# Understanding the Xicor 3-wire E$^2$POT Interface

by Applications Staff, September 1996

On Xicor's X9312, X9C102/103/503/104, X9313, X9314, and X9316 E$^2$POTs, the $\overline{INC}$ and $\overline{CS}$ pins serve to define the mode of operation. The signals are also NORed together to generate an enable signal for the internal wiper decoder as shown in Figure 1. Casual treatment of these control signals on power-up can lead to inadvertent store operations, "walking wipers" and other unexpected results.

One of the results of improper connection of the $\overline{INC}$ and $\overline{CS}$ pins is a walking wiper. This phenomenon is characterized by an automatic increment or decrement of the wiper on power-up. Detecting both the $\overline{CS}$ and $\overline{INC}$ pins LOW on power-up creates a condition sufficient to cause an internal wiper to move one position either up or down, depending on the state of the U/$\overline{D}$ pin. Additional movement of the wiper requires the $\overline{INC}$ pin to be "clocked" from HIGH to LOW. The walking wiper condition is possible when the $\overline{CS}$ and $\overline{INC}$ pins are tied to another device where the outputs float (in which case they might be detected as LOW) or if they are tied or held LOW on power up. To reduce the possibility of this condition, we recommend that a pull-up be used on the $\overline{CS}$ pin.

Xicor has no specific recommendation on the $\overline{INC}$ pin, it can be pulled either HIGH or LOW. However, on these devices, for some modes of operation, $\overline{INC}$ and $\overline{CS}$ are interchangeable. That means that holding $\overline{CS}$ LOW and clocking $\overline{INC}$ will work the same as holding $\overline{INC}$ LOW and clocking $\overline{CS}$. So, if $\overline{INC}$ is LOW and $\overline{CS}$ is pulled or driven HIGH, then there is the potential that the wiper will move one tap when $\overline{CS}$ goes LOW. If $\overline{INC}$ is normally LOW, be careful not to transition $\overline{CS}$ from HIGH to LOW before first setting $\overline{INC}$ HIGH.

A third unexpected condition is an inadvertent store operation. It is important to remember that $\overline{CS}$ going from LOW to HIGH, while $\overline{INC}$ is HIGH, initiates the store wiper position mode. This initiates the nonvolatile store operation which requires several milliseconds to complete. As long as $\overline{CS}$ and $\overline{INC}$ are normally HIGH in the quiescent state the device won't see a LOW to HIGH transition on $\overline{CS}$ during power-up or power-down conditions. This prevents the triggering of any unexpected wiper storage modes. If wiper storage is not required for any reason, hold $\overline{INC}$ LOW while allowing $\overline{CS}$ to transition from LOW to HIGH. Once $\overline{CS}$ is HIGH, then $\overline{INC}$ can go HIGH without a store operation. One way to keep $\overline{CS}$ and $\overline{INC}$ normally HIGH is to use a pull-up on both pins.

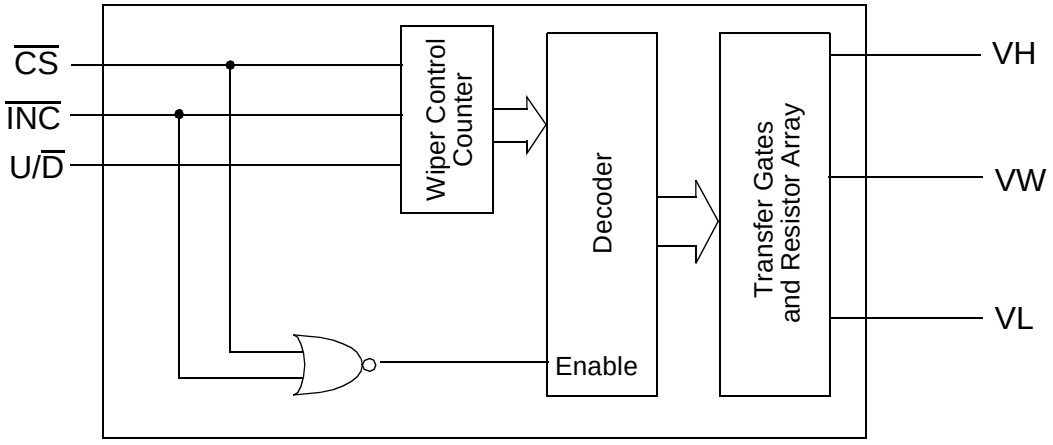


**Figure 1. Functional Diagram**