

REALTIME AIRCONDITIONER PLANT FAILURE DETECTION SYSTEM

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

by

KOTA KARTHIK (37130208)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING



SCHOOL OF ELECTRICAL AND ELECTRONICS

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

Accredited with Grade "A" by NAAC

JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI – 600119

MARCH – 2021



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of KOTA KARTHIK (Reg.No.37130208) who carried out the project entitled “**REAL TIME AIR CONDITIONER PLANT FAILURE DETECTION SYSTEM**” under our supervision from December 2020 to March 2021.

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Submitted for Viva voce Examination held on_____

Internal Examiner

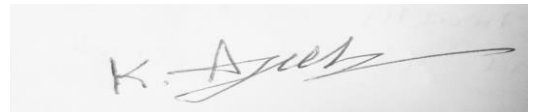
External Examiner

DECLARATION

I, KASULA AJITH KRISHNA (37130190)

hereby declare that the Project Report entitled “**REAL TIME AIR CONDITIONER PLANT FAILURE DETECTION SYSTEM**” done by us under the guidance of Dr. G.JEGAN, M.E., Ph.D. is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering.

1.

A handwritten signature in black ink, appearing to read 'K. Ajith', is written on a light-colored rectangular background.

DATE:

2.

PLACE:

SIGNATURE OF THE CANDIDATES

ACKNOWLEDGEMENT

We are pleased to acknowledge our sincere thanks to Board of Management of **SATHYABAMA** for their kind encouragement in doing this project and for completing it successfully. We are grateful to them.

We convey our thanks to **Dr.N.M.NANDHITHA M.E., Ph.D.** Dean, School of Electronics and Communication Engineering and **Dr.T.RAVI M.E., Ph.D.** Head of the Department, Department of Electronics and Communication Engineering for providing me necessary support and details at the right time during the progressive reviews.

We would like to express our sincere and deep sense of gratitude to our Project Guide **Dr.G.JEGAN, M.E., Ph.D.** for her valuable guidance, suggestions and constant encouragement paved way for the successful completion of our project work.

We wish to express our thanks to all Teaching and Non-teaching staff members of the Department of **Electronics and Communication Engineering** who were helpful in many ways for the completion of the project.

We would like to thank our beloved **PARENTS** for their constant love and support, without whom this wouldn't be possible and finally we would like to thank the **ALMIGHTY** for his wonderful blessing.

ABSTRACT

The monitoring of air conditioner is being difficult when there are in several in number. To reduce the difficulty in monitoring the air conditioner, the automation is one of the solutions. In this project we are developing a model which monitors the machines and sends the status of the machine to the control point. The particle Argon board is used to monitor and transmit the data to the control unit. To monitor the status of the AC machine, temperature and vibrations of the machines are the parameters taken to define the status of an air conditioner.

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CHAPTER-1

1. INTRODUCTION:

The method of extracting humidity from inside of a house to increase customer convenience is known as air conditioning, or AC. Air conditioning can be found in both residential and industrial settings. AC is commonly used to provide a more convenient indoor and cold atmosphere, mostly for humans and other animals. It is often used to lower the temperature and humidity of large rooms with high - temperature equipment, including computers and laptops, as well as to view and preserve certain fragile objects, including sculptures.

Air conditioners (AC) are a commonly used device in both the home and the workplace. Air conditioning systems provide warmth in a residential environment during inclement weather. In large industrial environments, air conditioning equipment contributes to increased efficiency in addition to increased convenience. Because of the above benefits, culture desires that air conditioning devices be available at all times. Until now, such machinery has been serviced either on a regular basis or, worse still, throughout the form of reactive or failure servicing. Given our growing reliance on air conditioners, it's time to consider implementing predictive maintenance.

Condition monitoring is a technique that uses sensors to monitor the condition and provide an estimate of when maintenance should be performed. Near control of chosen parameters will help to minimize predictive maintenance. A well-designed condition monitoring software can cut down on maintenance downtime. The maximum spindle expense of this policy is offset by the avoidance of lost efficiency during proactive maintenance breakdowns or outages. The voltage and current for the air conditioner were recorded using a distributed sensing technique in this analysis. Detectors gather data, which is then processed to construct a dataset that can be analyzed using purely-supervised training methods to determine any faults in the air conditioner.

The monitoring of air conditioner is being difficult when there are in several in number. To reduce the difficulty in monitoring the air conditioner, the automation is one of the solutions. In this project we are developing a model which monitors the machines and sends the status of the machine to the control point. The particle Argon board is used to monitor and transmit the data to the control unit. To monitor the status of the AC machine, temperature and vibrations of the machines are the parameters taken to define the status of an air conditioner.

