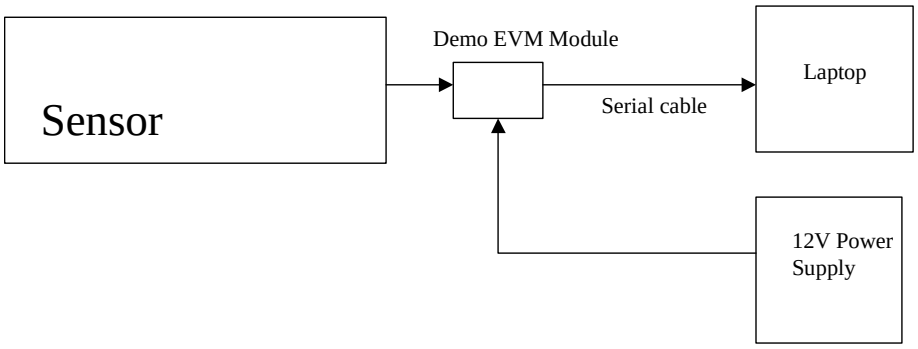
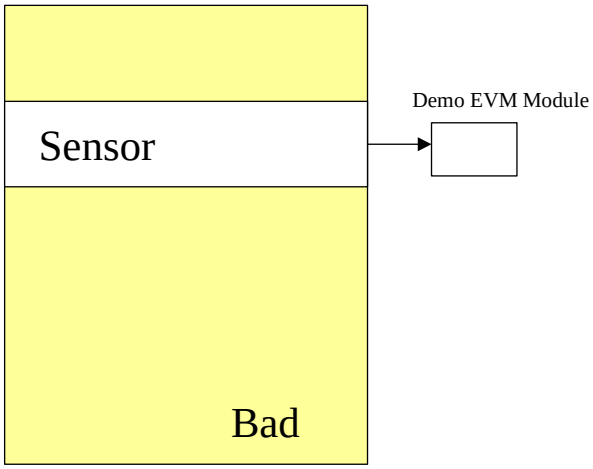
EF3415 – Sleep'O'Meter

The purpose of this application is to track the movements of the subject while is sleeping. If the subject has a good sleep the it will not move to many times during the night. In the cases when the subject is disturbed by external factors like noise/light/vibrations frequent moves will occur. Also in the case when the subject has some health problems frequent moves will occur.

By tracking the moves and the presence of the subject in bad other tasks like counting the number of sleep hours can be performed.

The project uses a sensor that is placed in bed, on the mattress and the EVM demo module KIT33794DWBEVM based on MC33794 and 908QY4 CPU. The main application is reading the data from the demo module thru the serial port and is displaying it on the screen. The data can be recorded and saved and a Plot showing the active sensor for each minute can be created using the collected data.





The setup is quite simple – place the sensor on the mattress, connect the sensor, the power and the serial cable to the EVM module. Connect the serial cable to the computer and start the EVM_log Excel program.

Press the start Button and the readings from the sensors will show up on the screen.

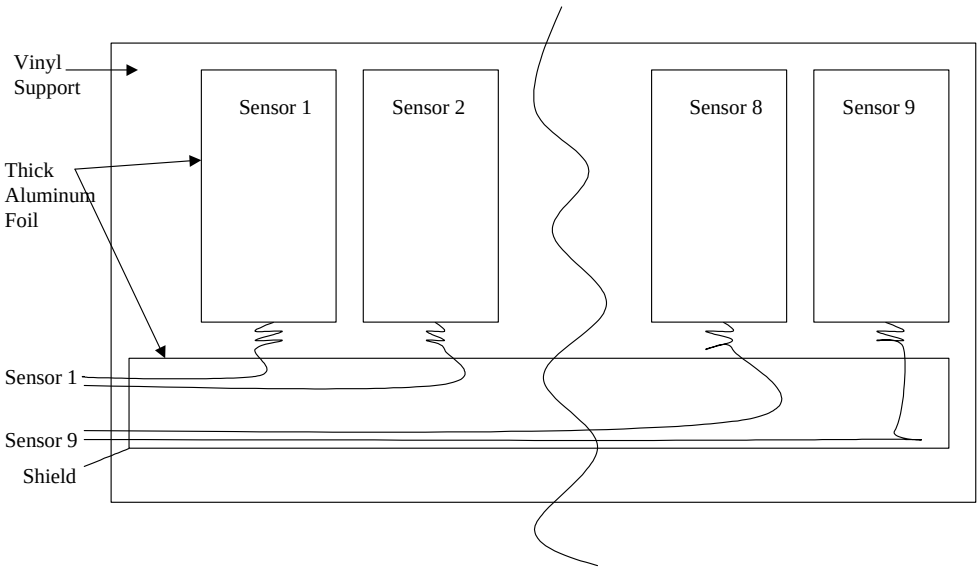
This screen can be used for the initial debug of the sensor – place your hand in different regions of the sensor and check the result on the screen.

