

VC8E-WFD (Hardware Version 1.0, Firmware Version 0.5)

User Manual

CAUTION

*An oscilloscope or X-Y display is meant to display a moving dot. If it is left to display an unmoving dot on the screen (especially if bright) for an extended amount of time, a permanent burn can be left on the phosphor screen. The VC8E-WFD has several fail-safes (inherent design, watchdog timer) designed to prevent this by blanking the Z axis, but there is no **hardware** timeout on the beam. It is possible that under some abnormal, unanticipated condition, the device could crash with the beam on and the dot unmoving. For this reason, do not operate the VC8E-WFD unattended. If you are not using the Z axis input, this caution is especially important.*

You can turn the brightness down on your X-Y display if you wish to operate the VC8E-WFD unattended, so that beam on or off, nothing is displayed.

1. Introduction

The hardware layout is of your own making; the prototype is shown in this manual as an example. It is assumed that the VC8E-WFD has been electrically tested.

2. Initial Setup of X-Y Display

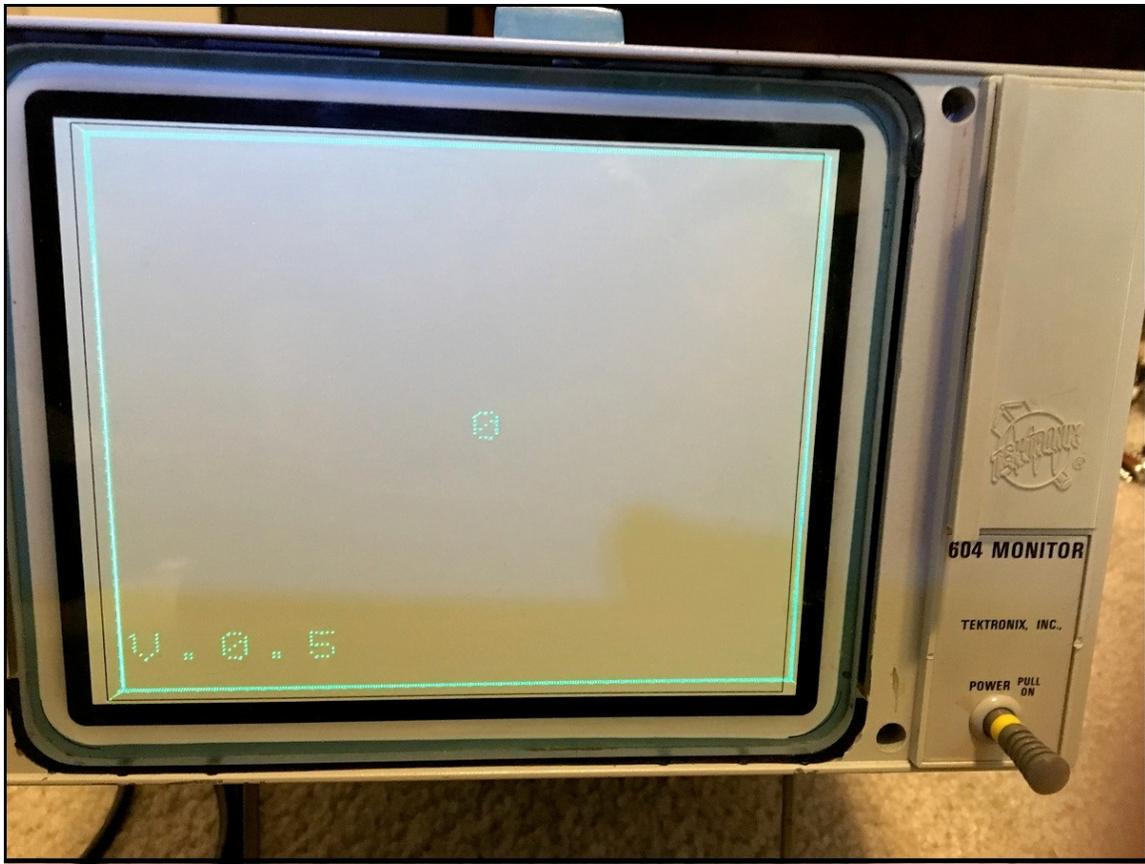
The unit outputs a positive, 0-2.4 volt signal for the X and Y signals and a positive, 0- ~5V CMOS-level signal for the Z axis. You will have to adjust your display appropriately. So, 0,0 for X and Y respectively will be on the lower left of the display. The display is assumed to be a good oscilloscope with as large of a screen as possible or, better yet, a dedicated X-Y display. It has been my experience that a true X-Y display has better specs on beam focus and other refinements.

Many oscilloscopes don't have a Z input. In this case, the display will still operate, but you may see lines going from dot-to-dot as the beam is moved on the screen. This will generally result in a usable, but not optimal, display. The centering/brightness of the display will require occasional touch-up as the X-Y display warms up and/or ages; the VC8E-WFD itself as built is likely to be extremely stable.

In order to enter the SETUP display, press and hold the WEDGE THRust button as the unit is powered up. A box will appear on the display with a 128 or 0 in the center and the version number of the firmware in the lower left corner. If you don't see this:

1. Check that the unit is not in "programming" mode
2. Check that the switch paddles work
3. Move and X,Y offset controls of your display until the lower left 0,0 corner is located. Then, manipulate these controls and the X,Y scaling on your equipment so that a square is displayed that is as large as possible without distortion or blooming. Extreme brightness is definitely not recommended as this can leave a burn on the tube. Your scope or X-Y display will have front-mounted scaling through some means. My 604 uses potentiometers on a board internal to the display (pointed out in the Tektronix 604 user manual) for this purpose.

