

LOGISTICS PACKAGE TRACKING AND DATA ACQUISITION SYSTEM USING ACTIVE BLUETOOTH LOW ENERGY TAGS

**Submitted in partial fulfilment of the requirements for the award of Bachelor of
Engineering degree in Electronics and Communication Engineering**

By

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **RONGALI ANIL KUMAR (37130349)** and **PUTTAPARTHI VENKATESH (37130330)** who carried out the Project entitled "**LOGISTICS PACKAGE TRACKING AND DATA ACQUISITION SYSTEM USING ACTIVE BLUETOOTH LOW ENERGY TAGS**". Under the guidance of **DR. G. JEGAN, M.E., Ph.D.**, during the period NOV 2020 to MAR 2021.

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ABSTRACT

This project presents a prototype device that tracks movements of packages During the transportation. To analyze each package, the proposed device uses the Iridium satellite network or GPS. In this mainly Bluetooth Low Energy (BLE) tags and BLE tag reader with memory track and report assets located in the packets. A BLE tag is associated with each asset and has a unique ID. A Bluetooth hub is created in the vehicle and All the data of BLE tags is received by the Bluetooth hub. The Bluetooth hub sends the data to the iridium satellite. The BLE tag is also used to reduce the power consumption.

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CHAPTER 1

1 INTRODUCTION

In this activity, we have tackled the issue of following information parcels utilizing reinforcements utilizing low-power Bluetooth labels to move information. Bluetooth Low Energy (BLE) is a neighborhood remote organization innovation intended to decrease power utilization and expenses while keeping up a similar scope of availability contrasted with more seasoned Bluetooth. Bluetooth low force label associated with microchip. The microprocessor which stores the data and sends the data to the Bluetooth hub which is created in the vehicle. The Bluetooth hub sends the data to the iridium satellite modem. The iridium satellite modem is connected with the iridium satellite. We get the data from the www.rockblock.com.

1.1 ATmega328

The ATmega328 is a solitary chip microcontroller created by Atmel in the megaAVR arrangement (as of late found by Microchip Technology in 2016). It has a 8-cycle RISC processor with a Harvard adjusted plan.



Fig.no 1.1 ATmega328P in 32-pin thin quad flat pack (TQFP-32)

1.1.1 Specification

The Atmel 8-bit AVR RISC-based microcontroller combines 32 KB ISP flash memory with read-while-write capabilities, 1 KB EEPROM, 2 KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with Examination mode, inward and outer intrudes on, sequential byte switch, 2-wire interface, SPI sequential port, 6-channel 10-digit A/D converter (8-channel TQFP and QFN/MLF bundle), with guard dog timing The gadget has an interior oscillator and five programming saving capacities. The gadget works between 1.8-5.5 volts. The gadget can reach up to 1 MIPS for every MHz.

1.1.2 Features

Table.no 1.1 Features of ATmega328

1.1.3 Family

A common alternative to the ATmega328 is the "picoPower" ATmega328P. A comprehensive list of all other members of the megaAVR series can be found on the

Parameter	Value
CPU type	8-bit AVR
Performance	20 MIPS at 20 MHz
Flash memory	32 KB
SRAM	2 KB
EEPROM	1 KB
Pin count	28 or 32 pin:
Maximum operating frequency	20 MHz
Number of touch channels	16
Hardware QTouch Acquisition	No
Maximum I/O pins	23
External interrupts	2
USB Interface	No
USB Speed	—

Atmel website.

- ATmega328
- ATmega328P and ATmega328P-AUTOMOTIVE
- ATmega328PB and ATmega328PB-AUTOMOTIVE (superset of ATmega328P) - has more UART, I2C, and SPI peripherals than ATmega328P

1.1.4 Applications

ATmega328 is frequently utilized in numerous ventures and in private frameworks that require straightforward, low-power, low-power microcontrollers. Maybe the most well-known execution of this chip is on mainstream Arduino improvement stages, which are models of Arduino Uno and Arduino Nano.

1.2 Programming

Table.no 1.2 Programming

Programming signal	Pin Name	I/O	Function
RDY/BSY	PD1	O	High means the MCU is ready for a new command, otherwise busy.
OE	PD2	I	Output Enable(Active low)
WR	PD3	I	Write Pulse(Active low)
BS1	PD4	I	Byte Select 1 ("0" = Low byte, "1" =High byte)
XA0	PD5	I	XTAL Actionbit 0
XA1	PD6	I	XTAL Actionbit 1
PAGEL	PD7	I	Program memory andEEPROM Data PageLoad
BS2	PC2	I	Byte Select 2 ("0" = Low byte, "1" = 2ndHigh byte)
DATA	PC [1:0]: PB [5:0]	I/O	Bi-directional data bus (Output when OE is low)

Dependability tests demonstrate that the normal information disappointment rate is fundamentally under 1 PPM at 85 ° C for a very long time or 25 ° C.

At the point when PAGEL (PD7), XA1 (PD6), XA0 (PD5), BS1 (PD4) are set to nothing, enter framework mode. Reset pin is 0V, VCC is 0V. VCC is set to 4.5-5.5V. Stand by 60µs, at that point set RESET to 11.5-12.5V. Stand by more than 310µs. Set XA1: XA0: BS1: DATA = 100 1000 0000, keep XTAL1 driving in any event 150 ns, and set the WR heartbeat to nothing. This will trigger chip expulsion. Stand by until RDY/BSY (PD1) goes up. XA1: XA0: BS1: DATA = 100 0001 0000, XTAL1 dial, WR dial zero. This is the Flash order to compose. what's more, some more.

