TECHNICAL MEMORANDUM (NASA) TM 29

DIGITAL TIME SLOT DISPLAY FOR OMEGA RECEIVER

Variations of circuits to display the Omega sequence letters A through H have been designed, breadboarded, and tested. One of these is suggested as an alternative station display method for the Ohio University Omega sensor processor systems.

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I. INTRODUCTION

Methods of decoding a digital word to display alpha-numeric characters for driving a standard seven-segment LED display have been devised for Omega station identification. The circuit could replace the system now being used in Ohio University's Omega receivers, which lights one of eight LED's to signify the Omega time slot being received. The letters A through H, representing the Omega stations, can be read directly from the seven-segment display.

II. THE CIRCUITS

The first circuit (see Figures 1 and 2) uses the TTL logic family. Three inputs are connected to the SN7442 BCD-to-decimal decoder. The outputs are normally high with one going low for each input code. When an output goes low, the diode matrix pulls certain inverter inputs low. The outputs of these inverters go high preventing current from flowing through the associated LED segments. The outputs that are low allow current to flow and light the segments.

The second circuit is identical to the first except that the DM8865 is replaced by a SN15836 DTL hex inverter. See Figure 3. The pullup resistors can be eliminated because when the input to the SN15836 is left unconnected, the output is low.

The third circuit uses two COS/MOS integrated circuits as shown in Figures 4 and 5. The decoder gives a high logic level output for each input code. For this reason the diodes in the matrix are reversed. A CD4050 non-inverting buffer is used to drive the display.

III. COMPARISONS

The second circuit is lower in cost than the first. The current through each LED segment for the first circuit is 3.3 μA. The current is 4 μA for the second and third circuits. Since the third circuit uses COS/MOS it requires very little drive current compared to the first two circuits. For the same reason, the third circuit requires much less power to operate.

In all three circuits the 750 Ω resistors can be replaced by 470 Ω resistors to increase the brightness of the LED's.

If a resistor is connected between the anodes of the LED's and the postive power supply voltage, the cathodes can be connected without the seven resistors. This would reduce the cost but the current through the LED's would vary depending on how many were on at one time. This would cause the brightness of the display to vary from one letter to the next.

IV. CONCLUSIONS

The second circuit is the least expensive. The third circuit would cost about forty cents more than the first and $1.40 more than the second circuit. The amount of space needed for each circuit is relatively the same. The present receivers are designed using COS/MOS. The power to the third circuit excluding the display power is in the same range as the power supplied to the other integrated circuits in the present receivers. This power is much less than that needed for the other two circuits. Driving the first two circuits with a COS/MOS integrated circuit might cause a problem with not enough drive current. Considering all these factors, the third circuit is recommended.

