INTRODUCTION

This description is intended to explore one idea in implementing the PIC12C509 in cars. The real time consummation of fuel while driving has always been an important feature in the most efficient use of cars. The presented controller is the main subject of one project, which is intended for creating a low-cost consumer product. For countries such as Bulgaria, with a Currency Board (Council), similar devices are in use, therefore the project is named “The Hand of Board.”

CIRCUIT DIAGRAM
Power On

Initialization
- GP0, GP1, GP3, GP5 - Outputs
- GP2, GP4 - Inputs
- Timer0 - Counter Mode
- Value_Area[10]

Sample: = 0

Subroutine (Input Capture)
(measuring period – GP2)
Value_Area[0] = XX(Binary)

Samples: = 0

Yes

Subroutine (Compare)
1. Comparing values – one each other
   Value_Area[n] = Value_Area[n+1]
2. Determining the number of majority
   entries – M
3. Compare the average value:
   \[ \sum_{j=1}^{M} \frac{Value_Area_j}{M} \]

Subroutine (BCD Transform)
LED_Num: = 0; i = 1
Disp_Value: = BCDi

Subroutine (Serial Display)
1. Send BCDi decade through GP0
2. Form Strob “-” to GP3
3. Clock Shift Reg. by GP5 – “-”

LED_Num = 3?

No

Yes

Send Blank Clock
Clock Shift Reg. by GP5 – “-”

Clear Count/Latch/Drv
GP1: “-”
i: = i+1
Disp_Value: = BCDi
SYSTEM ANALYSIS

The device, presented on circuit diagram below is made up of four main parts as shown in the circuit diagram.

**Input sensor**

The input sensor is a paddle-wheel flowmeter manufactured by Kobold Messing Gmbhd, models DPL 005 - 250. The sensor’s output frequency is directly proportional to the flow velocity. The manufacturer had considered sensor’s characteristics with environment in the car-size, aggressive gases, EMI, temperature etc.

**Microcontroller**

The microcontroller PIC12C509 receives (by pin GP2/TOCKI) the sensor’s signal and performs permanent measuring of frequency, using the “lookup-table” techniques. TIMER0 is working as a counter and with one additional software counter realizes the input-capture function. Although the instruction set does not have a divide instruction, the high performance of execution cycle (1μs) and as well as the low input frequency of signal (max. 273 Hz) allowed the realization of more sophisticated algorithms of average approximation and one sample form of majority filtration. Well-suited bit-orientation instructions allowed the control of the dynamic display being realized by four output pins (GP0, GP1, GP3, GP5).

**Control Block of Display**

This part of the device controls Dynamic Display. It consists of one Counter-Latch-Driver (74143-TI) and 4-bit shift register with parallel load (74178-TI).

CN/Latch/Drv forms the 7-segment codes as it receives them from GP0 using serial clocks corresponding to BCD format of the current character.

GP3 writes counter’s content into a 4 bit latch. By replacing the current character, pin GP1 clears in advance the counter.

GP5 clocks the shift register assuring consecutive firing of LED’s. By power-on, or pressing a RESET button in Register loads “marching one’s,” which is shifted to the right on every clock from GP5.

**Dynamic Display**

Dynamic Display is realized by three 7-segment LED’s with common anode.