CHAPTER -2

LITERATURE SURVEY

[1] Title: Nonintrusive Load Monitoring of Variable Speed Drive Cooling Systems

AUTHOR: Peter A. Lindahl; Muhammad Tauha Ali; Peter Armstrong;

To enhance the electricity efficiencies of constructing cooling systems, producers square measure associate degree increasing variety of creating use of variable pace drive (VSD) vehicles in appliance parts, while these devices will save a considerable amount of electricity, the advantages will be achieved only if these modules are used as planned and under proper oversight. Unnoticed defects will stymie potency gains. As a result, monitoring cooling system output is critical for determining defective conditions and correctly informing building or multi-building models used for prognostic management and energy management. This paper describes nonintrusive load observance (NILM)-based "mapping" strategies for tracking the output of a building's central air-conditioning system using good electrical meter or energy sensor data. A key mapping, which utilizes a variable linear model, decouples the power pull of the air conditioner from that of the entire building by using relations between the line-current harmonics of the building and the power input of the air conditioner's VSD motors. A key mapping, which uses a variable linear model, disaggregates the capacity of the air conditioner. pull from that of the entire house by using associations between the line-current bass notes of the building and the power input of the air conditioner's VSD motors The heat removal performance poor treatment of the air conditioning unit is then measured using the key mapping's measurable power draw, the building's regional temperatures, and outside temperature change as inputs. The utility of such modeling techniques in congested poor treatment information gathered from a research center building on Khalifa University's Masdar town market. The modeling techniques work together to get reliable estimates of the air-conditioning building performance before it is operating in ideal circumstances. As a result, these calculations may be used as input in building energy management controllers, providing an output baseline for detecting air conditioning underperformance.

[2] Title: Predictive Maintenance of Air Conditioning Systems Using Supervised Machine Learning.

Author: Shreya Sharma.

A variety of faults will occur in Associate in air conditioning, resulting in a reduction in potency, an increase in energy demand, and an increase in maintenance costs. As a result, prophetic maintenance is needed. The option tree machine learning algorithmic software is used to detect the type of defects one is gas and another is discharge electrical condenser failure - in this article. The data for unreliable and working air conditioners were obtained and analyzed using distributed sensors, microcontrollers, and specialized electronic devices.

The choice tree's findings for fault detection and designation, as well as freight tracking, were compared to those of the aid classification algorithm in the App Learner system case, and the choice tree's predictive performance is estimated to be greater. The provided analysis work would evaluate the malfunctioning air conditioning, predict that type of malfunction at initial

point, and attempt to maintain it.

[3] Title: Handling Incomplete Sensor Measurements in Fault Detection and Diagnosis for Building HVAC Systems

Author: Dan Li; Yuxun Zhou; Guoqiang Hu; Costas J. Spanos.

Data-driven fault detection and identification (FDD) has been developed potential with time multiple detector measurements as a result of the occurrence of detector networks and information technologies. However, due to unavoidable detector mistakes or coordination delays, the information square measure is sometimes imperfect, with distorted values, lost values, or unseen missing values. In practice, the unfinished information square measure is often handled by removing missing measures and odd spikes explicitly. Furthermore, several preprocessing methods that erroneously impute information by averaging or smoothing have been widely used. We have a propensity to answer the building FDD downside with insufficient information during this article by suggesting a substitute solution, the adjacent data recovery (AIR) filter. The filter is used to modify the FDD for a standard air handling unit (AHU) device with limited expertise, according to ASHRAE research 1312. The experimental findings indicate that the proposed technique outperforms the progressive methods and increases FDD accuracy by ill lacking detector measurements.

[4] TITLE: Interval-Valued Features Based Machine Learning Technique for Fault Detection and Diagnosis of Uncertain HVAC Systems.

AUTHOR: Sondes Gharsellaoui; Majdi Mansouri

Numerous uncertainties, such as measuring errors, noise, and temperature, often interrupt the process of heat, cooling, and air-conditioning (HVAC) system. As a result, this paper proposes a replacement machine learning (ML) methodology based on multiscale interval principal element analysis (MSIPCA) for fault detection and diagnosis (FDD) of unsure HVAC systems. The evolved MSIPCA-ML approach's primary aim is to improve diagnosing efficiency, improve indoor environment quality, and reduce energy demand in hazard-prone building systems. The interval-valued knowledge illustration is used to resolve model ambiguity. The proposed FDD's output is examined by using collections of artificial and emulated information extracted beneath completely different in-service conditions. The obtained results show the evolved technique's high efficiency in tracking unsure HVAC systems, owing to the period interface support vector machine (svm and nearest neighbor high diagnosing capabilities, as well as their capacity to differentiate between the different in-service phases of an Air conditioner system

[5] Title: Recommended Air Conditioner Temperature Based on Probabilistic Power Flow Considering High-Dimensional Stochastic Variables

Author: Xueqian Fu.

Current power distribution systems face a number of reliability problems as a result of group activity a community of cooling system (Ai-Co) masses into future grids. These issues, such as

the Ai-Co overload problem, cause a significant disparity between supply and demand during the summer peak, and some power consumers must bear the brunt of switch power brownouts. The main theme of this paper is the engineering implementation of Ai-Co management laws when taking into account the flexible sharing of power economic science and thermal comfort. The recommended Aico operational temperature should be replicated in accordance with various micrometeorological conditions. The research is unique in that the cooling system temperature is typically recommended using probabilistic power flow (PPF) and high-dimensional random variables. To resolve PPF calculation problems, a quick calculation technique is provided that is accompanied by singular price decomposition, principal component analysis, and a polling methodology. Examining the tactic with the Latin hypercube sampling algorithmic rule in a rather 118-bus facility validates the feasibility and efficacy of the proposed approach. Numerical experiments demonstrate the benefits of plus matrix resolving and, as a result, the random response surface methodology (SRS) for PPF calculations in high-dimensional cases.