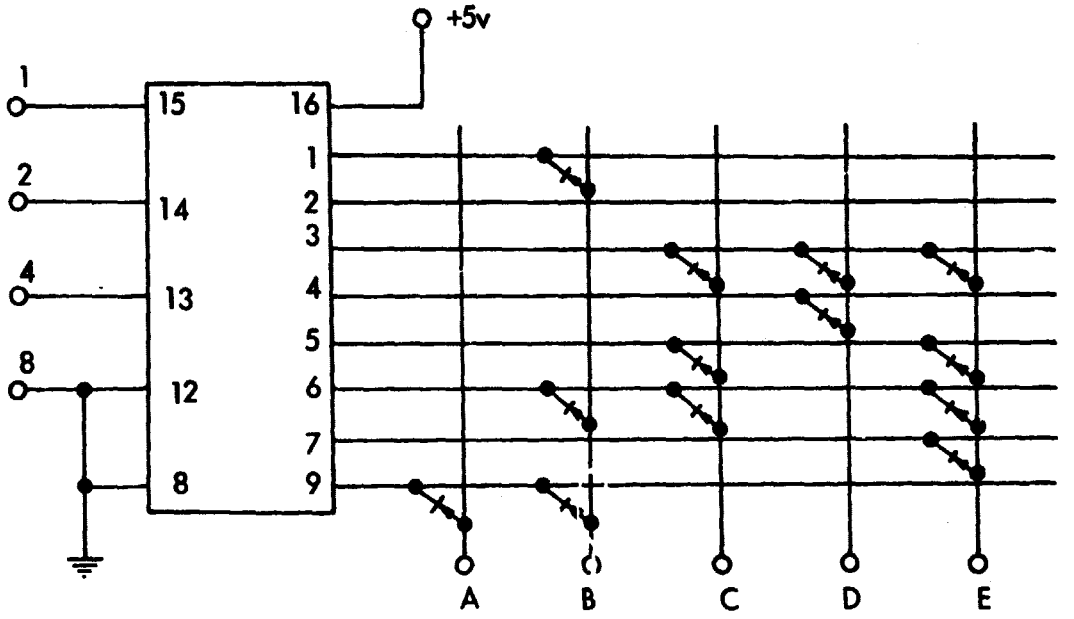


Figure 1. Decoder and Matrix: Circuit 1

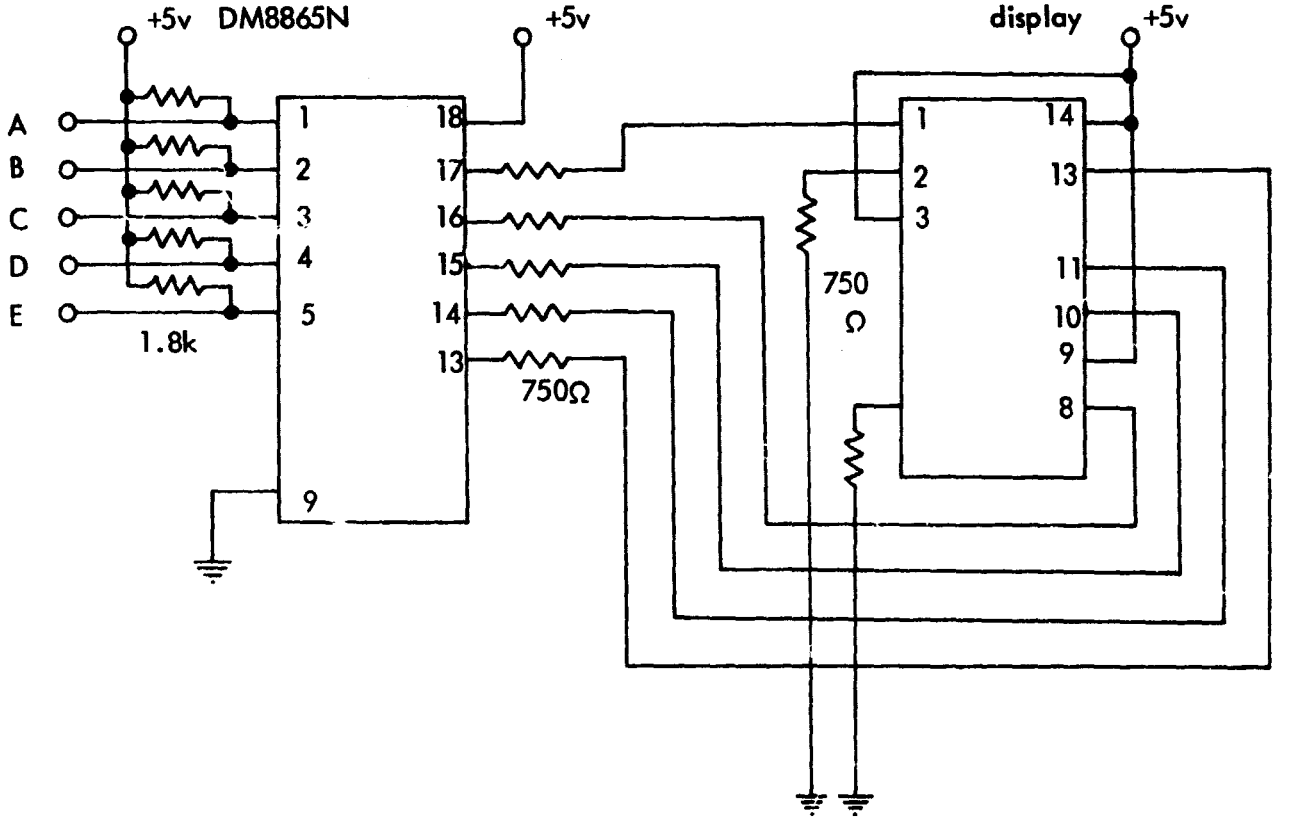
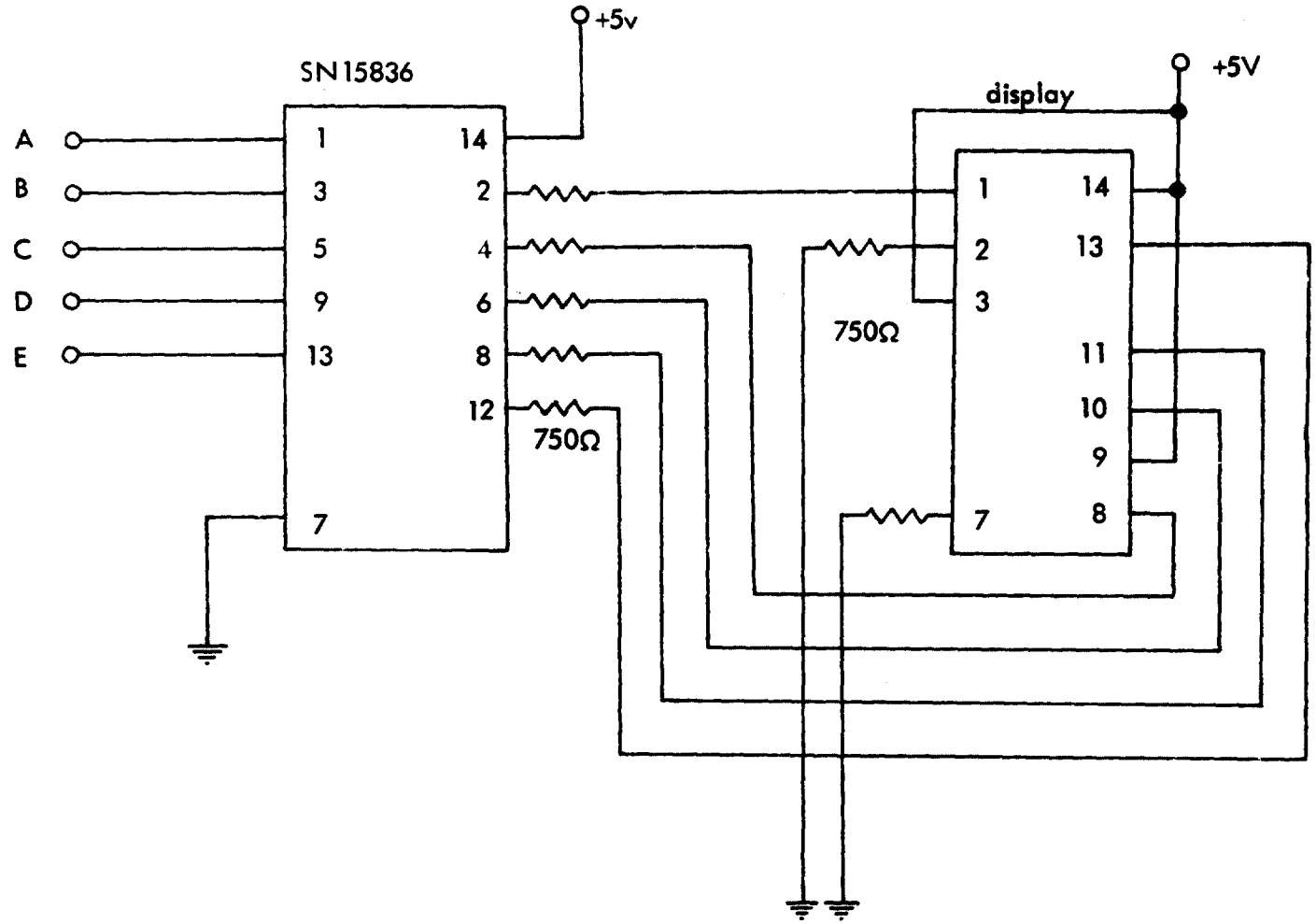


Figure 2. Display and Driver: Circuit 1



Note: Uses Decoder and Matrix from Figure 1.

Figure 3. Driver and Display Circuit 2.

