed when launching screen is present, BIOS continues to launching GUI.

*If you have other disk drive enabled, you can insert *TRIANGULAR uOS 1.10-VIC Documents.d64* or any other disk into it and in BIOS Setup menu change Work Disk to that disk drive (most probably #9). By doing this you can easily load/save documents on separate disk than TRIANGULAR μOS System Disk (which is recommended setup). Otherwise, you will load/save documents from System Disk (unless you will change disk while working in WORDS word processor), which is default option (Work Disk set as #8 or device # of Boot Drive if #8 is not available).

GUI (graphic user interface) is central element of TRIANGULAR µOS. GUI's arrow-like cursor is joystick navigated:

– Up, Down, Right, Left
– You can move diagonally (e.g., Up-Left)
– Fire to select/click

On bottom of the screen there is task bar with black TRIANGULAR logo on center and digital clock on the right side with up arrow symbol to right of the clock. By clicking on this arrow, you will be able to go back directly to initial desktop screen from future windows (this is very useful when you want to skip closing previous windows and their inter-loading operations).

By clicking on TRIANGULAR logo, you will open start menu where you can select:

- SETTINGS – opens SETTINGS window
- RESTART – restarts TRIANGULAR µOS
- SHUT DOWN – exits to standard BASIC mode

On main screen desktop there are 4 icons:

- THIS VIC – open window similar to My Computer or This PC on Windows
- APPS – opens folder with selection of apps
- GAMES – opens folder with games
- SETTINGS – opens SETTINGS window

SETTINGS window allows you change system time (by clicking on + and – signs to change hours, minutes, seconds). Click on RESET CLOCK button to reset system clock. Below label WORD DISK there are buttons with device # (8> to 11>) on them. Red button color indicate that device is unavailable. Cyan color marks available drive and green show current selected work drive. Clicking on cyan button will change Work Drive to it. Below of PRINTER label there are buttons to select printer device # (NO, #4 - #7). If NO button is selected (default) no port is assigned and print functions are not available in TRIANGULAR µOS apps (e.g., WORDS). Most popular setup is to use printer as device #4. SAVE button saves selection into config file. As in most GUIs clicking on X button closes the window. By doing so without saving, any changes (besides time) are canceled. Rainbow colored COLORS button (to left of SAVE button) opens sub-window with GUI color management.

COLORS window enables color options. By clicking on one of eight tiles on right of BACKGR PATTERN label you can change desktop wallpaper pattern. COLOR offers selection of color for background wallpaper. REVERSED will reverse wallpaper patter (enabled with first pattern will change it to solid color). TITLE BAR will change color of title bar of windows. Don't forget to click on SAVE button to save color changes.

THIS VIC 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 a program for viewing disk content. Below title bar there are buttons with device # (8> to 11>). Red disk button indicate that device is unavailable. Cyan color marks available drive and green show current selected drive. Clicking on cyan/green button will start displaying disk content (on default program will display content of disk in Work Drive). Below buttons is field which displays disk name. When there no disk in disk drive or disk is empty (not formatted) program will display message: NO DISK! Further down there is field for disk content listing, which will display 10 items per page. In bottom corners of window there are 2 arrows: > (on right) will advance listing 1 page if additional programs are available and < arrow (on left) will get back to page 1. Clicking on any program will start it.

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 µOS
- BASIC – restarts computer to BASIC
- & – displays basic system info
- @ – displays current device info
- #[*devide number*] – changes disk drive: #1 for Datasette, disk drives 8-11 e.g.: #1, #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>[*original file*] after prompt "TO:" type [*new file*] – copies file e.g.:
  C> ORIGINAL FILE
  TO:NEW FILE
- N>[*disk name<id*] – formats disk e.g.: N>DISKNAME<ID
- I> – initialize disk
- V> – validates disk

If any of above command will be entered erroneously or with improper parameter(s) error message INVALID COMMAND! or BAD PARAMETER! will be displayed. After operation user will be informed of its success (message: OK ✓) or descriptive error message will be displayed.

APPS folder contains 4 programs: WORDS, MATH, MONITOR and SYNTH.

WORDS is a word processor. Use Cursor Up or Cursor Down/Return to scroll page. Shift + Return to discard changes in current line and advance to next line (up or down). All operation evoked by function keys beside F5 (F1-F4 and F8) will pop up confirmation Yes/No prompt.
Press F1 to start new file. F2 prints document on printer. (You must assign printer to any port [#4 - #7] in SETTINGS, before printing otherwise F2 key won't enable printing function). Use F3 key to load document and F4 to save current document to file. F5 inserts tabulation of 5 spaces. Exit by pressing F8.