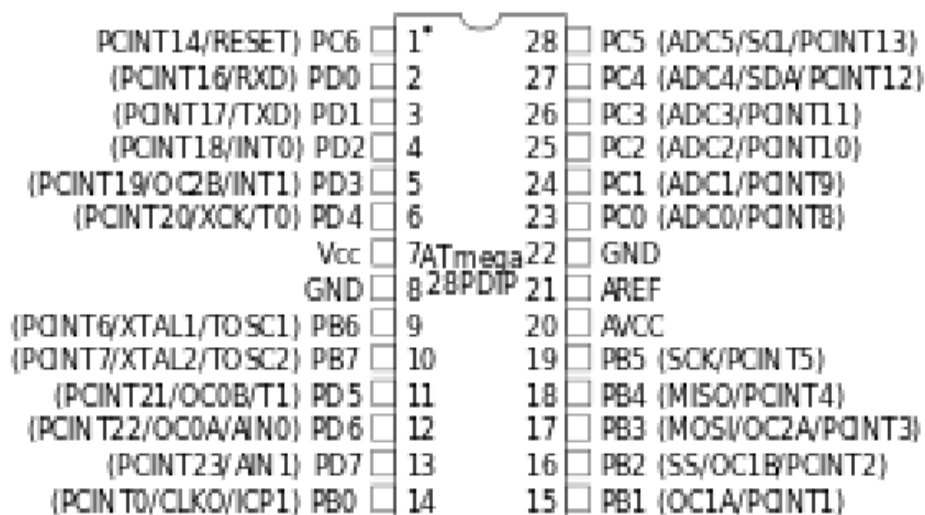


Fig.no 1.2 Pinout of ATmega 48A/PA/88A/PA/168A/PA/328/P in 28-PDIP

1.2.1 Serial Programming

Table.no 1.3 Serial Programming

Symbol	Pins	I/O	Description
MOSI	PB3	I	Serial data in
MISO	PB4	O	Serial Data out
SCK	PB5	I	Serial Clock

The itemized data of the MCU object is retained through as far as possible, and the point by point data of the MCU is remembered through the slipping. At the point when RESET and SCK are dropped, VCC is refreshed. Stop at any pace of 20 ms, and afterward send the request approval succession 0xAC, 0x53, 0x00, 0x00 orders to the MOSI pin. The MCU will rehash the following byte (0x53).

1.3 Flex sensor

Adaptability sensor or bowing sensor A sensor that actions the measure of deviation or twisting. For the most part, the sensor is mounted on a surface, and the obstruction of the sensor changes by twisting the face. Since the obstruction is by and large equivalent to the bowing worth, it is utilized as a goniometer, as a rule called an adaptable potentiometer.

1.3.1 Types of flex sensor

- Conductive ink based flex sensor
- Fibre optic flex sensor
- Capacitive flex sensor
- Velostat flex sensor (popular among hobbyists)

1.3.2 Working Principle of Flex Sensor

The sensor gadget deals with the rule of bowing wires, which implies that its strands are twisted and its opposition can be changed by any control. At the end of the day, the sensor is utilized as an adaptable resistor, and its adaptability changes when it is twisted. This adjustment in obstruction relies upon the width of the line, which implies that the affectability of the sensor will change at various points, in light of the fact that the opposition will be distinctive when level, the opposition will be diverse when bowed 450, and comparably, the opposition will be 900 when twisted. These three twisting conditions will be distinctive as demonstrated in Figure 2.

1.3.3 Three Bending Conditions of Sensor

In the event that we partition it into three circumstances. In the event that the avoidance sensor isn't bowed, the obstruction will be ordinary. In the two cases, when the twisting level of the avoidance sensor is 450, the opposition will be multiplied contrasted with the primary case. Additionally, when there are three on account of 900 bowing sensors, the obstruction will be twice pretty much as extensive as in the primary case and twice as extensive as in the event that 1. In this

manner, as far as estimation, the obstruction is relative to the ebb and flow, which implies that it will increment and the point will increment.

1.3.4 Applications

Flex sensors are generally utilized in research fields like PC structures, redesigns, security frameworks and music joining. It is additionally notable among understudies and novices.

Human Machine Interface devices

Dataglove is a standard HMI gadget made of adaptable sensors. The information glove flexes the tactile parts of sensor deviation.

Rehabilitation Research

In revival examines, use rope gloves or information gloves to record joint development.

Security Systems

In Rehabilitation research, wired gloves or dataglove is used to record the joint movement

1.4 Light-emitting diode

A light discharging diode (LED) is a semiconductor light source that emanates light as you go through it as of now. Electrons in semiconductors are additionally connected with the initiation of electrons, sending energy as photons. The light shadow (contrasted with photon energy) is dictated by the power needed for electrons to go through the semiconductor tape opening. White light is acquired by utilizing different semiconductors or phosphor layers to send light from semiconductor devices.