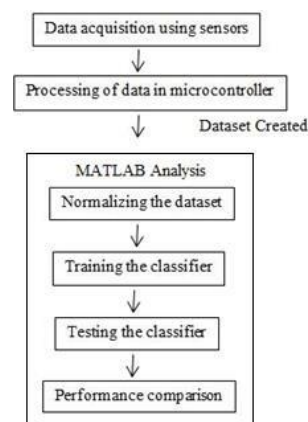
CHAPTER-3

EXISTING SYSTEM

In the air conditioner, a number of failures which occur which result in lower efficiency, increased demand for power and higher servicing costs. Prognosticative management is needed as a consequence. In this article, the choice tree machine learning formula is used to detect many of types of faults: gas-run and compressor malfunction. Using distributed sensors, microcontrollers, and dedicated electronic instruments, data for both inaccurate and operating air conditioners is collected and analyzed. The MATLAB Classification App learner's toolbox. The results of the tree of selection were then compared with those of the aid vector machine and the accuracy of the prediction tree was demonstrated to be greater for faults and classification as well as cargo control. The research conducted would evaluate the faulty air conditioning and predict the failure in an early stage to seek repair in advance.

EXISTING METHODOLOGY

The status of the AC is monitored in real-time using sensors, and the data obtained is processed in the microcontroller. The stored data is used to construct a dataset. The sample is then evaluated in MATLAB using Classifier App Instructor Toolbox to classify the flawed AC and the associated forms of error using classification algorithms such as decision tree and help vector regression (svr). The current model's flow chart is seen below.



3.1 existing system block diagram

HARDWARE

Since machine learning algorithms are data-driven, the first step in developing the model is to collect data. Data collection is accomplished by the use of remote sensing. Various sensors of various types are used in the sensing system.

A current transformer is a sensor that detects and measures the current flowing through a wire. a clamp-type current transformer YHDCSCT- 0030 is used in the prototype to calculate alternating current up to 30 A. This is a voltage output style current transformer with an internal sampling resistor to prevent open circuit connection, with the following specifications:

30 A Rated Input Current

1 V Rated Output Voltage

30 A/V calibration coefficient

The voltage transformer is a sensor that detects high alternating voltage. ZMPT101B is the current style voltage transformer used in the model with an on-board potentiometer for calibrating the voltage transformer and operating amplifier and shunt resistance to adjust the voltage range as shown in fig 2. The sensor's live and neutral pins are attached to the live and neutral wires from the AC stabilizer. The voltage transformer's specifications-

2 mA Rated Input Current

2 mA Rated Output Current

01000 V is the operating voltage.

Arduino Nano is an ATMEGA32P based microcontroller board that was used in the model with an Operating Voltage (V_{cc}) of 5 V, as seen in fig 2. The microcontroller is used to gather data from sensors attached to analogue pins and to process the data that is collected.

CIRCUIT DESIGN

The circuit's schematic architecture was created in Altium's Circuit Maker and is seen in fig 3. The sensors' output pins are wired to the analogue pins of the Arduino Nano as an input. The output waveform of the current transformer is an alternating signal, but since the input to the microcontroller's analogue input cannot be negative, the output is changed by 2.5 V (as $V_{CC}/2 = 2.5$ V). A potential divider circuit is configured for this, and the contacts are made appropriately. The level shifting for the voltage sensor is achieved using the onboard passive element network, so there is no need for an external potential divider circuit.

ADVANTAGES

- It can detect gas failure and condensers malfunction
- It can easily monitor by MATLAB classification app learner tool.

DISADVANTAGES

- The main disadvantage is it cannot detect the temperature and vibration of the air conditioner system
- The existing system can do only monitoring but it cannot stop the air conditioner system

CHAPTER - 4

4. PROPOSED SYSTEM

SCOPE OF THE PROJECT:

This product can be used in large scale air-conditioned system plants for detecting the failure in advance. This system uses the real-time machinery vibration analysis and temperature of the air- conditioner plants. This system also uses the cloud platform to monitor the performance of an air-conditioner. By using This system, we can save human efforts and millions of dollars every year worldwide especially in the hottest countries like Dubai, Qatar etc. where the air conditioner plant is widely used.

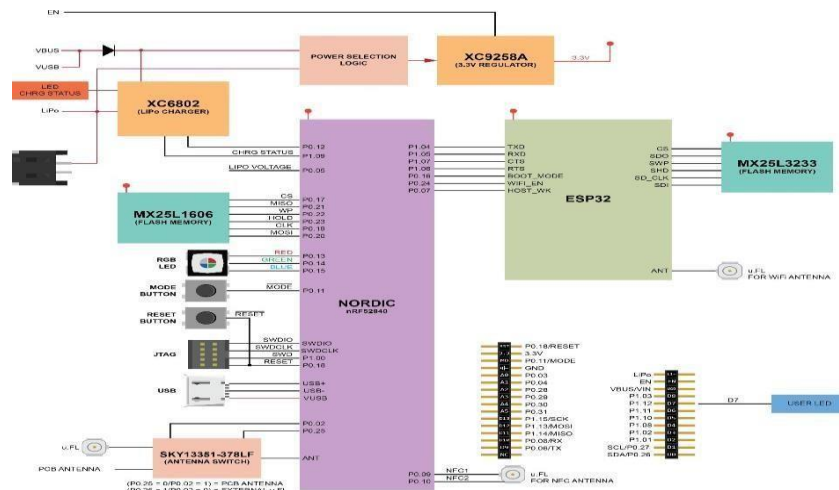
HARDWARE REQUIREMENTS:

- Particle ARGON Development Board
- 3 Axis MEMS Vibration Sensor
- Temperature Sensor
- Cellular Antenna
- 230v Ac to 5v Dc Convertor

PARTICLE ARGON DEVELOPMENT BOARD

The argon was the Wireless development panel for Wireless connections with good performance. It supports the Nordic-nRF52840 and has integrated electronic charging time, making it easy to mount a Li-Po and use your own network in minutes. The argon helps to link existing networks via a Wi-Fi system to the Particle Device Cloud.

