# PROJECT DOMAIN-BIOTELEMENTRY

**A PROJECT REPORT**

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## BONAFIDE CERTIFICATE

Certified that this Project Report titled "**BIOTELEMENTRY**" is the bonafide work of **Abhishek. B (1311007), Varun Rufus Raj Samuel. D (1311005), Manish. B (1311006), Thanesh.P (1311014), Naveen M.L (1311017), Gautham.S (1311026),** who carried out the project work under my supervision during the academic year 2014-2015.

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# ABSTRACT

Medical field is getting stronger day by day. To make something innovation in this field we made a working model of a sonogram device with body temperature sensor and ECG monitoring device which can as well work as a alert device. This device receives data from the patients body with the help of sensors. These sensor values are feed into a micro controller unit which converts the analog data into digital data with help of software and display it to the displaying unit (computer). The sonogram machine consist of a ultrasonic sensor which can transmit and receive signals these signals are then converted into wave forms and this wave form is displayed in the computer for the use of the doctor to verify it. The ECG sensor and the temperature sensor is placed on the sides of the ultrasonic sensor . The ECG sensor is is used to take the pulse from the patients body and convert it to analog signal and then transmit it to the microcontroller, the muc then transmit it to the display unit with the help of wifi module. The output is taken from the device using wifi transmitter as analog signals. These analog signals are converted into digital data in the display unit where a arduino uno is placed .

**Keywords:** ultrasonic sensor ( Hc-sr04) , ECG SENSOR , temperature sensor

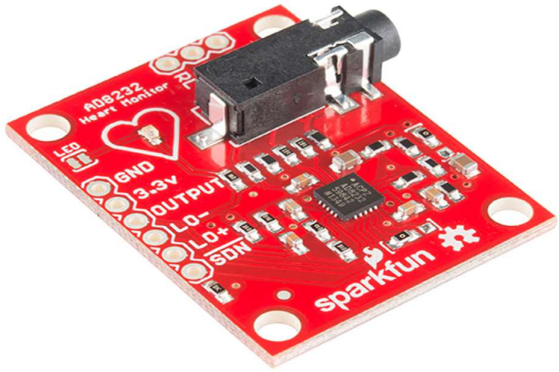
# INTRODUCTION

The model consist of a ECG sensor,ultrasonic sensor,body temperature sensor. These sensor are used to take the bioparameter values from the body. These values are feed into a micro controller unit which converts the analog data into digital data with help of software and display it to the displaying unit (computer).The ECG sensor is used to take the pulse from the patients body and convert it to analog signal and then transmit it to the micro controller, the muc then transmit it to the display unit with the help of wifi module. The output is then transmitted using wifi transmitter as analog signals. The temperature sensor gets the values from the patients body as voltage values from 0 to 5. The value is send to the microcontroller unit and then it is transmitted to he display unit with the help of wifi transmitter . The ultrasonic sensor is used to get the distance between one point to another which sends waves to the human body these waves get reflected from the body because of the presence of soft tissues in it . This time interval is calculated and a pictorial representation of the organ is made in the computer with the help of software .

# DESCRIPTION OF SUB SYSTEMS

## ECG SENSOR MODULE:

### AD8232 SINGLE LEAD HEART RATE MONITOR BOARD:




The AD8232 Single Lead Heart Rate Monitor is a cost-effective board used to measure the electrical activity of the heart. This electrical activity can be charted as an ECG or Electrocardiogram and output as an analog reading. ECGs can be extremely noisy, the AD8232 Single Lead Heart Rate Monitor acts as an op amp to help obtain a clear signal from the PR and QT Intervals easily.

The AD8232 is an integrated signal conditioning block for ECG and other biopotential measurement applications. It is designed to extract, amplify, and filter small biopotential signals in the presence of noisy conditions, such as those created by motion or remote electrode placement.

The AD8232 Heart Rate Monitor breaks out nine connections from the IC that you can solder pins, wires, or other connectors to. SDN, LO+, LO-, OUTPUT, 3.3V, GND provide essential pins for operating this monitor with an Arduino or other development board. Also provided on this board are RA (Right Arm), LA (Left Arm), and RL (Right Leg) pins to attach and use your own custom sensors. Additionally, there is an LED indicator light that will pulsate to the rhythm of a heart beat. Biomedical Sensor Pads and Sensor Cable are required to use the heart monitor.

