80C31 Microcontroller Driven Electroluminescent Display II

System Level Block Description

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November 7, 2004
**Narrative**

The system operates by collecting data and configuring the data for use on a display driver. The configuration is done by a microcontroller.

As discussed in the Functional Description, there are two options for obtaining data from the car:

- **Method A**: The preferred method; uses the Engine Control Module (ECM) installed on the car by the ME department to deliver data to the microcontroller.
- **Method B**: Individual sensors are developed and installed on the car for the microcontroller to acquire data.

Both methods have different system block diagrams, but the same underlying concept of collecting data first and the configuring data for display. Figure 1 shows the system block diagram for Method A while Figure 2 illustrates Method B.

Since the ECM in Method A consolidates data collection, the block diagram is simplified. The ECM transmits data to the microcontroller. The microcontroller prepares the data for display and then sends the data to the SED1330 controller. This controller requires an external static memory chip to store display data. The controller stores display data and uses that to update the electroluminescent display.

In Method B, the data collection hardware conditions raw analog and digital data from the sensors. The A/D converter reads in analog data while the microcontroller directly reads digital data.

![Figure 1 – Method A System Block Diagram](image-url)
The rest of this system level block description focuses on the Method A approach shown in Figure 1.

**AMD-80C31 Microcontroller**

The microcontroller is responsible for collecting data from the ECM following the I^2^C communication standard. The standard uses a single data line and a synchronous clock line to communicate between devices. In this case, data is always transmitted to the microcontroller.

The microcontroller switches between dashboard mode and O_2_ mode when it receives the mode toggle signal. The microcontroller sends out byte-by-byte commands to the SED1330 controller to first initialize the display and later to send it data. Figure 3 shows the microcontroller system block diagram.
Display Controller
Using a microcontroller alone to display data directly to the screen would be difficult, because the screen must be continuously updated and this requires a great number of machine cycles. By using the SED1330 display controller, this problem is avoided because the controller updates the screen without prompting from the microcontroller.

The display controller receives data and commands from the microcontroller’s address and data buses. The SED1330 controller has its own group of instructions or “command set.” The microcontroller uses these byte-by-byte commands to instruct the display controller how to format the image on the electroluminescent display.

When the display controller receives display data from the microcontroller, the display controller stores the data in a selected memory chip for storage. By storing the data as it arrives, the display controller need not interrupt the microcontroller by requesting the same data to refresh the screen.

External Static RAM
The static memory stores character codes and bit-mapped graphics data for the SED1330 controller. The SED1330 controller determines read/write operations.
Software
The microcontroller handles the task of system initialization, changes in mode of operation, collecting conditioned data and interpreting data into commands used by the display controller. Figure 4 shows the overall system software flowchart.

Figure 4 – Overall Software Flowchart