

SAE Formula 1 Multifunction Display Project: Datasheet

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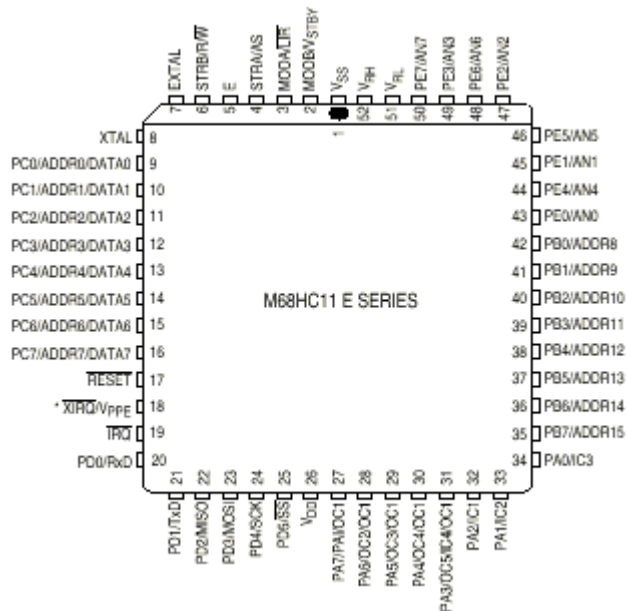
Display Unit

- Dimensions (L x W x H): To Be Determined
- Weight: To Be Determined
- Power Consumption: To Be Determined

Visor LED Display

- Dimensions (L x W x H): To Be Determined
- Weight: To Be Determined
- Power Consumption: To Be Determined

Microcontroller



- 3 MHz E Clock (333ns instruction cycle)
- 38 General-purpose I/O pins (16 bi-directional)
- Real-Time Interrupt Circuit
- 16-Bit Timer System
- 8-Bit Data Bus
- Supply Voltage = 5V
- Built-in ADC:
 - 8 Channels
 - Input Range: 0-5V
 - Conversion Time: 33us
 - Max Input Leakage Current: 400nA

(For further specifications, see Motorola's [M68HC11 E Series Technical Data](#) manual.)

LCD

- Size: No larger than 5” square
- Resolution: 320x240 pixels
- Type: Monochrome Graphic
- Operating Temperature Range: To Be Determined
- Shock Resistance: To Be Determined
- Operating Voltage Range: To Be Determined
- Backlight: Yes
- Built-in Driver Chip and Display RAM
- Data Input: 8-bit parallel

Keypad

- Type: 12-key numeric membrane switch
- Dimensions: To Be Determined
- Weight: To Be Determined
- Output Voltage: To Be Determined
- Interface: To Be Determined
- Operating Temperature Range: To Be Determined
- Shock Resistance: To Be Determined

The user interface consists of the 12-key numeric keypad. To select Racing Mode, Practice Mode, Test Mode, or Demo Mode, the user will simply press the appropriate key followed by the # key. The following are the assignments for each key:

1. Racing Mode
2. Practice Mode
3. Test Mode
4. Demo Mode
- 5 – 0 and “*”: Reserved for future expansion

Note that the keypad may also be used as input when the system is interfacing with the Data Acquisition System. For example, two keys could be used as “Page Up” and “Page Down” to scroll through lists of data.

Sensors

Engine Speed Sensor:

- Supply Voltage: 12V
- Input Range: 0 to 14,000 RPM
- Output Impedance: To Be Determined

- Output Voltage Range: To Be Determined
- Accuracy: To Be Determined

Oil Temperature Sensor:

- Supply Voltage: 12V
- Input Range: 140° to 300°F
- Output Impedance: To Be Determined
- Output Voltage Range: To Be Determined
- Accuracy: To Be Determined

Oil Pressure Sensor:

- Supply Voltage: 12V
- Input Range: 0 to 100 psi
- Output Impedance: To Be Determined
- Output Voltage Range: To Be Determined
- Accuracy: To Be Determined

Transmission Gear Sensor:

- Supply Voltage: 12V
- Input Range: To Be Determined
- Output Impedance: To Be Determined
- Output Voltage Range: To Be Determined
- Accuracy: To Be Determined

Functionality Test Setup

To verify the operation of the Multifunction Display System, three test procedures will be performed. Initially, the sensor inputs to the system will be simulated by applying voltages to the appropriate I/O pins on the microcontroller. Each sensor and its corresponding software routine will be tested individually. The second step will be to use the Formula SAE team's engine testbed, a device that consists of an engine mount, vehicle gauges, and all appropriate wiring. The Multifunction Display will be connected to the engine sensors on the testbed and a comparison will be made between the analog gauge readings and the output of the digital display and the HUD (heads-up display). Vibration testing will be performed in the Mechanical Engineering Department's labs to determine the durability of the displays. Finally, the display system will be mounted in the Formula car and tested.