## Features:

- Operating Voltage - 3.3V
- Analog Output
- Leads-Off Detection
- Shutdown Pin
- LED Indicator
- 3.5mm Jack for Biomedical Pad Connection

## Pin Connections:

The AD8232 Heart Rate Monitor breaks out nine connections from the IC. We traditionally call these connections "pins" because they come from the pins on the IC, but they are actually holes that you can solder wires or header pins to.

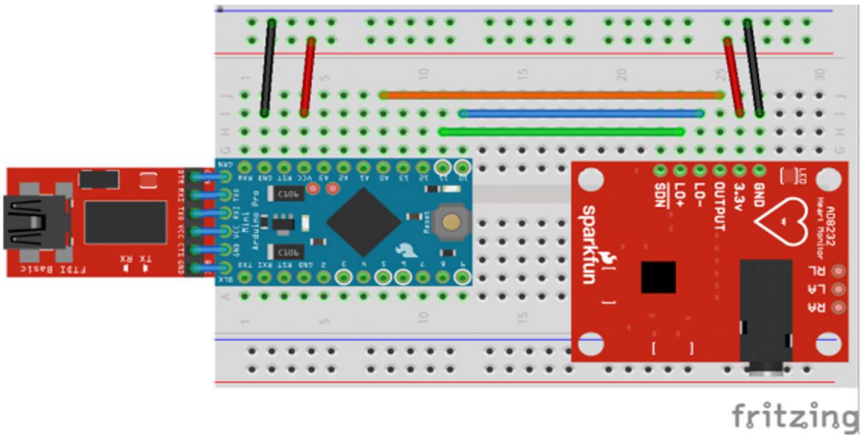
Five of the nine pins on the board to your Arduino. The five pins are labeled as **GND**, **3.3v**,**OUTPUT**, **LO-**, and **LO+**.

| Board Label | Pin Function | Arduino Connection |
|---|---|---|
| **GND** | Ground | **GND** |
| **3.3v** | 3.3v Power Supply | **3.3v** |
| **OUTPUT** | Output Signal | **A0** |
| **LO-** | Leads-off Detect - | **11** |
| **LO+** | Leads-off Detect + | **10** |
| **SDN** | Shutdown | **Not used** |

## CONNECTING HEADERS TO A BOARD:

You can use any method you'd like to make your connections to the board. For this example, we'll solder on a five-pin length of male-male header strip and use a breadboard and jumpers to make our connections.

Follow the diagram below, to make necessary connections. The SDN pin is not used in this demo. Connecting this pin to ground or "LOW" on a digital pin will power down the chip. This is useful for low power applications.




Connection Diagram

Now that the electronics are complete, let's look at sensor pad placement. It is recommended to snap the sensor pads on the leads before application to the body. The closer to the heart the pads are, the better the measurement. The cables are color coded to help identify proper placement.

| Cable Color | Signal |
|---|---|
| **Black** | RA (Right Arm) |
| **Blue** | LA (Left Arm) |
| **Red** | RL (Right Leg) |

**SENSOR CABLE:**

This is your simple three conductor sensor cable with electrode pad leads. These cables are 24" long and feature a 3.5mm audio jack connector on one end with snap style receptacles for biomedical sensor pads. Each cable comes in a red/blue/black set.

**WORKING**:

This cable is connected to the ECG sensor module by means of the jack and then the electrode leads are placed on the human body and the difference between the electrical conductivity of the body is measured and the values got from the ECG sensor module is feed into the microcontroller board and data is then transferred to the display unit.

## BODY TEMPRETURE SENSOR MODULE:

For sensing the body temperature we are using a MLX90614 sensor module.