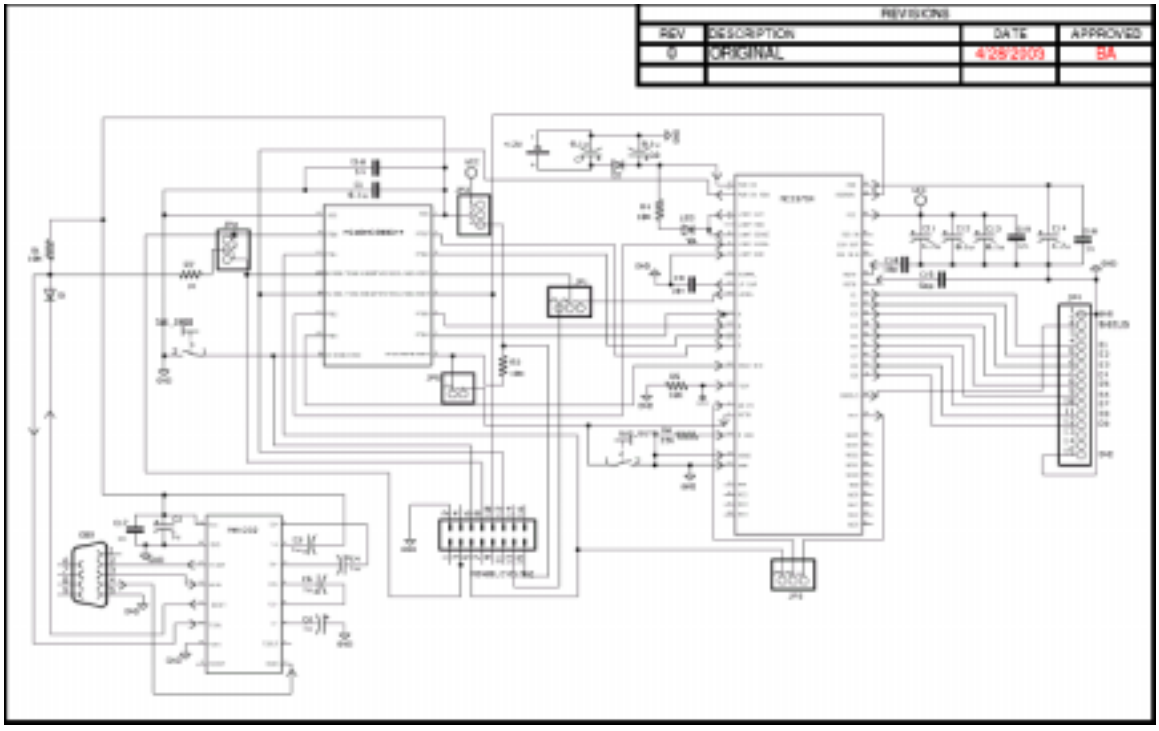
Once the recording is done press the Compute Average Button in order to get the results – the Average sheet will be populated with the average readings for each minute and the Position versus Time Chart will be created.

The Chart will show the position of the active sensor over time – in this case sensor no. 9 was placed at the edge of the bed and sensor no. 1 was at the opposite end.

As you can see from this chart something disturbed the subject about 2.35AM – in this case some noisy neighbors coming back from a party.

By analyzing the Charts obtained for different nights a clear connection can be made between the number of movements in bed, the disturbing factors and the quality of the sleep.

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Software

The VBA Module contains subroutines for Data Collection, a Form that is presenting the data in real time and a subroutine to compute the average values of the data for each minute and display the chart.

Serial port COM1:9600/N/8/1 is used for communication with the EVM module.

The MSComm object is used for serial communication.

The StartSerial() subroutine open the serial connection and initialize the MSComm object.

```
Set MSCommXX = New MSComm
With MSCommXX
   .CommPort = 1
   .Handshaking = 0
   .RThreshold = 1
   .RTSEnable = True
   .Settings = "9600,n,8,1"
   .SThreshold = 1
   .PortOpen = True
   .InputLen = 0   'every charcter in the buffer is returned
```

The protocol used By the EVM over the serial line is:

```
>Driver 1      ‘set shield driver on
>S 1           ‘ select electrode nr. 1
>X             ‘ Read the value for electrode nr. 1
>122           ‘ EVM return the value for electrode nr. 1
>S 2           ‘ Select electrode nr. 2
>X
>126
….
>S 9
>X
>144           ‘EVM return the value for electrode nr. 9
```

Conclusion

The Sleep’O’Meter is a fun project, but it can be a useful tool for examining the sleep behavior of individuals in different conditions.

Resources

MC33794 reference sheet –www.motorola.com
KIT33794DWBEVM.PDF – kit documentation
MS VBA Help