BLOCK DIAGRAM



particle argon block diagram

USB-PORT

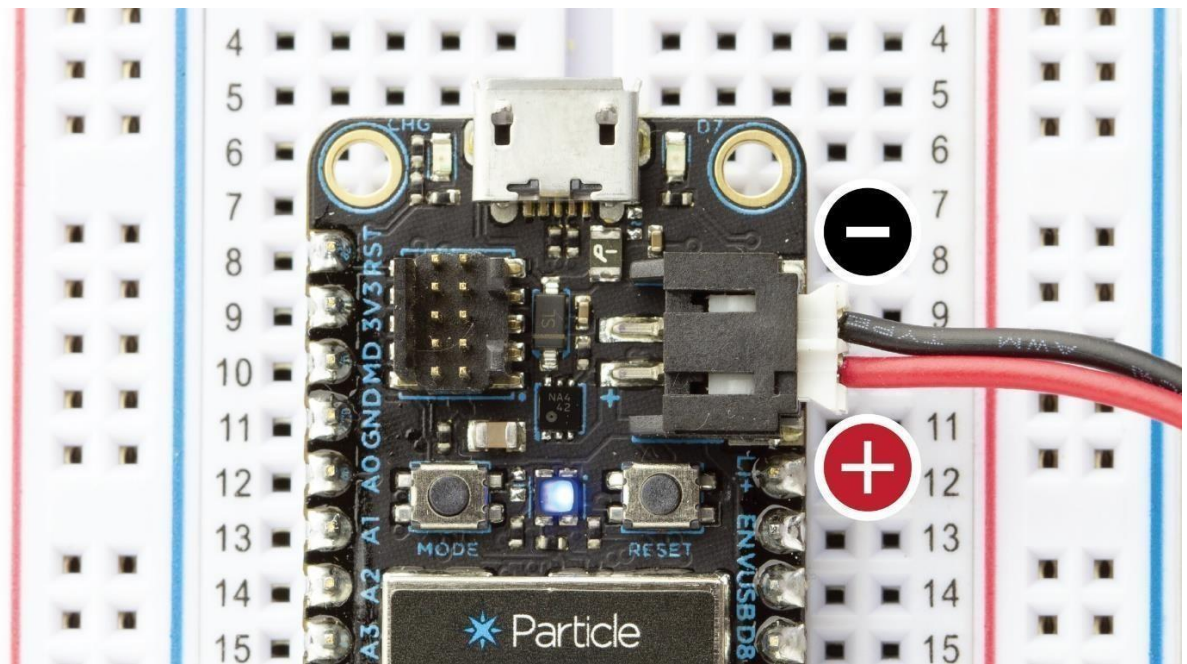
The easiest way to energize the element is via USB port. Please confirm that the USB port will supply at least 500mA. As an on-regulator limits USB power to 3.3V. Reduced regulator to rex XC9258A

V-USB PIN

The input is connected to the USB port internally. If the machine is connected to a USB plug, the marginal performance should be roughly 5 VDC and not connected to a USB device. This pin can be used for controlling peripherals running at certain voltages. The new nominal amount of 501 mA of the USB port cannot be met. This device point is also covered with a 1000mA enclosed fuse.

Li-Po

You can power the device with one single Li-Po cell (3.4V) if you want to completely wirelessly . The element contains an on-board Li-Po adapter that can load and monitor the system if the USB supply is stopped or, without the USB, operate it solely from the Li-Po.



power input in particle argon

Li-PIN

This button is connected internally to the positive terminal of the lithium-ion connector. In order to monitor the element one cell is attached to LiPo/Lithium or a DC power supply. Note that this pin has an input applied power of 3.5 to 4.3 VDC.

3V3-PIN

It represents performance and onboard three.3 Volt's magnitude shift operator. The operator has a GHB rating of 1000mA. When using this pin to control other gadgets or USB ports, bear in mind to keep your budget under the element's initial demand. In the presence of USB or Li-Po power, this pin can also be used to power the part. Please attach the modified pin to GND after shifting over this pin to uninstall the onboard operator.

EN PIN

The linear unit pin does not function as an impact pin in and of itself, but it does control the 3V3 capacity. A 100K electrical device is used to raise the linear unit pin to the higher of the V-USB, the usb Device connector, or Dipolar. Since the drop produces voltages similar to 5 volts, rarely connect the linear unit directly to a three.3V GPIO pin. Instead, you must only shorten linear units by using an N-channel MOSFET or another interactive semiconductor device.

The linear unit pin will force the device into a deep power-down mode anywhere it absorbs little to no power. It can also be used to completely reboot the device, equivalent to unplugging it, of one stipulation:

If you use the currently carrying point to deep reboot the device, be cautious not to let leak current back to the MCU via GPIO or 3v3 pull-ups. If you only power external devices with 3V3, you won't have this problem because 3V3 is de-powered when the linear unit is small.