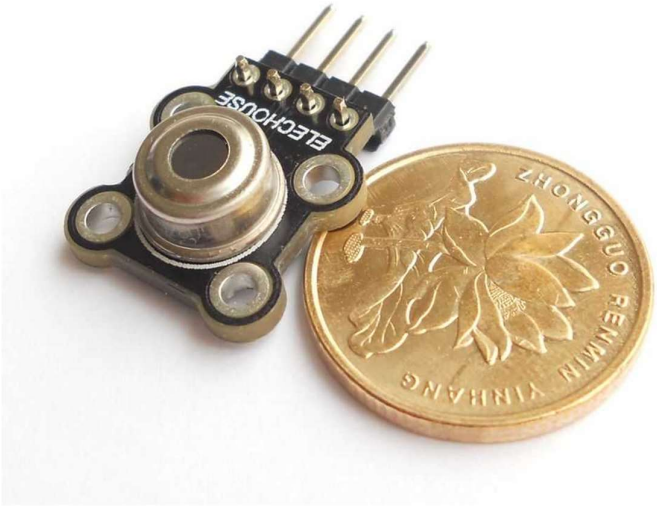
Melexis' MLX90614ESF-AAA is an infrared thermometer designed for non-contact temperature sensing. An internal 17-bit ADC and a powerful DSP contribute to the MLX90614's high accuracy and resolution. It has a huge number of applications including body temperature measurement and movement detection.

The MLX90614 provides two methods of output: PWM and Sm Bus (i.e. TWI, I2C). The 10-bit PWM output provides a resolution of 0.14°C, while the TWI interface has a resolution of 0.02°C. The MLX90614 is factory calibrated in wide temperature ranges: -40 to 85°C for the ambient temperature and -70 to 380°C for the object temperature. The measured value is the average temperature of all objects in the Field Of View of the sensor. The MLX90614 offers a standard accuracy of 0.5°C around room temperatures.

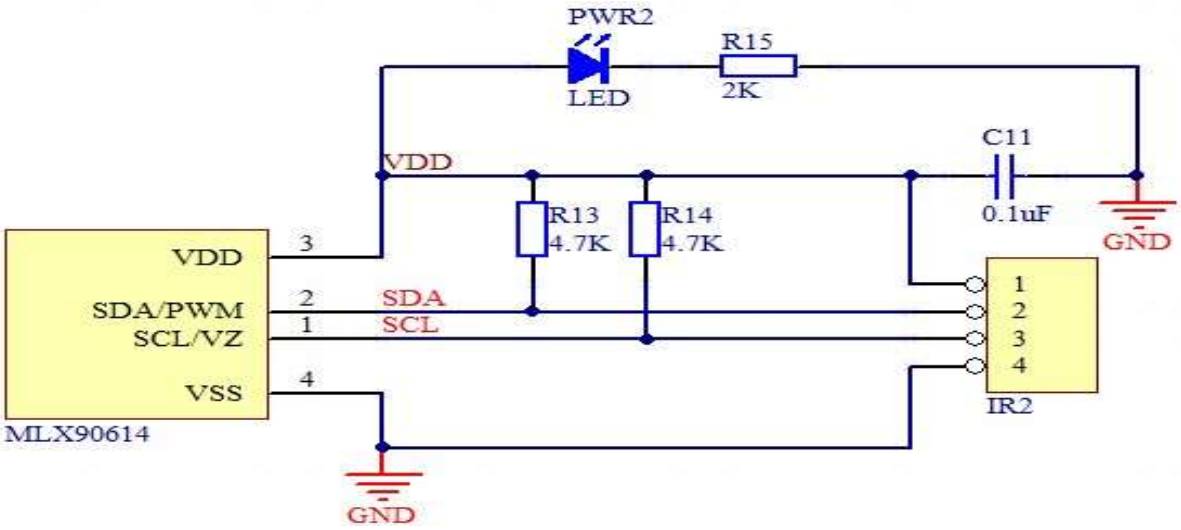
Features:

- Factory calibrated
- -40 to +85°C for sensor temperature
- -70 to +380°C for object temperature
- SMBus compatible digital interface
- Customizable PWM output for continuous reading
- High accuracy of 0.5°C over wide temperature range (0 to +50°C for both Ta and To)
- Measurement resolution of 0.02°C
- 4.5V~5V power supply

