WOPR for IBM 5150/60

Project Proposal

Why WOPR?

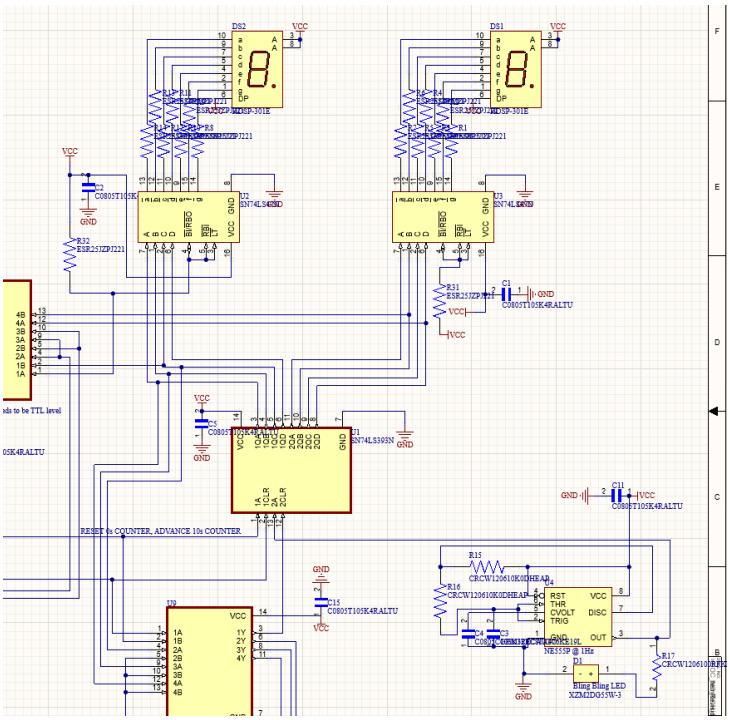
WOPR, acronym for War Operation Plan Response, is a supercomputer in the 80s movie *War Games*. Other than its inherent purpose of planning to start a global thermonuclear war and constant drive to play a good game of chess, it also has lots, lots of LEDs flashing all around it. Although the 5150/60 Personal Computers bears little resemblance to WOPR itself, the WOPR's control panel will fit right into the IBM beige box design of the 80s.

What will it look like?

The purpose of this design project is to replicate part of WOPR's main control panel to fit inside a full-height 5.25-inch drive bay of the IBM 5160 PC/XT. The panel will consist of 16 LEDs, a push button to generate a reset signal to the P8284A clock generator, a "Turbo Switch" to select between 4.77 MHz and 7.2 MHz clock frequency for the NEC V20 Processor (CMOS/improved version of Intel 8088 with 80186/286 instruction support) and on/off switch for the entire LED panel.

Original Designs

The design takes inspiration from my previous ignition board design for the Pitt SOAR rocket team, whose clock section was based on a 7400-series digital clock on hackster.io - [7400 Series Logic Clock - Hackster.io]. The 7400-clock on hackster.io used a Maxim Integrated DS3231M I2C real time clock to provide the 1Hz square wave, but I substituted it with a 555-timer running at 1Hz for SOAR.



Modifications + Improvements

The new design done away with the 7400 series logic and combined the entire counting + 7Seg driver circuitry with the CD4026 decade counter + display driver chip. One significant issue with using CMOS circuitry is its ability to source current for the LEDs (20 mA).

Thanks to the IBM PC/XT's built-in 12-volt power supply (which can supply up to 2.4 amps due to the massive motor required to spin up the WD-25 hard disk drive's 4 platters to 3600 RPM), the entire WOPR board will be supplied with 12V. Based on the CD4026's datasheet, the CD4026 should be able to supply at least 20 mA @ 12V in WOPR's common cathode LED configuration:

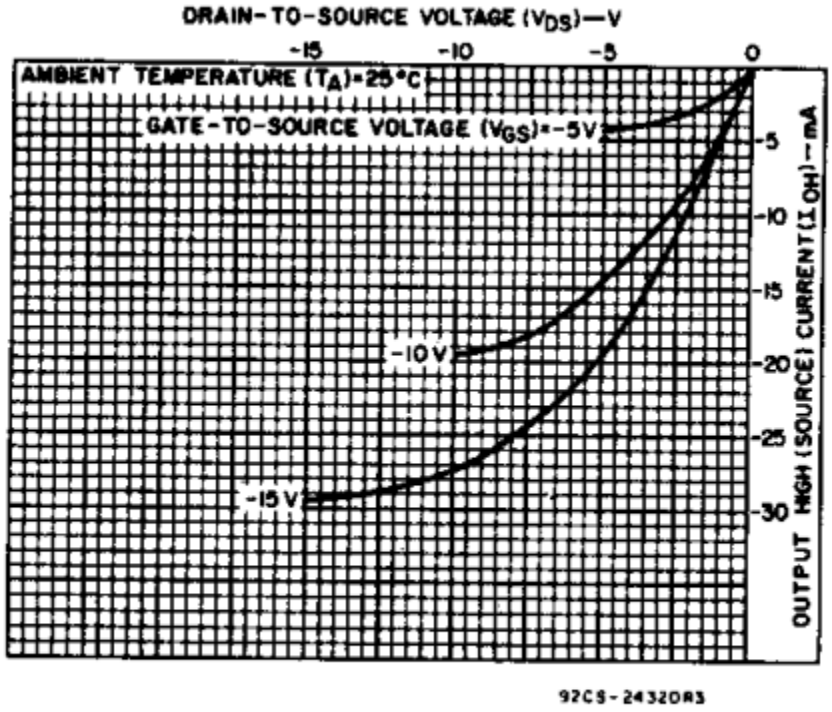


Fig. 8 — Typical p-channel output high (source) current characteristics.

Two 500-ohm resistor nets in DIP-16 package were used to control the output current to the LEDs. As the CD4026 also comes in a DIP-16 package, it allows a cleaner and more compact PCB layout.

The PCB will fit behind a custom designed 3D-printed (or laser cut acrylic if the 3d printed model fits properly) front panel with WOPR – War Operation Plan Response printed along with IBM's logo on the top left. 3 holes on the right side will be for the reset button, turbo switch and WOPR master switch.