

MODIFICATION TO THE HP2640 TERMINAL

by Harold Jeff Goldberg

Introduction

As most of you know, the HP2640 video terminal in 504-A has been modified to produce black characters on a white background when operated in the standard manner. This RFC describes the modification and how to use it.

Background

CRT terminals usually produce white characters on a black background. Most of these terminals have some method of reversing this, producing black characters on a white background either character by character, or possibly, by field definitions. It was discovered that the HP produced a reasonable looking display when in the "inverse video" mode. By having successive lines of inverse video output blend in to each other instead of having dark spaces between lines of text, a feeling of continuity is maintained, which makes the display easy to look at.

The HP also has a feature which allows any white areas (usually the character) to be reduced to "half brightness". When using the inverse video mode in conjunction with the half brightness feature, the background is made half bright and an excellent display is produced which looks like a normal printed page of text and is quite easy to look at for long periods of time.

Although software could have been developed to maintain the display in the desired mode (and was for ITS), there existed problems which could not easily be solved on Multics. It was decided that, if possible, a simple hardware modification should be installed to produce the desired effect.

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Construction

A study of the functional block diagrams in the HP manual revealed that it was possible to invert the logic levels "inverse video" and "half brightness" by use of a simple inverter circuit. If an exclusive-or gate was used, the inversions could be switchable- a desirable feature.

It was determined which printed circuit boards produced the desired signals for the common bus. Inverse video, or NIV (its complement), was produced by the DMA board, and half brightness, or NBHB, was produced by the display expansion board. The signals were routed through the "top plane"- a pc board connecting four of the logic boards via edge connectors.

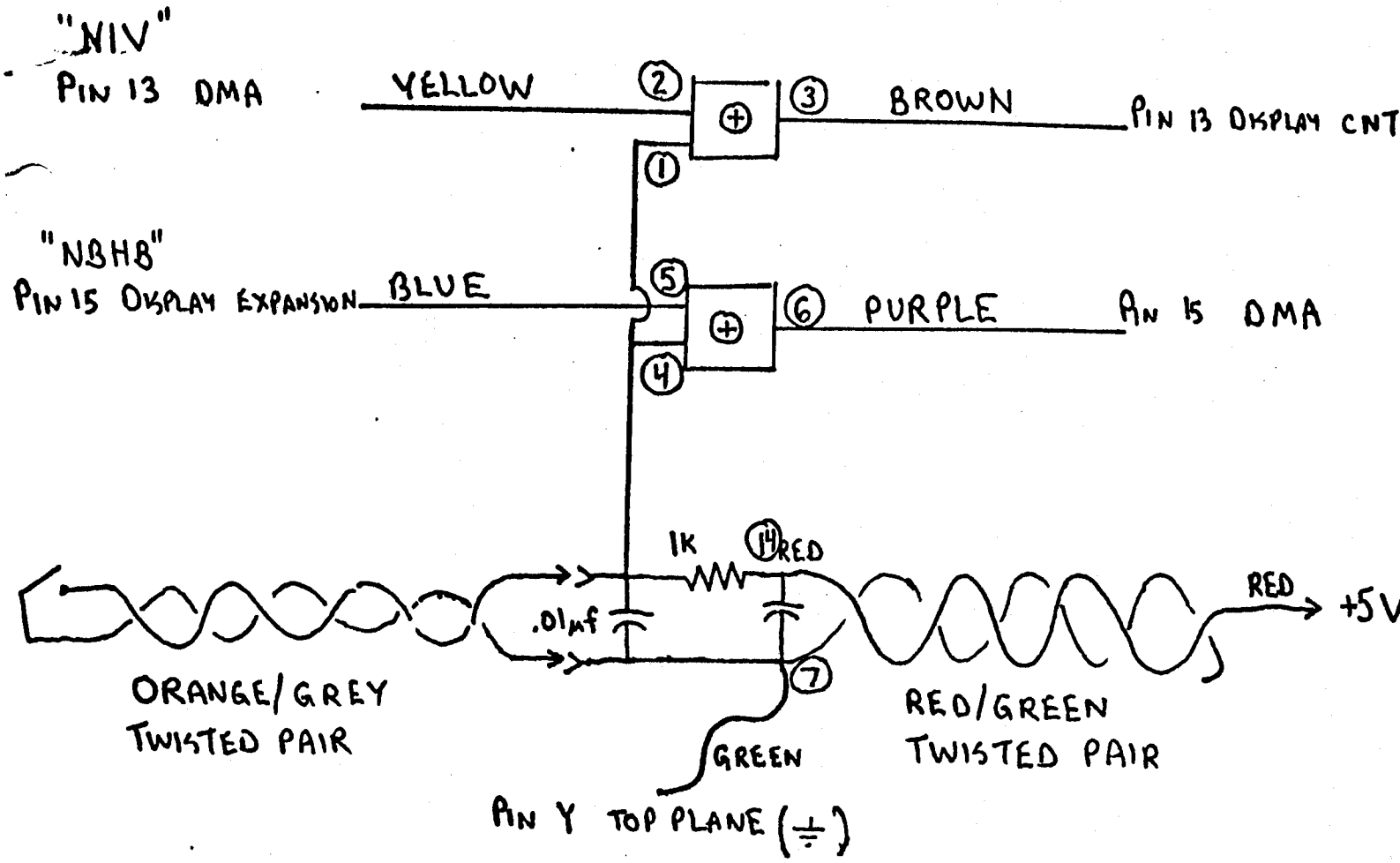
A new top plane assembly was obtained and modified by breaking the bus in appropriate places, installing new connections, and mounting a quad-exclusive-or chip (7486) on it. Power for the chip was obtained from a +5V test point on the display timing board, while ground was obtained from the "y" bus line on the top plane. A switch was routed through to the back of the terminal to control the inversion logic. A schematic diagram of the circuit is attached to this RFC.