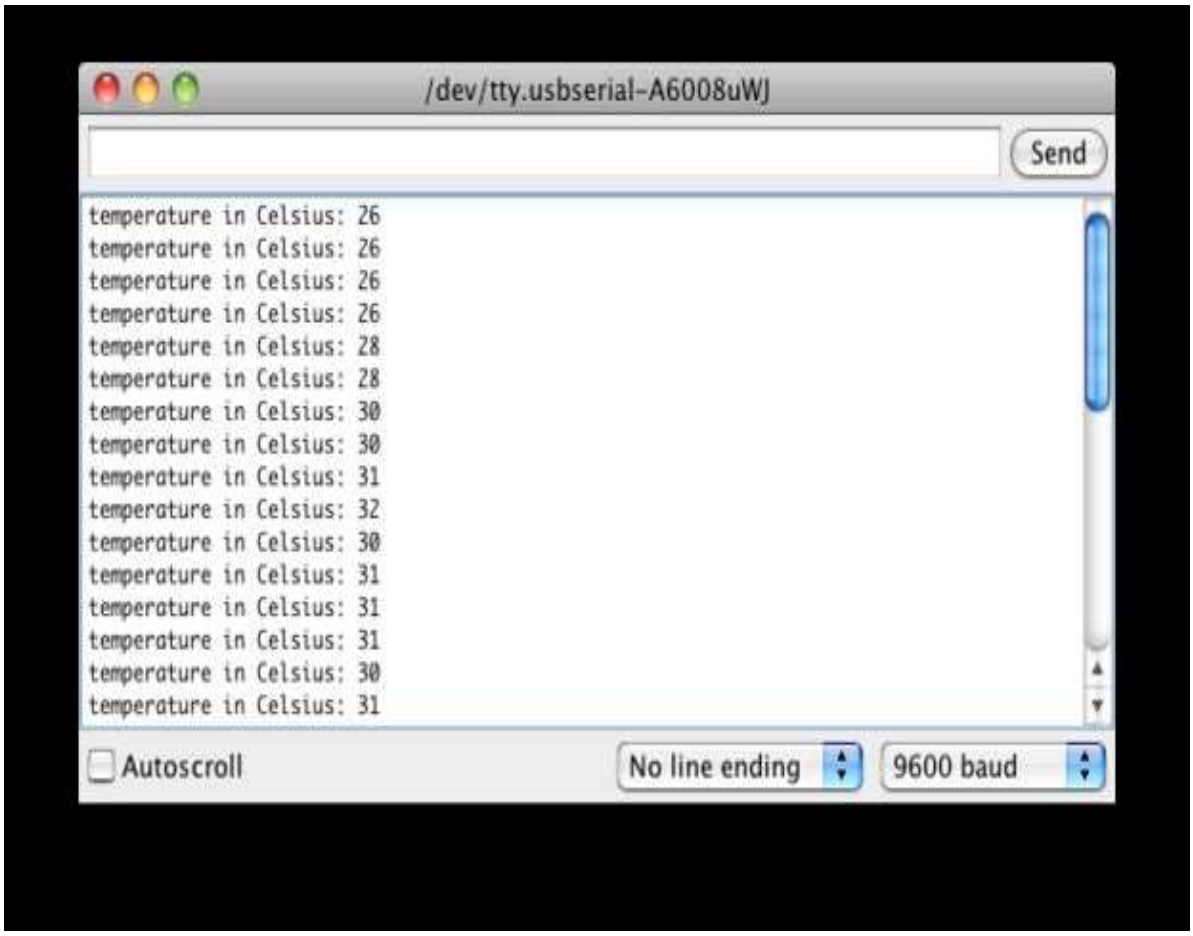
This compact breakout board for MLX90614. On the back side the red LED would indicate power connection.




**CIRCUIT DIAGRAM OF TEMPRETURE SENSOR MODULE:**



**Output:**


/dev/tty.usbserial-A6008uWJ
Send
temperature in Celsius: 26
temperature in Celsius: 26
temperature in Celsius: 26
temperature in Celsius: 26
temperature in Celsius: 28
temperature in Celsius: 28
temperature in Celsius: 30
temperature in Celsius: 30
temperature in Celsius: 31
temperature in Celsius: 32
temperature in Celsius: 30
temperature in Celsius: 31
temperature in Celsius: 31
temperature in Celsius: 31
temperature in Celsius: 30
temperature in Celsius: 31
Autoscroll
No line ending
9600 baud

# SONOGRAM SENSOR MODULE

We are using  Hc-sr04 Ultrasonic  sensor for sensing the tissues and map it as a ultrasound scan output using suitable software.