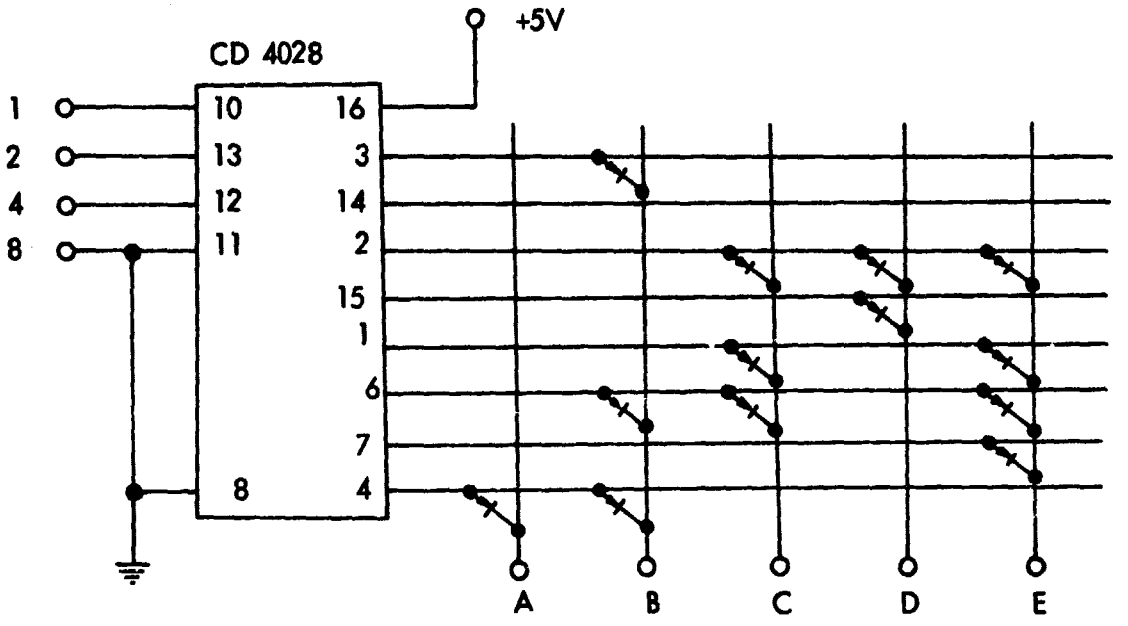


Figure 4. Deroderan Matrix for Circuit 3.

