

parency is played. At the end of the message a second pair of recorded tones (667 and 1,200 Hz) causes the 4017 counter to advance to pin 4, turning off the first light and turning on the second with its appropriate interfacing transistors and triac.

This process is repeated until all transparencies have

been displayed and described. At the end of the show, recorded tones at 850 and 1,200 Hz activate their respective PLLs and the 4017 is reset so that all lights are turned off. The 4043 R-S flip-flop is also reset and turns off the 2N2222, which deactivates the relay and turns off the cassette player. □

Making a clock chip keep better time

by M. F. Smith

Department of Computer Science, University of Reading, England

Maintaining both the time and date functions in microprocessor applications became much easier when National's MM58167 and MM58174 microprocessor-compatible real-time clocks were introduced. The software approach that was used before their introduction simplified software and memory requirements, allowed increased flexibility of clock rates and selection of time, resolution, and easily accommodated scheduling protocols. However, keeping time during a brown-out was still disastrous to system operation as was attempting to maintain the correct time despite the occasional timing difficulties that occur under software control.

Yet, occasional read errors and problems with spurious writing to the MM58174 when power is going

down creates difficulties with the hardware-based system. These difficulties can be overcome with the software and hardware fixes prescribed here, which are intended for the MC6800 microcomputer system.

The problem with occasional read errors may be easily overcome by modifying software control to ensure that a valid binary-coded decimal number is read before the program continues and by ordering a rereading of the data if it has not been captured the first time (see printout of the partial listing, line 84). The cause of the read errors has never been definitely ascertained, although the problem has been encountered when other microprocessors have been used, such as National's 1NS8073. Thus, there may be a rare timing problem within the MM58174 itself, or the difficulty may occur between the microprocessor and the clock chip.

Trying to write to the clock chip when the power is going down will ordinarily cause a loss of timing information. A number of methods of preventing the loss were tried, and the one in the figure was the simplest and most successful.

Here, the CD4066 electronic switch will allow the chip to be selected only when the MC6800 clock enables

Glitch-free. The CD4066 transmission gate prevents loss of time-date information that is associated with an MM58174 hardware clock during a power-down condition. Read errors in time-date information may be eliminated in the software of a microprocessor system by writing a loop to ensure the program does not advance until the data has definitely been read correctly.