You must, however, exercise caution if you have electronic equipment that is powered by a separate, external power source. When an externally driven device drives GPIO high when the linear unit is low, enough current is provided to prevent the nRF52 from disabling and rebooting. Similarly, connecting a step-up to an external power source will do the same thing. Make certain that no power is supplied to the nRF52 before the 3V3 is turned off.

ANTENNA

Also on component, there are two radios. A Bluetooth Low Energy radio (nRF52840) and a cellular local area network radio (ESP32). We've received a u.FL connector for the wireless local area network radio to mount the wireless communication antenna. If you wish to use the wireless access property, this is often required.

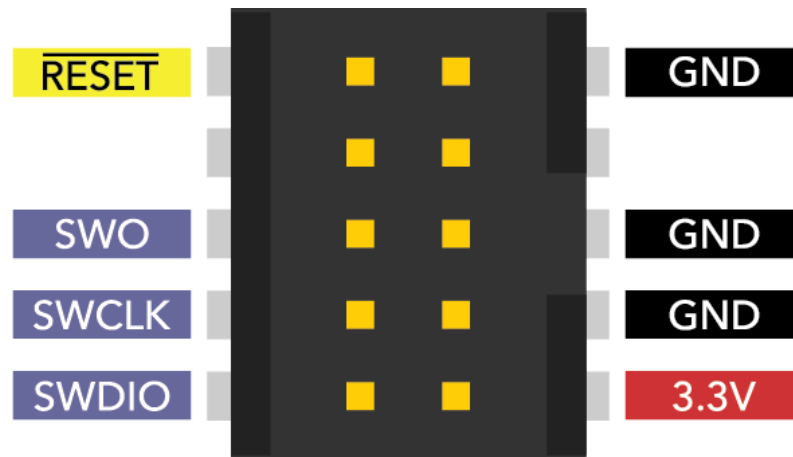
There are two alternatives for the Bluetooth low energy antenna, based primarily on component. It has an on-board printed circuit board antenna that is allowed by default inside the device OS, as well as a UFL connector for connecting an external antenna. If you want to use the outside of antenna you must enter the correct order into the programming code.

FCC APPROVED ANTENNAS BLE AND Wi-Fi

Also, it is necessary to use this Wi-Fi-antenna as BLE antennas. A-u-FL to RP-SMA converter could be available in certain cases. Additional qualifications may be needed if you are designing a device that uses alternate antennas.

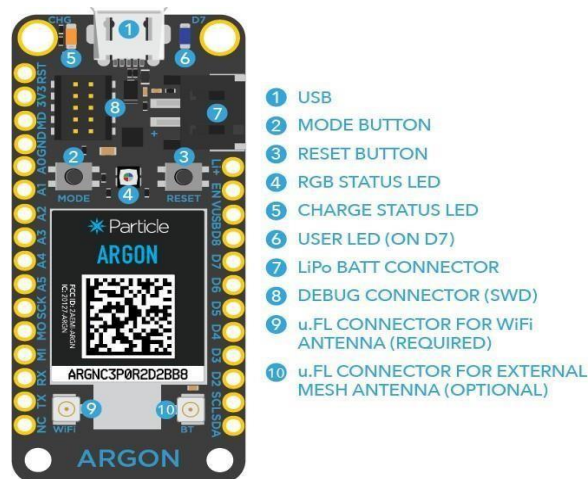
PARTICLE ARGON(SWD)

The Argon does have a specific 10 pin debugging adapter that shows the SWD device. Using any regular SWD method, except our Gen 3 Debugging, you can debug your code or reconfigure your Argon bootloader, system OS, or application firmware through this interface.



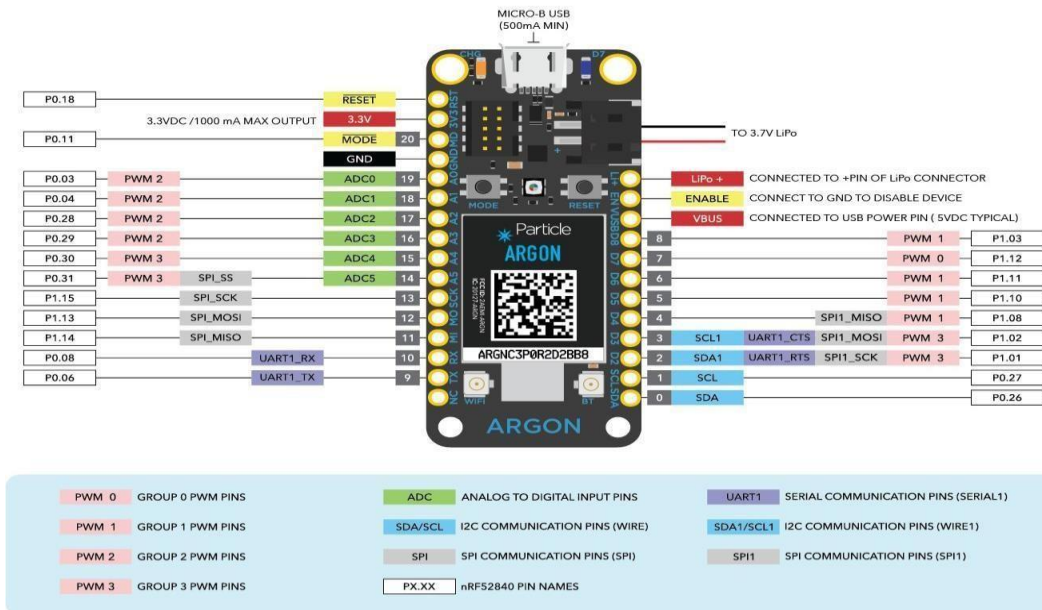
particle argon SWD

PIN MARKINGS



pin diagram of particle argon

PINOUT DIAGRAM



v1.0

pinout diagram

STATUS LED – ARGON

You are seeing the atomic number 18's standing semiconductor diode and Device Modes. To see the information for various instruments, use the blue unit filter on the left side of the page, just below the Particle brand.