MATH – scientific calculator. To add 2 numbers, enter 1st number (by keyboard or by cursor by clicking on numbers in purple/blue field). Entered number will appear on right from B label. Use left arrow button or DEL key to delete 1 digit. Reset B register by clicking on C button. Click on = or + button to store number from B register in A register. Next similarly add 2nd number and then click on any desired operation button. Result is showed on right from A label (above B register). Other mathematical functions operate similarly: enter 1 or 2 numbers and press cyan button with given function. Pi button (with π symbol on it) stores π value in register B.

MONITOR is program that shows and edits 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 – goes back to APPS folder
- ENTRY – change memory from given memory address, one byte after one byte (additionally, besides X, you can type R to faster 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

SYNTH – sound synthesizer. F1 and F2 keys will lower/rise volume (which is represented by green volumeter). Use keys listed in layout below to play on 4 sound voices simultaneously. Pressing those keys while holding Shift will play them in lower octave. Use F8 key to exit.

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

- SIMCITY – create and develop your city. Move cursor by joystick and 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 them can further develop into occupied one and bring revenue to the city
- STAR WARS X-Wing vs TIE Fighter – fabulous Star Wars themed space shooter. Score 500 points shooting down TIE Fighters to discover Darth Vader greatest secret. Move using keys A,W,S,D and shoot by pressing Spacebar.
- BREAKOUT – Superb edition of this famous game. Use Joy-right or Joy-left to move bar
- NEED4VIC – Great racing game. Press J or K to move your racing car

APPENDICES

A. Troubleshooting

Loading of next module of TRIANGULAR μOS can "freeze" in process of inter-loading next μOS module or disk program (very rare occurrence). This happens when loading screen not proceeds to next module for over 10 seconds for small μOS modules (it will take longer when much bigger 3rd party programs are loaded by user). When loading screen is not responsive for longer time, it means error in inter-loading procedure, most probably keyboard buffer was not filled with key properly. To see what really happened change color of cursor to blue (press Control + 7) and enter command POKE 36879,24 and hit Return key. This should change background color to white which will show underlying black text of loading sequence. If computer doesn't change cursor or background color try again. If still there no effect it might be real freeze. If color change succeeds, try using RUN command to see if program will start or go to top of screen (Home key) and press Return in order try to reload program. If it will loads successfully enter RUN command. If that not work check if upper most load command is correct. It should have format: LOAD "[filename]", [device # (8 - 11)] like in e.g.: LOAD "GUI", 8. If none of it works then start system anew. To prevent this kind of freeze, try not to use keyboard when inter-loading procedure is performed (it can slip improper key into keyboard buffer, which most often leads to this error).

B. Changelog

What's new in TRIANGULAR μOS 1.10/VIC for Commodore VIC-20:

- Support for Commodore VIC-20 with at least 5KB and it's 22 column 8 color text mode
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Changelog for TRIANGULAR μOS 1.05/PET for Commodore PET:

- Config file contains system key
- UOS/BIOS error messages system improved
- DISK text program added to show disk content and run programs
- SETTINGS can properly cancel changes and other bugfixes
- Improvements, bugfixes and cleaned code from redundant parts of all programs produced very stable version

Changelog for TRIANGULAR µOS 1.04/PET for Commodore PET:

- OS name changed to TRIANGULAR µOS
- Launching and config filenames changed
- 8 KB version removed (since it is actually 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
- THIS PC window renamed to THIS PET
- SETTINGS now have SAVE button for saving settings
- Some icons updated
- CMD is greatly overhauled with commands syntax similar to DOS Wedge/JiffyDOS and added listing directory/disk content function
- MONITOR 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 form 8 KB version removed
- Improvements and bugfixes

Changelog for TRIANGULAR OS 1.03 for PET:

- System now have 4KB and 8KB modes – launcher choose which one to boot
- 8KB mode has consolidated code into 1 program of GUI, STAR WARS, BIOS and TRIANGULAR OS launcher, CMD and its HELP, Monitor and its HELP
- Fixed bug in disk detection system
- Few minor bugfixes
- 2 new games (RATRUN & MAD BOMBER) in 8KB mode (instead of SNAKES and LUNAR LAND)

Changelog for TRIANGULAR OS 1.02 for PET:

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

Changelog for TRIANGULAR OS 1.01 for PET:

- First version to have manual
- Various minor improvements done in launching TRIANGULAR program
- BIOS – fixed launching logo position
- GUI – memorize cursor position in-between loading modules plus minor bugfixes
- CMD – 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 – AI opponent fixed and minor esthetic changes
- LUNAR LAND – received minor esthetic changes