The principle LED showed up as electric items in 1962, discharging infrared light (IR). Infrared LEDs are utilized in the control circuit, as LEDs are utilized in various buyer contraptions. The obvious light transmitting diode has low force and is obstructed in red. Current LEDs can give a wide scope of various waves, brilliant (UV) and infrared light, and high splendor force.

Early LEDs were frequently utilized as markers, fitted with little lights and seven-dimensional showcases. Ongoing advancements have given more engaged LEDs that are more reasonable for indoor and outside lighting. LEDs have supported the

rise of new displays and new nations, and their high change rate is basic to the advancement of new correspondence innovations.

Contrasted and radiant light sources, LEDs have numerous benefits, including low force utilization, long life, improved strength, more modest size, and quicker exchanging speeds. LEDs are utilized in different applications, for example, airplane lighting, fantasies, vehicle headlights, promoting, standard lighting, traffic signals, camera lights, enlightened backdrop, planting develop lights, and clinical hardware.

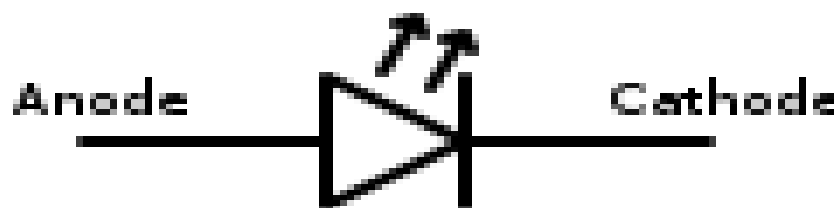


Fig.no 1.3 Diode

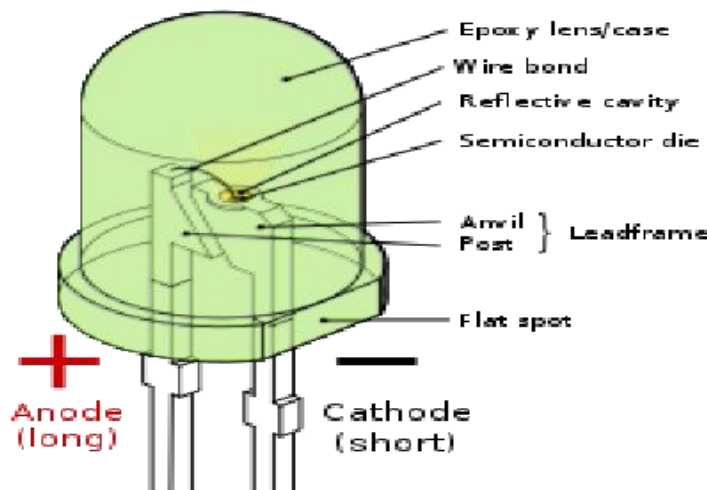


Fig.no 1.4 Parts of Conventional LED

Standard LED parts. The level lower part of the table and the installed section inside the epoxy fill in as a fixator to keep the administrator from being driven out because of the machine or vibration.

1.4.1 Advantages

- **Efficiency:** LED illuminates rapidly. A commonplace red marker LED can arrive at full splendor inside 1 microsecond. LEDs utilized in specialized gadgets can have a quicker reaction time.
- **Color:** LEDs are ideal for incessant on-off cycles, which are not the same as brilliant and fluorescent lights that bomb rapidly during regular cycles, or focused energy release lights (HID lights) that take quite a while prior to restarting.
- **Size:** By beat width regulation or diminishing the forward current, the LED can be handily darkened. This sort of heartbeat width tweak is the reason LED lights, particularly vehicle headlights, appear to flash or glimmer when seen by a camera or a few group. This is a sort of stroboscopic impact.
- **Warmup time:** Compared with most light sources, LEDs transmit next to no warmth as IR, which may harm touchy articles or textures. The squandered energy is dispersed through the lower part of the LED as warmth.
- **Cycling:** LED disappointments are essentially darkening over the long haul, instead of unexpected disappointments of radiant bulbs.
- **Dimming:** LEDs can have a moderately long help life. One report assessed the help life to be 35,000 to 50,000 hours, albeit an opportunity to finish disappointment might be longer or more limited. The appraised life of fluorescent lights is ordinarily around 10,000 to 25,000 hours (halfway relying upon the states of utilization), and the evaluated life of glowing bulbs is 1,000 to 2,000 hours. A few DOE exhibitions have shown that lessening support costs (instead of saving energy) from expanding the assistance life is the fundamental factor in deciding the compensation time of LED items.
- **Cool light:** LEDs are strong state parts and are not effortlessly harmed by outside stuns, which are unique in relation to delicate fluorescent lights and brilliant lights.
- **Lifetime:** The durable bundling of the LED can be intended to shine its light. Radiant and bright light sources for the most part require outside reflectors to gather light and direct it in a usable way. For bigger LED bundles, an absolute interior reflection (TIR) lens is generally used to accomplish a similar impact.

In any case, when a lot of light is required, many light sources are generally conveyed, and it is hard to center or point them at a similar objective.