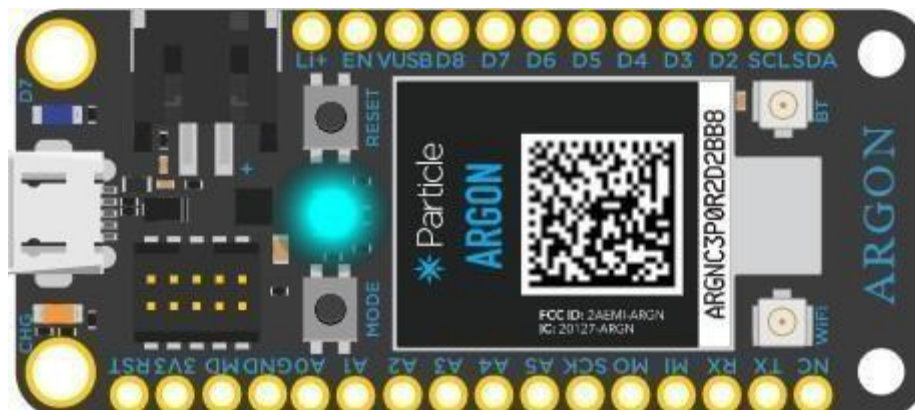
STANDARD MODES

These are the typical habits you may encounter from your system on a regular basis. They are the variations of sunlight on a balanced device.

Here's how an atomic number 18 behaves on a daily basis when powered on.

CONNECTED OR NOT

Because it's on respiration cyan, the computer is happily wired to the internet. You will be able to choose functions or flash code when in this phase.

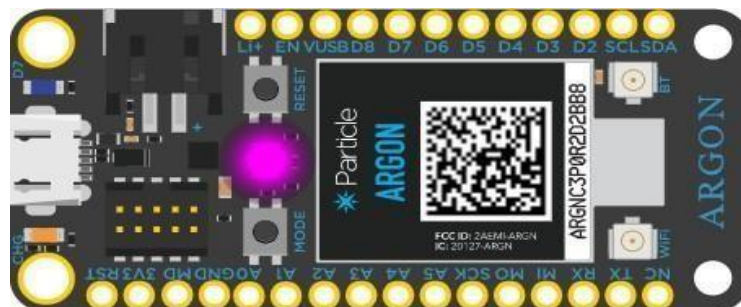


particle argon connected status

OTA FIRMWARE UPDATES

If your smartphone is flashing magenta (red and blue at the same time), it is currently loading an app or changing its microcode. A microcode upgrade or blinking code from the net IDE, CLI, or bench causes this state to be enabled. When you add your laptop to the internet for the first time, you will see this mode.

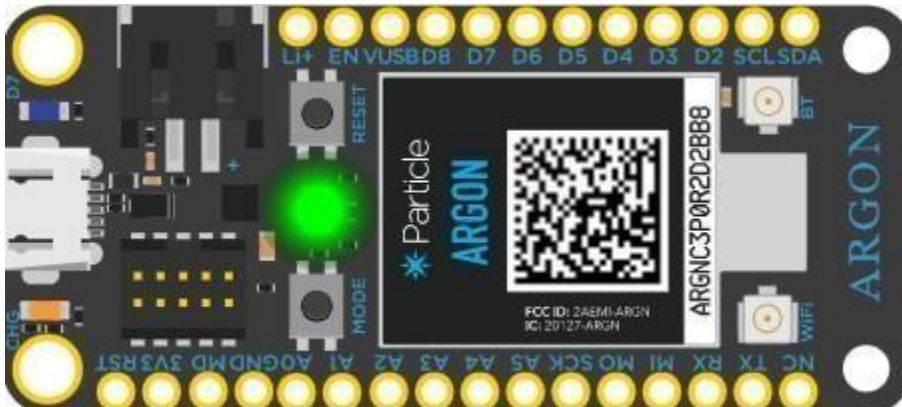
It's worth noting that if you access this mode by keeping MODE on boot, the flashing magenta means that holding the MODE button down will enter safe mode, which allows you to connect to the cloud without running device microcode.