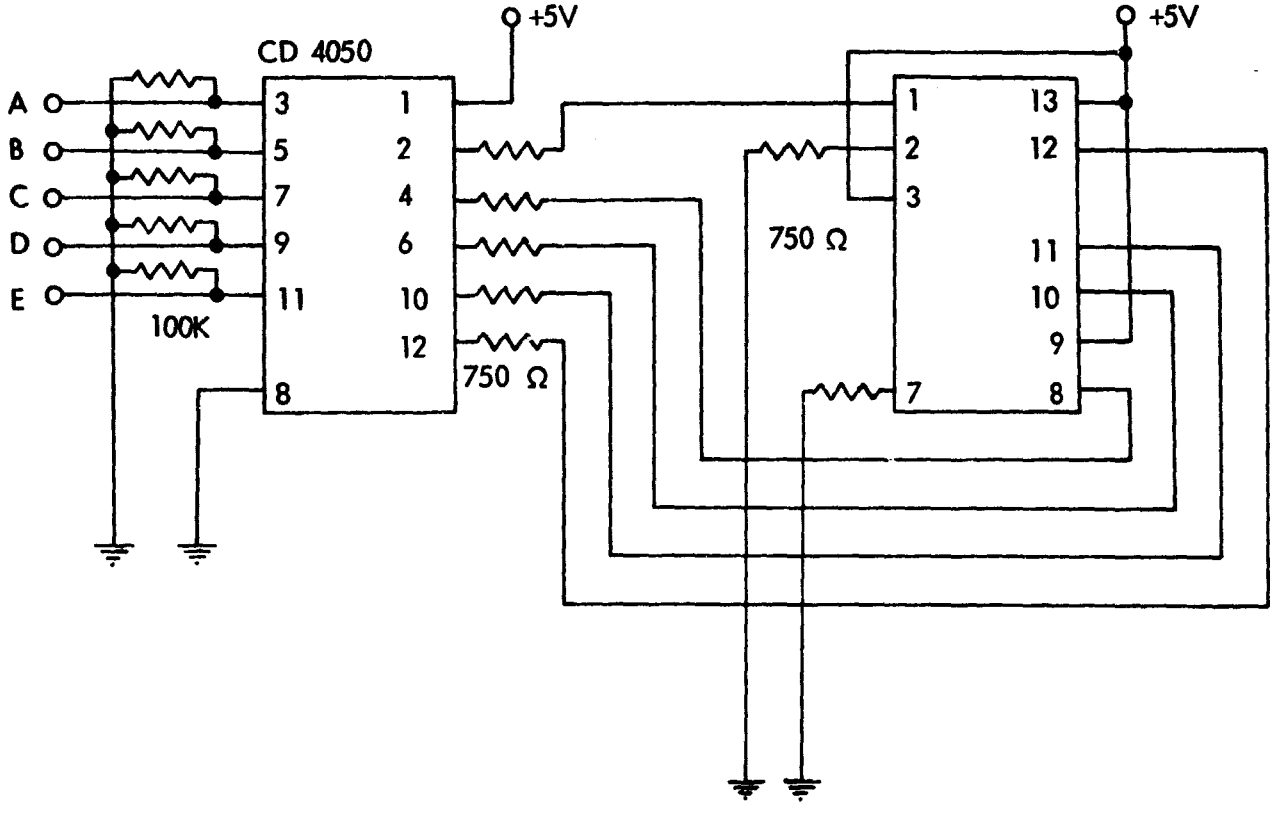
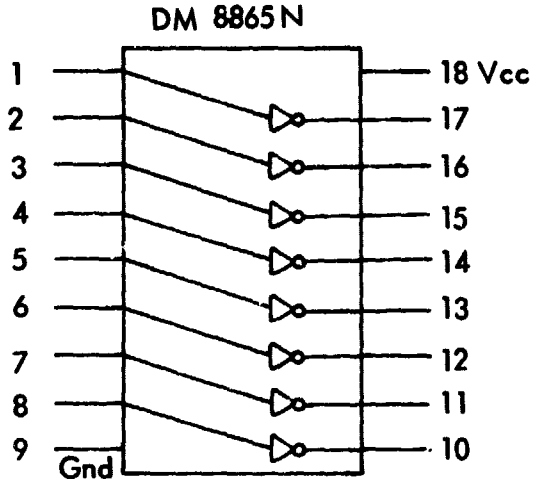
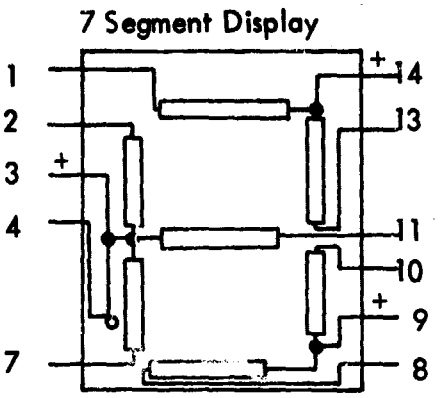
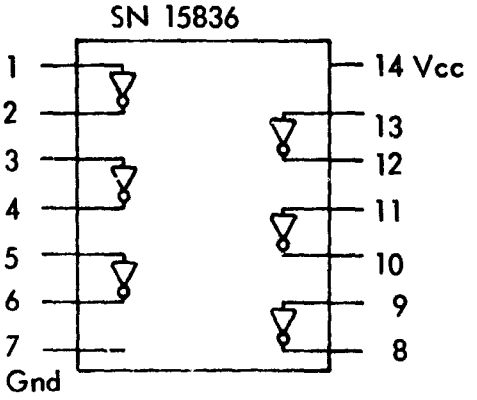
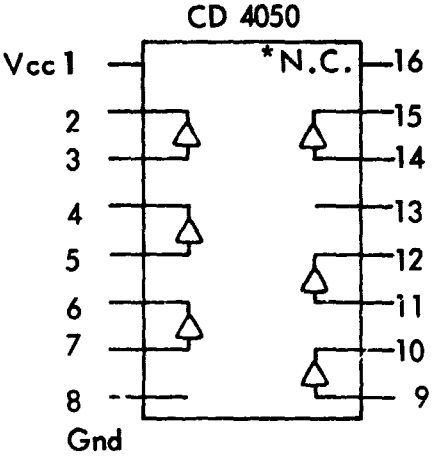


Figure 5. Driver and Display Circuit 3.









*N.C. - No connection

Figure 6. Chip Diagrams.