1.4.2 Disadvantages

- **Temperature dependence:** LED execution is exceptionally subject to the suitable temperature or warm conductivity of the working climate. Unreasonable driving of LEDs at high temperatures can make the LED pack overheat and at last reason mechanical disappointment. Sufficient warmth sinks are expected to look after life span. This is particularly significant for car, clinical and military applications, where hardware should work at high temperatures and have a low disappointment rate.
- **Voltage sensitivity:** The LED ought to be provided with a force volume higher than its limit and lower current than its appraised esteem. At present the hour of life shifts significantly with little changes in the portion utilized. Thusly, they require current force supply (typically a progression of LED pointer arrangement).
- **Color rendition:** The scope of most cool white LEDs is altogether different from the shade of dark body radiators (like sun or glowing lights). Because of the idea of metamerism, a sharp tallness of 460 nm and a valley at 500 nm can make the shade of the item be enlightened by a cool white LED and the daylight or glowing light source seem to have various tones, ordinarily chilly white dependent on phosphors by LED the most exceedingly terrible. The equivalent is valid for the green space. The nature of shading delivering of LEDs is estimated by the shading delivering file (CRI).
- **Area light source:** One LED can't anticipate a point light source, it has a roundabout light dissemination, however a Lambertian appropriation. Accordingly, LEDs are hard to use in applications that require a roundabout light field. Notwithstanding, it is feasible to deceive diverse light fields by utilizing various materials or "focal points." LEDs can't give variety under a couple of degrees.
- **Light pollution:** As white LEDs discharge more limited frequencies than high sodium fume lights and other light sources, the affectability of blue and green

light to dark light builds, implying that the white LEDs utilized for outside lighting will deliver all the more light Sky.

- **Efficiency droop::** As the current expands, the proficiency of the LED diminishes. As the current builds, the temperature will expand, which will harm the existence of the LED. These outcomes force obvious cutoff points as of now on LEDs in high-power applications.
- **Impact on wildlife**LEDs are more appealing to bugs than sodium fume lights, so individuals stress over the conceivable annihilation of the food web. Driven light close to the ocean, particularly blue and strong white, can make the turtle hatchery lose and cause it to wander inside. Limit harm.
- **Use in winter condition**they don't produce a lot of warmth contrasted with glowing lights, the LED lights used to control traffic can be obstructed by snow and cause mishaps.
- **Thermal runaway:** Equivalent LED wires can't be similarly disseminated right now because of the creation resistance at the forward voltage. At the point when the telephone is warmed, utilizing at least two links from a similar current source may cause LED disappointment. In the event that it is unimaginable to expect to consolidate forward power, it is important to pivot to guarantee that as of now between similar wires is equitably disseminated

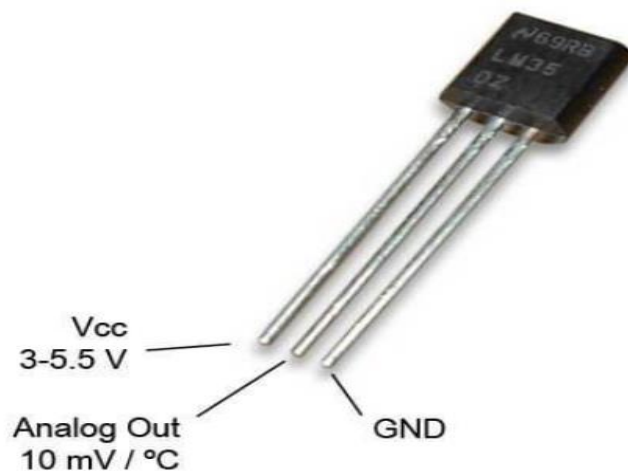
1.4.3 Applications

Driven use can be separated into four classes:

- Visible sign, light is sent straightforwardly from the light source to the natural eye to send data or significance.
- Lighting, where items light up to create a noticeable reaction to these articles. Assess the cycle and connect with measures that don't include human assessment.
- Narrowband light sensor, where the LED works backward inclination mode and reacts to episode light as opposed to radiating light.

1.5 LM35 - Precision Centigrade Temperature Sensor

A temperature sensor is a little device, generally a RTD (Resistance Temperature) or a thermocouple, which gathers data about the temperature of a particular source and converts the information into a construction that the device or watchmaker can comprehend. Warm sensors are utilized in numerous edges, for example, HV and



AC outline control controls, food arrangement units, clinical equipment, prescription administration and vehicles on the hood watch list.

Fig.no 1.5 LM35 Precision Centigrade Temperature Sensor

The LM35 arrangement is a temperature sensor with coordinated exactness, and its yield power is equivalent to the temperature in degrees Celsius (degrees Celsius). Hence, the LM35 is more worthwhile than an immediate temperature sensor appraised in Kelvin, on the grounds that the client doesn't have to yield a huge persistent voltage to the yield terminal to perform straightforward Celsius estimations. The LM35 doesn't need outside estimation or slicing to give general point by point data of $\pm\frac{1}{4}^{\circ}\text{C}$ at room temperature and $\pm\frac{3}{4}^{\circ}\text{C}$ over the whole temperature scope of - 55 to $+150^{\circ}\text{C}$. Cutting and estimating in water can guarantee ease level. LM35 low yield, line yield and exact estimation make it simpler to incorporate simple to-peruse or control circuits. It tends to be utilized with a solitary

force source, or with composite hardware and force. Since it just burns-through 60AA of power, its temperature is extremely low, and the temperature in dry air is underneath 0.1°C . The appraised temperature of LM35 is higher than -55° to $+150^{\circ}\text{C}$, while the evaluated temperature of LM35C is -40° to $+110^{\circ}\text{C}$ (-10° has higher precision). The LM35 arrangement can be incorporated into the fixed TO-46 semiconductor bundle, while the LM35C and LM35D can likewise be coordinated into the TO-92 semiconductor bundle.