4.3.7 particle argon firmware update status

SEARCHING FOR INTERNET

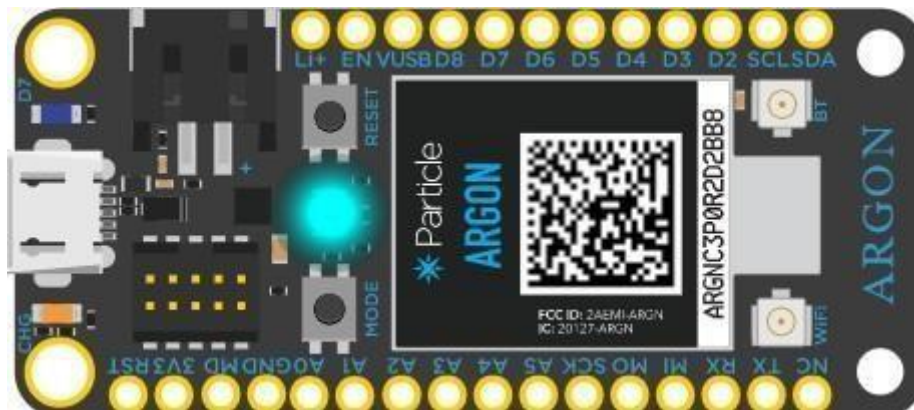
Your computer is attempting to bind to Wi-Fi if it is flashing green.



particle argon looking for status

CONNECTING TO CLOUD SERVICE

As the computer is in the process of linking to the server, it will rapidly blink cyan. This mode is often seen when you first add your computer to a network when it has merely blinked unfamiliar.



particle argon connecting to cloud status

RECEIVING MODE

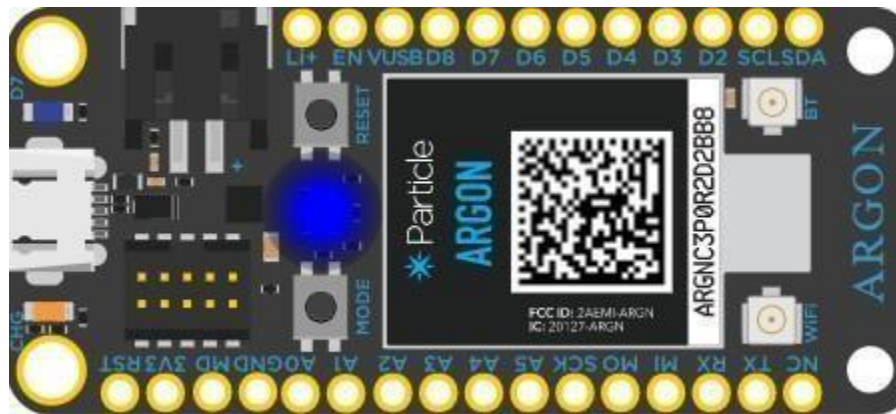
When your computer is in Listening Mode, it is waiting for you to configure your communications system or for setup through USB serial.

Normally, after you've successfully arranged your data three system using the iOS or robot smartphone applications, the configuration completed flag is ready and you can leave Listening Mode.

If you've reset your configuration or found exploitation USB, you'll need to manually set the configuration done flag exploitation these instructions to use the particle USB setup-done command.

Keep the MODE button for 3 seconds, or before the RGB semiconductor diode starts blinking blue, to place your computer in Listening Mode.

You can also reach listening mode by using particle USB start-listening.



particle argon listening status

NETWORK RESET (FAST BLINKING BLUE)

To clear the keep network settings on your computer, hold the MODE button down until it blinks blue, then hold it down for another 10 seconds until the RGB semiconductor diode blinks blue easily, then release.

- On all three models, it will clear the mesh settings and thus the setup full flag, allowing the system to return to setup mode (listening mode)
- For the atomic number 18, there would also transparent Wi-Fi settings.
- For the chemical part, it will also clear the cellular APN and SIM selection.
- For LAN, it will also clear the manipulation LAN flag.



particle argon network reset status

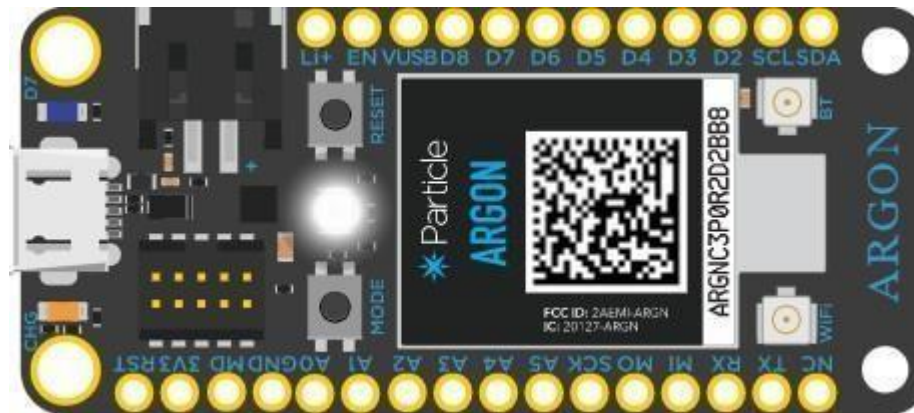
WIFI STATUS

If the computer is breathing white, the Wi-Fi module is turned off. Whether you have set your device to MANUAL or SEMI AUTOMATIC in a user microcode, you can see this mode.

