WOPR for IBM 5150/60

# 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](https://www.hackster.io/harit-shah/7400-series-logic-clock-9c9b9f). 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.

Diagram, schematic

Description automatically generated

# 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:

Diagram

Description automatically generated with medium confidence

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.