1.5.1 Operation of LM35:

- LM35 can be handily associated similarly as other coordinated temperature sensors. It very well may be caught or framed on a superficial level, and its temperature will be in the 0.01°C scope of an unnatural weather change.
- Assuming that the air temperature is around equivalent to the surface temperature; if the air temperature is excessively high or lower than the ground temperature, the real temperature of the LM35 chip will be at a transitional level between the earth temperature and the air temperature.

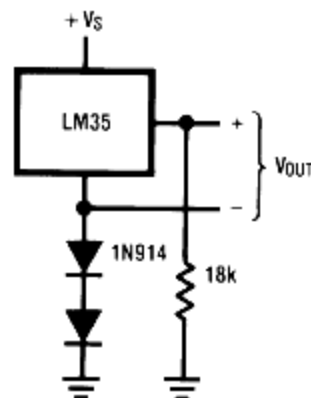


Fig.no 1.6 operation of LM35

Warm sensors have notable applications in natural administration and cycles, just as testing, estimation and correspondence. Computerized temperature sensor, giving 9-digit heat perusing. The computerized temperature sensor can give magnificent exactness, and its plan can be perused in the scope of 0°C to 70°C , and may arrive at a precision of $\pm 0.5^{\circ}\text{C}$. This sensor is completely viable with advanced temperature readings in degrees Celsius

The LM35 offers a wide range of bundles, including the accompanying highlights. ,

- TO-46 metal is a semiconductor formed bundle
- 8-pin surface mount SO-8 little size bundle

- truth be told, it can go from 80 KW to 600 KW, however most utilize just 80 KW.



-

ground.

Fig.no 1.8 LM35 Connection in bread board

What is relied upon to utilize the LM35?

- You should utilize a voltmeter to hear the Vout.
- Convert the yield voltage to warm with a basic converter.
- Sensitivity sensor is 10mV/oC.
- Utilize the duplication exchanging highlight, i.e., 100V/oC.
- The standard equation used to change heat over to energy is:
 - $\text{Temperature (}^{\circ}\text{C)} = \text{Vout} * (100^{\circ}\text{C/V)}$
 - So if Vout is 1V , then, Temperature = 100 °C
 - The output voltage varies linearly with temperature.

1.5.2 Features

- Ib Measure straightforwardly in degrees Celsius (degrees Celsius)
- It has Linear Rate Line + 10.0 mV/° C
- Exactness Accuracy of 0.5 ° C (+25 ° C)
- Reach Rated range - 55 ° to + 150 ° C
- Uit Suitable for far off applications
- Low cost because of cutting degree of lime
- The working voltage is 4 to 30 volts
- The current utilization is under 60 μA
- - Low warming, 0.08 ° C in dry air
- Non-linearity is just $\pm \frac{1}{4}^{\circ}\text{C}$ (standard worth)
- Low impedance yield, 0.1 ohm when burden is 1 mA

1.5.3 Types of Temperature Sensors

Contingent upon the working framework, there are different kinds of warmth sensors that can hear. The various kinds of warmth sensors are as per the following:

- Thermocouples
- Resistor temperature detectors
- Thermistors

- Infrared sensors
- Semiconductors
- Thermometers

1.6 GPS

The Global Positioning System (GPS) is a satellite-based route framework made out of in any event 24 satellites. GPS can be utilized 24 hours every day in any climate anyplace on the planet without membership charges or establishment



expenses.

Fig.no 1.9 GPS

1.6.1 Working of GPS

GPS satellites circle the earth double a day. Each satellite produces peculiar signs and orbital limits with the goal that GPS contraptions can decide and find explicit satellite positions. The GPS authority utilizes this information and trilateration to ascertain the particular client area. Truth be told, the GPS recipient estimates the distance of each satellite as it gets the gotten signal. By estimating the distance of a few satellites, the recipient can decide the client's area and show it.

To figure the size (length) area and advancement bearing, the GPS authority ought to be bound to the three satellite signs. At the point when you see in any event 4 satellites, the beneficiary can decide your 3-D position (size, height, and elevation). Ordinarily, GPS authorities will follow in any event 8 satellites, however this relies upon the hour of the day and area on the planet.

- Speed
- Bearing

- Track
- Trip dist
- Distance to destination

1.6.2 Signal

GPS satellites send at any rate 2 low-recurrence radio signs. The signs go too far of sight, which implies they will go through mists, glass and plastic, however not through numerous strong items like structures and mountains. Notwithstanding, the present beneficiaries are delicate and can regularly follow lodging conditions.

GPS signals contain three sorts of data:

- The pseudo-irregular code is the I.D. code that distinguishes which satellite is sending information. You can check which satellites the sign was found from on the satellite page of the gadget.
- Ephemeris information is needed to decide the situation of the satellite and give significant data about the satellite's life, date and time.
- The chronicle information will tell the GPS beneficiary the area of every GPS whenever of the day, and show the orbital subtleties of that satellite and any remaining satellites in the framework.