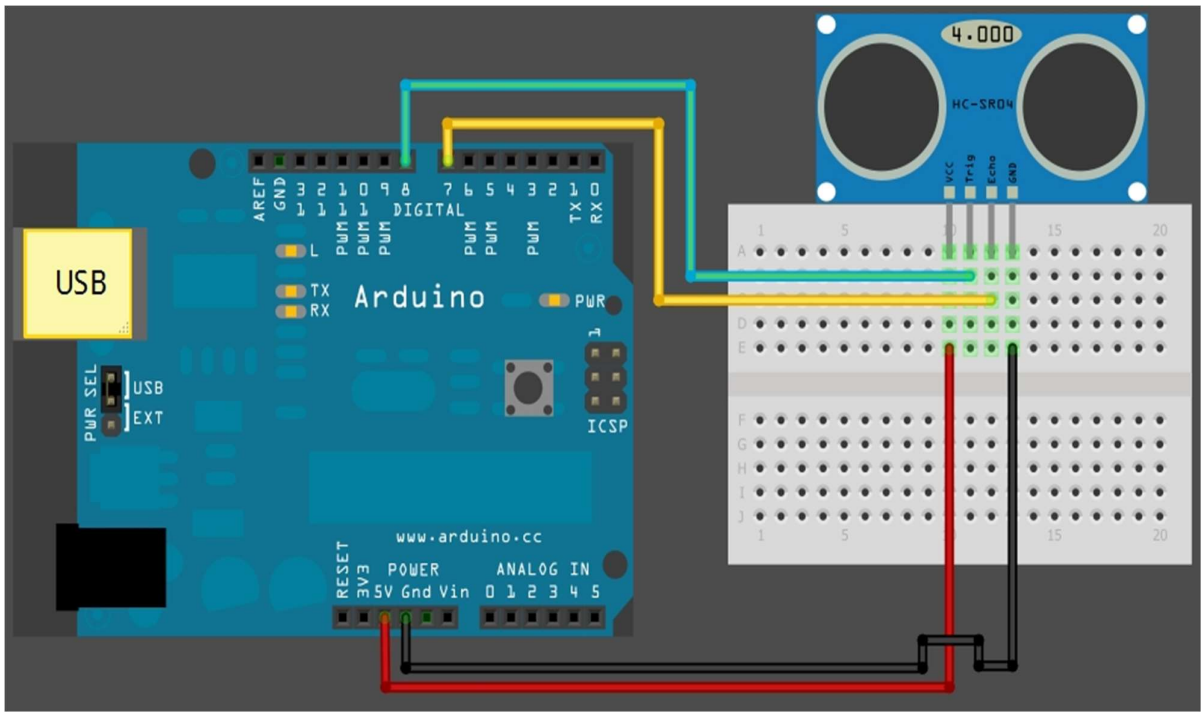
The HC-SR04 Ultrasonic Sensor is a very affordable proximity/distance sensor that has been used mainly for object avoidance in various robotics projects . It essentially gives your Arduino eyes / spacial awareness and can prevent your robot from crashing or falling off a table. It has also been used in turret applications, water level sensing, and even as a parking sensor. This simple project will use the HC-SR04 sensor with an Arduino and a Processing sketch to provide a neat little interactive display on your computer screen.

Sample sketch for arduino:

```
#define echoPin 7
#define trigPin 8
#define LEDPin 13

int maximumRange = 200;
int minimumRange = 0;
long duration, distance;

void setup() {
 Serial.begin (9600);
 pinMode(trigPin, OUTPUT);
 pinMode(echoPin, INPUT);
 pinMode(LEDPin, OUTPUT);
}

void loop() {
 digitalWrite(trigPin, LOW);
 delayMicroseconds(2);

 digitalWrite(trigPin, HIGH);
 delayMicroseconds(10);

 digitalWrite(trigPin, LOW);
 duration = pulseIn(echoPin, HIGH);
 distance = duration/58.2;
 if (distance >= maximumRange || distance <= minimumRange){
 Serial.println("-1");
 digitalWrite(LEDPin, HIGH);
 }
 else {
 Serial.println(distance);
 digitalWrite(LEDPin, LOW);
 }
 delay(50);
```

