Using KIM as a Dedicated Controller

KIM-1 application note 11477

Introduction

The KIM-1 microcomputer board can be used as a very low cost development system for application programs of up to about 512 bytes in length. Additionally, in low volume applications, the KIM itself can serve as the controller with the addition of a programmable read only memory (PROM), a power-on-reset modification, and some additional circuitry to transfer control to the added PROM upon power-up.

Besides being a cost effective method of getting a small number of dedicated controllers on the job very quickly, this approach has the added advantage of making the KIM operating and debug software available at the controller site.

Power-on-Reset Modification

The easiest method of getting KIM to automatically reset itself upon power-up is to disconnect the side of capacitor C-3 (on the KIM board) that normally goes to ground and connect it to +5 volts.

Power-on reset will eliminate the need for manual reset after a momentary power loss or complete power failure.

PROM Selection

If the control system must operate with a single power supply voltage, then a bipolar fusible-link PROM would be the best candidate for the storing application program.

Memory Expansion

The KIM-1 microcomputer provides 4K of contiguous expansion area (0400 - 13FF) which can be utilized for the added PROM memory.

Without any added buffering circuitry, KIM's expansion bus address lines (except for AB10 - 12) and data lines can drive up to about 1 TTL load and 100 pf of capacity. (30 pf of the original 130 pf drive capacity is used on-board.)
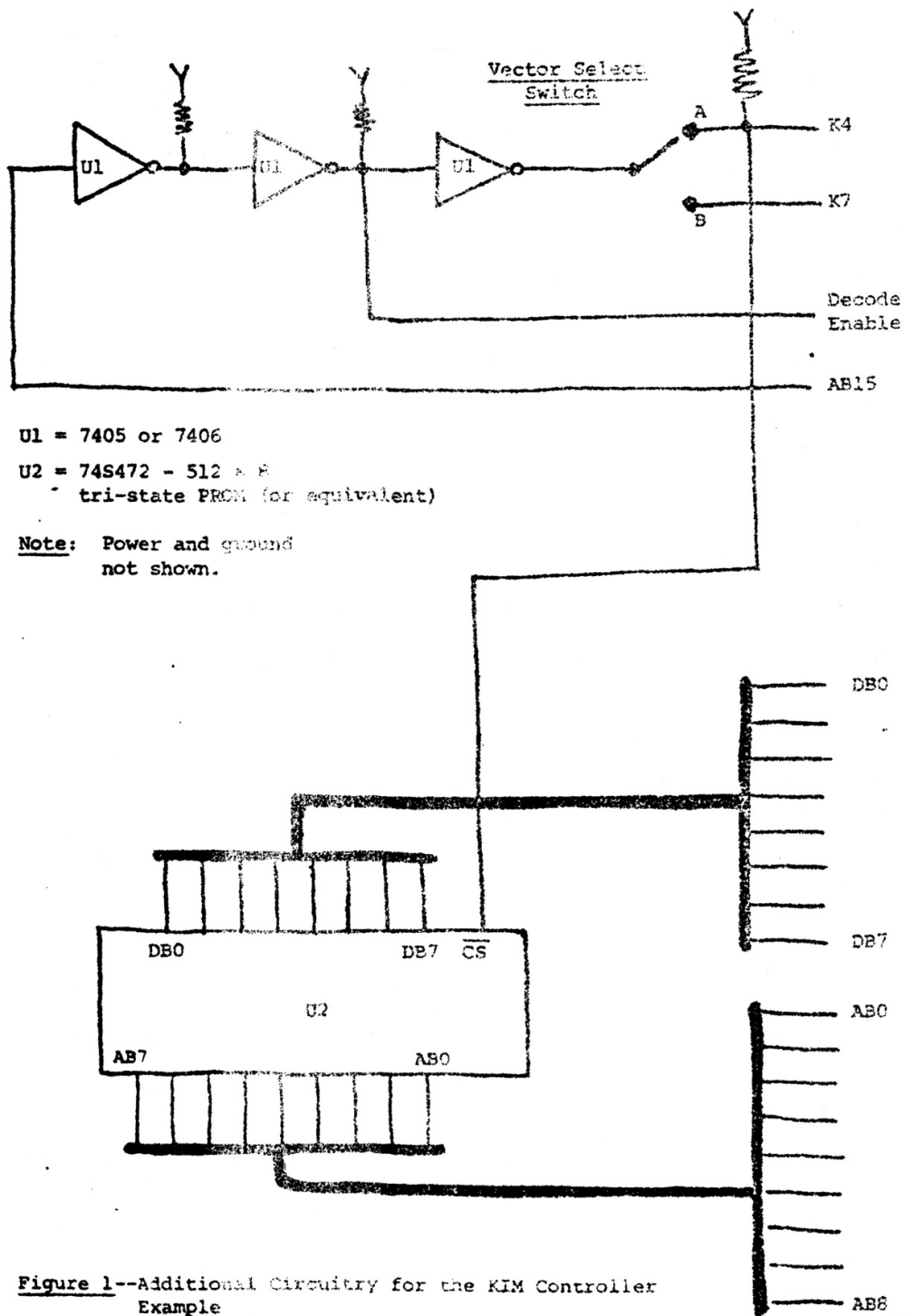
The extra memory must be addressed such that the highest six locations of the particular 1K block chosen hold the interrupt vectors which point to the application program.

In our example system (see Fig. 1) a 512 × 8 tri-state PROM is placed in the decoded K4 section of KIM memory (see KIM-1 User Manual, p. 38), addresses $1200 - $13FF. The top six addresses $13FA - $13FF hold the new system interrupt vectors.

Although the PROM is set up to be addressed at $1200 - $13FF it will also "seem" to reside at $1000 - $11FF. This is because it hasn't been completely decoded. If memory space is at a premium the PROM can be fully decoded by letting the PROM chip select ($\overline{CS}$) pin go low only when K4 is low and address line AB9 is high. This would require extra hardware.

Alternative Vector Selection

The address decoder (U4 on the KIM board) is now de-selected using the AB15 signal which is "true" whenever an interrupt vector fetch is initiated by the system (see Fig. 1). The same signal (AB15) is inverted and "wire-or'd" through a switch to the K4 or the K7 select lines. Now, depending upon the position of the switch, interrupt vectors will be fetched from the top six addresses of either block K4 or K7. K4 in the KIM system selects the added PROM and K7 selects the ROM in the 6530-002 array (the KIM monitor program). In this way you have two different sets of interrupt vectors in your system and may switch-select which set is to be used.

Vector Select Switch

U1 = 7405 or 7406

U2 = 74S472 - 512 x 8
    tri-state PROM (or equivalent)

Note: Power and ground
        not shown.

From KIM expansion and application connectors

Figure 1--Additional Circuitry for the KIM Controller
        Example