Do not leave the unit unattended in SETUP mode. There is no "timeout" on the screen.



Note that the image pictured shows a rectangular image; I happen to like this, because my display is rectangular and relatively large. Nonetheless, the box represents 1024x1024 points in size (with every fourth dot lit). If you can resolve these dots, you have a very good display indeed!

4. Manipulate the brightness and focus so that the smallest possible beam spot size is rendered with optimal brightness.
5. Display on its side? X and Y wires/cabling are reversed.
6. Numbers upside down? Your scope may have a “polarity switch”. Or, in the case of my Tektronix 604, the input is differential and I can use BNC shorting plugs to reverse polarity on each axis.
7. Don’t see anything? Check the grounds, check the brightness. Turn the VC8E-WFD off and locate the beam to the center of the screen; retry.
8. Verify that the paddle buttons operate. When you press each paddle button individually, they should display numbers on the screen center, corresponding to the bits in the byte that will be transmitted by the VC8E-WFD to the host (often, a PiDP8 running Spacewar). Button assignments are:

- | | |
|-----|--|
| 1 | Needle Ship (Player 2) Thrust |
| 2 | Needle Ship (Player 2) Turn Ship left |
| 4 | Needle Ship (Player 2) Turn Ship right |
| 8 | Needle Ship (Player 2) Photon Torpedo |
| 16 | Wedge Ship (Player 1) Thrust |
| 32 | Wedge Ship (Player 1) Turn ship left |
| 64 | Wedge Ship (Player 1) Turn ship right |
| 128 | Wedge Ship (Player 1) Photon Torpedo |

Keep in mind that you are steering a rocket using steering thrusters, not a car, so L and R seem reversed at first.

Note that “0” is displayed when buttons are released. Number assignments are additive. For example, pressing L+R on the WEDGE controller will generate a 96. Doing so on the NEEDLE controller will display a 6.

Pressing WEDGE (only) L+R turn, simultaneously, will result in a reboot of the VC8E-WFD. Obviously, this number is not displayed as the system is rebooted!

Do not leave the screen “on” in this state for long periods of time (i.e., hours, days) otherwise a burn could develop on the screen.

3. Initial Setup/Re-Setup of Wireless

It is useful to have Spacewar running on the PiDP8 **first**, loaded through one of several means (paper tape, default from the distribution from the switches, or from USB stick, or by direct switch entry. It is also very useful to connect to the PiDP8 via console via serial port, HDMI/USB keyboard, or ssh, so that the Spacewar text output of the Pidp8 is displayed. Press “O” to see the options, but make no selection.

Either turn-on the VC8E-WFD or reset the parameters from a previously entered network by pressing PHOton on the wedge. When you do this, all previous parameters are cleared.

When the unit is new, the setup parameters will not be programmed and setup mode is entered. If it has been programmed and you need to change the parameters, hold down the PHOton button on the WEDGE paddle upon holding this button down while powering up.

It will default to access point mode, with these WiFi settings:

SSID: VC8E-WFD
Password: DECPDP8I

Login in from your computer and pick any IP address/hostname as a URL from your computer’s browser. All HTTP requests will go to 192.168.4.1. The setup screen is presented as follows:



SSID

password

PDP8/data server IP

PDP8/data server port

save

Scan

Select your network by selecting “Configure WiFi or Configure WiFi (No Scan). Either select from the scan list or enter your SSID along with your password (**these are case sensitive**). Also enter the IP address of the source of the data (usually a PiDP8 running Spacewar) and the port number from 1-32767 (the PiDP8 distribution default is 2222). The 1-32767 is a VC8E-WFD restriction.

Store these by pressing the SAVE button, and they will be preserved in flash and EEPROM memory. The unit will reboot and hopefully you will connect and see the central star and the two ships, as shown. IF not, power cycle the unit. From that point on, enjoy! Note that powering the VC8E-WFD off while connected to the PiDP8 will seem to lock the PiDP8; the connection is broken and will take some time to clear. Or, you can simply reboot the PiDP8 or restart SiMH.

For some reason, it isn’t mentioned on the Spacewar text console, but “1” or “2” restarts the game with one or two players.

Once the WiFi/data sources are set up, the unit be able to restart, automatically login and display the Spacewar game. If it fails to do so, reboot the unit and reset the WiFi/data source parameters via the setup web page. Remember that you can always return to the SETUP mode by restarting the VC8E-WFD and holding down the WEDGE PHOTon button simultaneously.

Playing notes:

1. “Field of Stars” works, but is not recommended as of now due to the “flashiness” of the screen. This is being examined and I expect improvements in the VC8E code. If you use this, “Z” returns to single-star mode.
2. Without using the console, the game ends when all ships are destroyed. If you win, you can thrust your ship into the central star, Polaris, to restart instead of pressing 1 or 2 on the console.
3. Spacewar is an amazingly tight program, but there are oddities: for example, f you thrust your ship for very long stretches and gain momentum, you will find yourself suddenly rocketing in the opposite direction.
4. I haven’t played much with the parameters of the game.
5. Read the opening caution concerning unattended operation.



Appendix

Security

The password for the network **is not stored securely** in the VC8E-VFD. Any reasonably skilled hacker could easily recover it. Therefore, if you lose possession of or give away the unit, or make preprogrammed chips for others, do not do so with the password in place; erasure (as described above with WEDGE PHOton button) or the changing of your router WiFi password is recommended.