1.6.3 Overview of NEO-6M GPS Module

1.6.3.1 NEO-6M GPS Chip

The blox 6 motor additionally has a first fix time (TTFF) of short of what one second. Probably the best element of the chip we give is the force saving mode (PSM). By turning the recipient segment on and off, the framework power utilization can be limited. This incredibly diminishes the force utilization of the module to just 11mA, which is entirely appropriate for use in basic applications, for example, GPS clocks. The information pins needed by the NEO-6M GPS chip are partitioned into "0.1 inch" pitches, which incorporate the pins needed to speak with the microcontroller by means of UART.

Note: - The module upholds baud rates from 4800bps to 230400bps, and the default baud rate is 9600.

NEO-6M GPS chip



Fig.no 1.10 NEO-6M GPS chip

1.6.3.2 Position Fix LED Indicator

There is an LED on the NEO-6M GPS Module which indicates the status of Position Fix. It'll blink at various rates depending on what state it's in

- No Blinking ==> means It is searching for satellites
- Blink every 1s – means Position Fix is found

LED Indicator



Fig.no 1.11 LED Indicator

1.6.3.3 3.3V LDO Regulator

The working limit of the NEO-6M chip is 2.7 to 3.6V. In any case, this module is furnished with MICREL's MIC5205 super low dropout 3V3



3.3 LDO Regulator

controller.

Fig.no 1.12 3.3V LDO Regulator

The rationale pin can likewise withstand 5V, so we can undoubtedly associate it to Arduino or any 5V reasonable microcontroller without utilizing any rationale level changes.

1.6.3.4 Battery & EEPROM

The module is outfitted with the HK24C32 EEPROM back to back connect. 4KB in size and associated with NEO-6M chip by means of I2C. The module likewise contains a battery-fueled battery, which can be utilized as a super capacitor.

EEPROM and battery together assistance save RAM (BBR) battery. The BBR contains clock subtleties, late area subtleties (GNSS or contact subtleties) and module settings. In any case, this doesn't mean keeping records forever.

Since the battery saves the clock and saves additional room, the essential fix time (TTFF) is diminished by 1 totally. This glances at the quick association of the bolt around here.

Without a battery, GPS is consistently cool, so the principal GPS lock requires additional time. After the force is turned on, the battery will be charged naturally, and you can store information for as long as about fourteen days without power.



Fig.no 1.13 Battery & EEPROM

1.7 Antenna

Any sort of correspondence that utilizes a radio wire requires a receiving wire. Along these lines, the module is outfitted with a sensor radio wire with an affectability of - 161 dBm.



Fig.no 1.14 Antenna

You can shoot a receiving wire on a little UFL connector in the module.

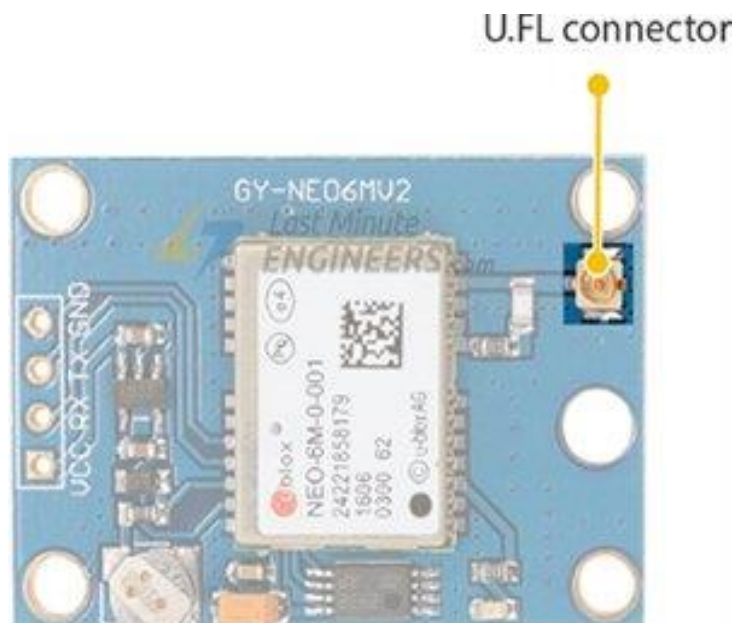


Fig.no 1.15 UFL Connector located on the module

Fix receiving wires are reasonable for most undertakings. Be that as it may, in the event that you need to build the affectability or introduce the module in the

metal box, you can likewise introduce any dynamic 3V GPS recieving wire with a UFL connector.

1.7.1 Pinout



Fig.no 1.16 Pinout

- GND is a ground pin and requires an association with the Arduino GND pin.
- Tx pin (transmitter) is utilized for sequential correspondence.
- The Rx pin (recipient) is utilized for sequential correspondence.
- VCC gives capacity to the module. You can associate it straightforwardly to Arduino 5V pin.

1.7.2 Specifications:

Receiver Type	50 channels, GPS L1(1575.42Mhz)
Horizontal Position Accuracy	2.5m
Navigation Update Rate	1HZ (5Hz maximum)
Capture Time	Cool start: 27sHot start: 1s
Navigation Sensitivity	-161dBm
Communication Protocol	NMEA, UBX Binary, RTCM
Serial Baud Rate	4800-230400 (default 9600)

Operating Temperature	-40°C ~ 85°C
Operating Voltage	2.7V ~ 3.6V
Operating Current	45mA
TXD/RXD Impedance	510Ω

1.8 IRIDIUM SATELLITE MODEM

1.8.1 Iridium Satellite Modem

Iridium 9602 is Iridium's cutting edge SBD handset. Intended for joining with complete remote arrangements, it gives the basic worldwide information network needed for the present worldwide arrangements. Iridium 9602 is little in size, low in cost, and simple to collect. It is truly appropriate for machine-to-machine (M2M) arrangements, for example, vehicle situating, stock checking, transport frameworks and individual global positioning frameworks.