Operation

Operation of the new option is simple and straightforward. The installed switch on the back of the terminal has two positions. One position causes the terminal to assume its original manufacturer's behavior. The other position inverts the meaning of both inverse video and half brightness, causing the desired black characters on a half bright background effect. All programs which were written for the terminal will still work in either mode, except the programmer must be aware of the inversion of the two signals in one switch position.

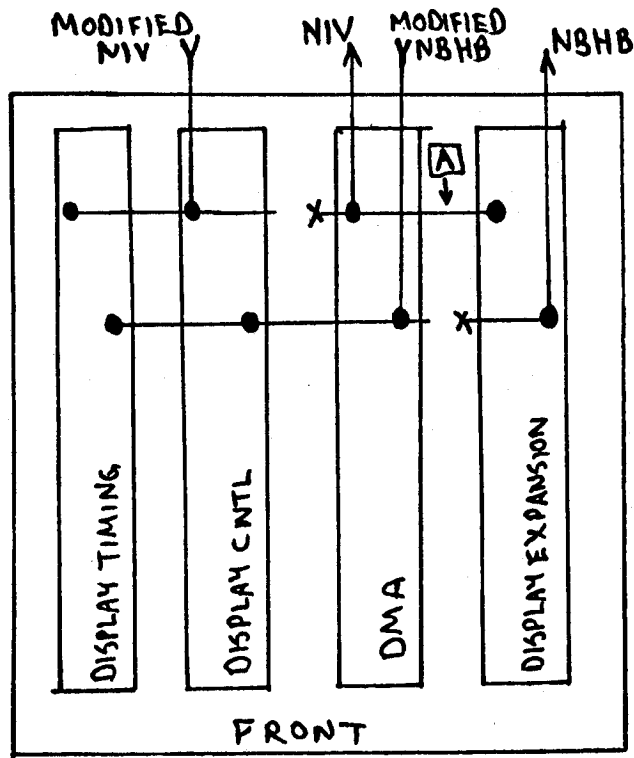
Credits

Thanks are extended to Dave Reed for help in initial examinations of the terminal, to Ken Pogran for obtaining parts and performing some intricate wire twisting, to the Computation Structures Group for use of their work room, and to everyone else for putting up with any inconveniences.



NOTES

1. ②'s are chip pin #'s
2. DISPLAY EXPANSION BOARD does not use NIV, hence the bus was not broken at point marked **A**
3. Busses shown are on underside of board.



INSTALLED TOP VIEW OF HP Part no. 02640-60022