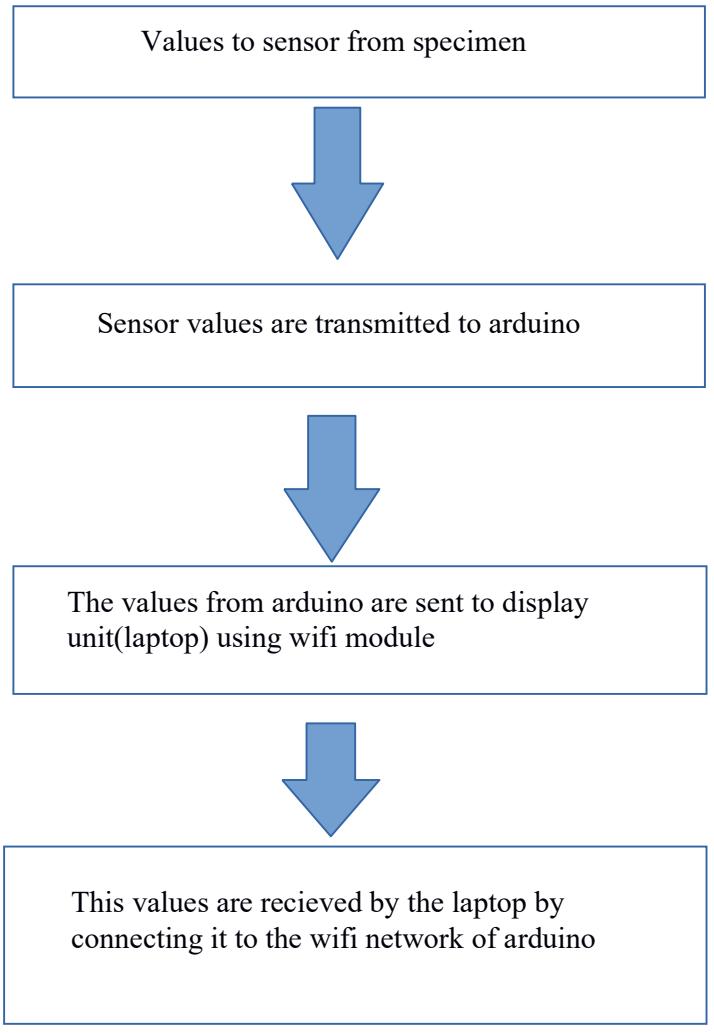
ULTRASONIC SENSOR:


CIRCUIT FOR CONNECTING ULTRASONIC SENSOR:



# PROPOSED SOLUTION

The bio parameters are collected using suitable sensors. The values got from the sensors are recorded using a microcontroller unit ARDIUNOUNO. The values got from the sensors are in analog from. An ANALOG TO DIGITAL DATA CONVERTER is used to convert the analog data to digital data. This data can be then transmitted through wireless transmitter to multiple display units. The alarm system in this devices works on the continuous values got from the sensors. These values are matched with the pre defined values using suitable software by trial and error method. If there is any match found then the alarm system is turned on and a text message or a alarm note is send to the display unit using GSM MODULE or wireless transmitter.



# MARKET ANALYSIS

*In many cases the doctors cannot attend the patient in personal*
*or they cannot always be with the patient. This project is to help the doctors and the attenders (relatives) to keep a track with the condition of the patient in the serviceable market there are many products to monitor the heart rate pulse and body temperature but this product help not only the patient but also the doctors to keep track of their patients the alarm system in this device will alert the patients doctor and his/her relatives using wireless transmission and text message. This product is cost efficient and handy .As it is portable and wearable it doesn't occupy much place .This can be used by an individual at any place and time. This project can have a change in the medical field by helping the doctor to analysis their patients without having personal contact with them.*

# CONCLUSION

An experiment was done on the temperature sensor and the readings were checked with the normal temperature values got from various specimens. The ECG sensor was programed and the values of pulse rate was got from the patients and the test for bringing the graphical output was done. The ultrasonic sensor was checked for measuring the distance between sending and receiving signals from a point to another point and determining the shapes but the shape was not well determined . Thus the above experiments were done and the outputs were got .The working model of the temperature sensor is set for display. This device can reduce the size of clinical instruments and also reduce in in convenience caused to the patients and the doctors. Ready output is got so there is no need of waiting for the output .

# References: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v T13 Technical Committee – AT Attachment http://www.t13.org/

vi Paul's 8051 Code Library, IDE Interface http://www.pjrc.com/tech/8051/ide/

vii Wesley's PIC Pages – IDE Controller http://www.pjrc.com/tech/8051/ide/wesley.html

viii Procyon AVRlib file index http://hubbard.engr.scu.edu/embedded/avr/avrlib/docs/html/files.html

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x Dobiash FAT Info http://home.teleport.com/~brainy/

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xii Long Filename Specification http://home.teleport.com/~brainy/lfn.htm

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