1.8.2 Leverages Iridium SBD Service

Iridium 9602 is simply used to help Iridium's short burst information administration. Iridium approved accomplices can consolidate Iridium 9602 and SBD administrations to make high-esteem vertical market arrangements. These administrations include: low-speed administrations, little handsets, little radio wires and ground inclusion.

1.8.2.1 Iridium SBD Service provides:

- Portable compact message: up to 340 bytes
- Separate portable message: up to 270 bytes
- The lower part is grounded, start to finish equal: under 1 moment

1.8.3 Working

Iridium 9602 is a solitary board handset that gives arrangement engineers the capacity to incorporate opposite end-client capacities, like GPS, microchip based rationale control, computerized and simple data sources, shut down, and radio wires. The Iridium 9602 handset doesn't embed or doesn't need a SIM card. Its gear interface incorporates sequential interface, power input, network yield and force disconnected control.

1.8.4 Key Features

- The littlest shape looks unmatched
- GPS module receiving wire feed for shared radio wire applications
- Meet RoHs
- XXMC connector for little omnidirectional L-formed horn
- Simple AT order interface
- Earth-to-post establishment
- Support Iridium Burst

1.8.5 Specifications

Mechanical

- Length: 41.0 mm
- Width: 45.0 mm
- Depth: 13.0 mm
- Weight 30.0 g

Environmental

- Operating temperature range: -40 to +85° C
- Operating humidity range: $\leq 75\%$ RH
- Storage temperature range: -40 to + 85° C
- Storage humidity range: $\leq 93\%$ RH

RF Interface

- Frequency range: 1616 to 1626.5 MHz
- Duplexing method: TDD (Time Domain Duplex)
- Input/output impedance: 50 Ω
- Multiplexing method: TDMA/FDMA

Power

- Idle current (average): 35 mA
- Idle current (peak): 170 mA (provisional value)
- Transmit current (peak): 1.3 A
- Transmit current (average): 140 mA
- Receive current (peak): 170 mA (provisional value)
- Receive current (average): 40 mA

- SBD message transfer (average current): 150 mA
- SBD message transfer (average power): ≤ 0.8 W

CHAPTER 2

2 Literature Survey

Title:

Analysis of Bluetooth Low Energy Detection Range Improvements for Indoor Environments

Abstract

An investigation of constant area framework (RTLS) shows that Bluetooth low energy innovation is one of the advances that can make reactions to the necessities of the home climate. In this specific circumstance, we have found out about the most recent advancements in Bluetooth, particularly the scope of Bluetooth and its utilization in indoor areas. The college has utilized an assortment of offices to direct trials to emulate a common indoor climate. The outcomes show that it is satisfactory inside the view and with impediments like glass, segment of building structures and strong block facades. Future exploration will investigate approaches to decide the area of Bluetooth low-power gadgets to decide the area of patients and hardware.

Author

Matti Siekkinen,
Markus Hienkari,
Jukka K. Nurminen

Title

Bluetooth Low Energy (BLE) based wireless sensors

Abstract

The low-power correspondence framework is fundamental for the future utilization of the Internet of Things. Bluetooth Low Energy (BLE) is a promising contender for this sort of posting. We study the utilization of BLE energy utilizing a force regulator to quantify genuine hardware, and afterward get a model of energy-put together conduct based with respect to estimation results. We will likewise examine the expense of BLE-based IPv6 interchanges, identified with future IoT situations. We look at our outcomes by playing out similar estimations utilizing ZigBee/802.15.4 gadgets. Our outcomes show that contrasted with ZigBee, BLE really saves energy regarding the quantity of bytes devoured per joule. What's more, the expense of IPv6

correspondence power is as yet sensible. We additionally distinguished explicit limitations on the utilization of the current stack and clarified that eliminating these restrictions could essentially improve energy effectiveness.

Author

Elke Mackensen and Matthias Lai,
Thomas M. Wendt,

Title

Bluetooth Low Energy (BLE) based mobile electrocardiogram monitoring system

Abstract:

The accompanying paper presents the aftereffects of investigation into the practicality of remote nerves dependent on Bluetooth Low Energy (BLE). The development of the mechanical remote sensors has prompted critical necessities for remote innovation, for example, low force utilization and basic GPS beacons that save assets. Bluetooth Low Energy (BLE) is another standard remote gadget that will completely meet these essential necessities. A customized BLE sensor framework has been utilized to test the widespread exhibition of BLE in remote sensor frameworks. We will currently introduce the aftereffects of different scientific dissects performed utilizing the BLE sensor framework.

Author

Bin Yu,
Lisheng Xu,
Yongxu Li.

2.1 AIM AND SCOPE OF PRESENT INVESTIGATION

Our main and Scope of Present investigation is to live tracking of packages using Bluetooth low energy tags. We have considered track in which many packets are present and each packet is connected with Bluetooth tag .The device sends the information to the satellite and location of track and details of the packet is shown clearly.

CHAPTER 3

3 PERSISTING WORK

Article global positioning framework, can utilize GPS and Bluetooth innovation to follow things. Generally GPS, GSM, RFID and Bluetooth utilize signal solidarity to follow things. We utilize the Global Positioning System (GPS) to follow long-range items and Bluetooth short-range objects. The application permits clients to see the current area of the objective article on Google Map through the Android application. Accordingly, each target will have the two GPS and Bluetooth module labels. The test outcomes show that most things lost because of inappropriate situation or burglary can be recuperated in a brief timeframe through the global positioning framework.

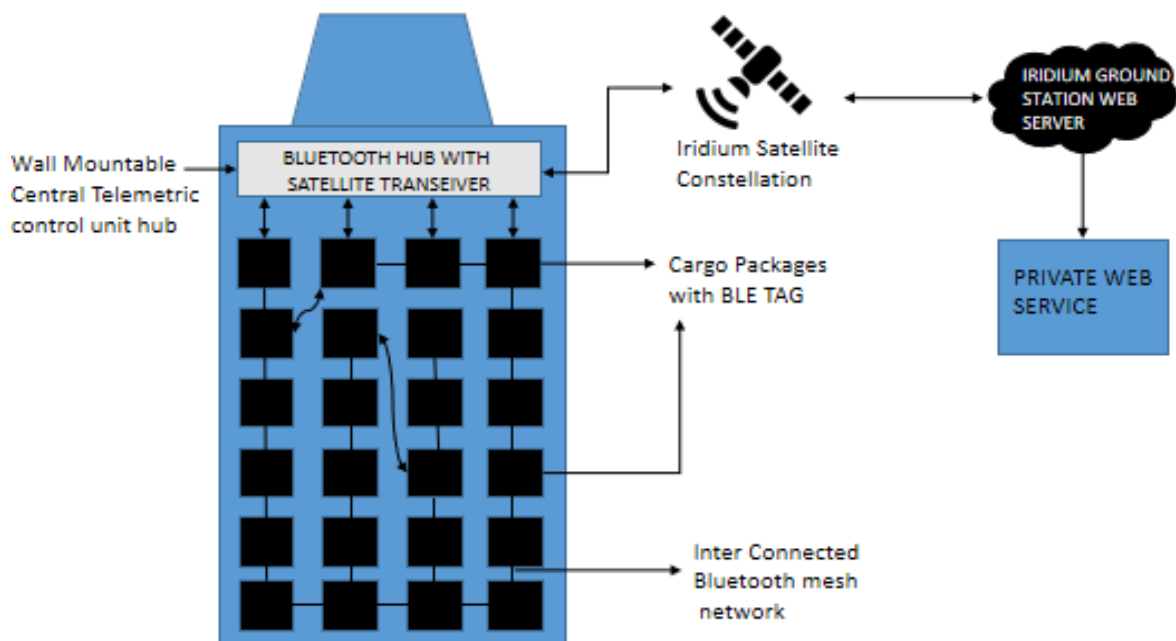


Fig.1. Top view of cargo truck

**Fig.no 3.1 LOGISTICS PACKAGE TRACKING AND DATA ACQUISITION
SYSTEM USING ACTIVE BLUETOOTH LOW ENERGY TAGS**

3.1 Key Features

- Low cost of tags runs on 3v button cell.
- Can create mesh network and share sensor data between to the central hub.
- Can obtain the proximity and orientation of package.
- Central Bluetooth hub can be fixed anywhere to fetch packages data.
-



Fig.no3.2 Connection with Iridium Satellite

3.1 Working:

The cargo truck contains of packages, each packet is connected with Bluetooth low energy, microprocessor, flex sensor, temperature sensor. The Bluetooth low energy tag works on 3v button cell. The flex sensor helps us to know the flexibility of the



package whether it is opened or closed and the temperature sensor gives us the temperature in the package. The total combined data is stored in the microprocessor. The total packets are connected in mesh network and bluetooth hub is created. The data is send to iridium satellite from the bluetooth hub. The data is collected from the iridium satellite by the website called www.rockblock.com.

Fig.no3.3 Connection of Bluetooth Low Energy Tags

CHAPTER 4

RESULTS

Longitude: 12.98803100

Latitude: 80



As our aim is to track the location of tag and It gives us the exact Longitude and Latitude. we can track our package and can reduce the damage of the packages using tags at low cost. By using the iridium satellite we are able achieve the tracking at any place.

REFERENCES

1. <https://ieeexplore.ieee.org>
2. <https://en.wikipedia.org>
3. <https://rockblock.rock7mobile.com>
4. <https://create.arduino.com>.
5. HIROYUKI TORII, et al., "Indoor Positioning and Tracking by Multi-Point Observations of BLE Beacon Signal", 2018 15th Workshop on Positioning, Navigation and Communication, WPNC.
- 6 HYUNSUNG KIM, et al "Design of a Low-Power BLE5-Based Wearable Device for Tracking Movements of Football Players", 2019 International SoC Design Conference, ISOCC.
- 7 SUBHAWAT JAYASVASTI, et al., "Indoor Positioning System on Identification of Neurodegenerative Disease: A Comparative Study of BLE versus RFID", 2019 5th International Conference on Engineering, Applied Sciences, and Technology (ICEAST).