- You used the term cellular.

and broadband central area network

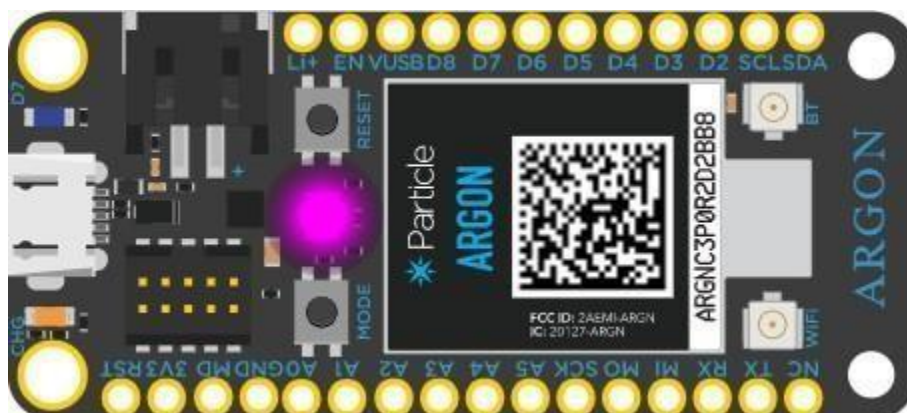
off() is a feature in your user microcode.



particle argon wifi off status

CHECKING FOR SAFE MODE

The computer connects to the cloud in safe mode, respiration magenta (red and blue at the same time), but no software microcode is run. This mode is one of the most useful for growth and troubleshooting. If something goes wrong with the app you installed on your smartphone, you'll be able to reboot it into Safe Mode. This runs the System OS without executing any code, which could be useful if the appliance code has vulnerabilities that prevent the device from connecting to the cloud.



particle argon safe mode

To place your computer in Safe Mode, follow these steps:

1. Press and hold each and vey button

2. Release the button exclusively when holding down the MODE button.
3. Keep an eye out for the semiconductor diode to start flashing magenta.
4. Press MODE buttons

Before entering safe mode, the system will perform the standard steps of connecting to the cloud: blinking beginner, blinking cyan, and fast blinking cyan. If you are unable to connect to the internet, you may not actually be in respiration magenta, but the execution of the program microcode will also be interrupted – therefore you are in an extremely “sort-of-protected mode” (for example, to reach “Safe Listening Mode”).

If there is no application code flashed to the computer or if the appliance is no longer valid, the device can enter safe mode on its own.

To enter safe mode, you can also use the particle USB safe-mode command.

DFU MODE (DEVICE FIRMWARE UPGRADE)

You must use this mode if you want to programme your computer with a custom microcode via USB. This mode activates the on-board bootloader, which accepts microcode binary files via dfu-util.

The installation guide can be found [here](#). There's even a how-to tutorial [here](#).
To enter DFU Mode, do the following:

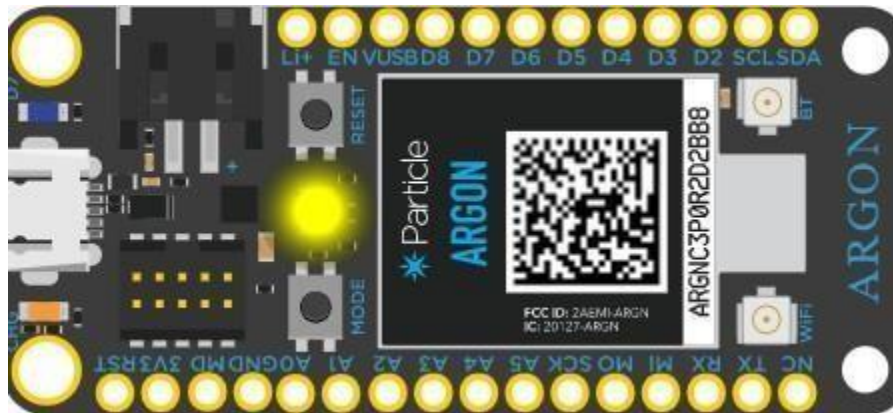
1. Press and hold each button
2. Release the button exclusively when holding down the MODE button.
3. Keep an eye out for the semiconductor diode to start blinking bright (it can flash magenta first)
4. press the MODE button

The computer may now be in DFU mode.

DFU mode necessitates the installation of application drivers under Windows. These are mechanically installed by the Particle command-line interface installer, but if you suspect driver issues, there is additional DFU troubleshooting.

Some users have reported dfu-util issues on USB3 ports (typically the blue ones). If the USB3 port is inoperable, use a USB2 port.

To enter DFU mode, you can also use the particle USB dfu command.



particle argon DFU mode

FIRMWARE REST

Gen three devices will store a backup copy of any desired user microcode in non-volatile storage at address 0x80200000, break free user non-volatile storage that is found at 0x000D4000. This backup copy of microcode are often fixed to user memory with a button sequence that's solely on the market once the backup copy non-volatile storage contains a legitimate microcode image.

To program your device with a backup copy of user microcode via USB, you'll have to place it in DFU Mode and run a command like one amongst the following:

You don't ought to flash tinker, of course, that is simply associate example. Note that the d00c, d00d, or d00e varies reckoning on the sort of device that is why there square measure 3 completely different commands.

To mill reset the user microcode once flashing valid microcode victimization the previous step:

Hold down the MODE button and faucet RESET. The standing LED can blink:

- Magenta (red and blue at identical time, safe mode)
- Yellow (DFU mode)
- Fast blinking yellow (restore mill firmware)

Be sure to unharness the mode button as presently as you get to quick blinking yellow, otherwise you will go one step farther and clear all of your settings furthermore.

FACTORY REST

Gen three (Argon, Boron) devices from the mill somewhat ironically don't have a mill user microcode backup image put in. therefore it is best if you pre-install one victimization the steps higher than 1st.

To mill reset, hold down the MODE button and faucet RESET. The standing LED can blink:

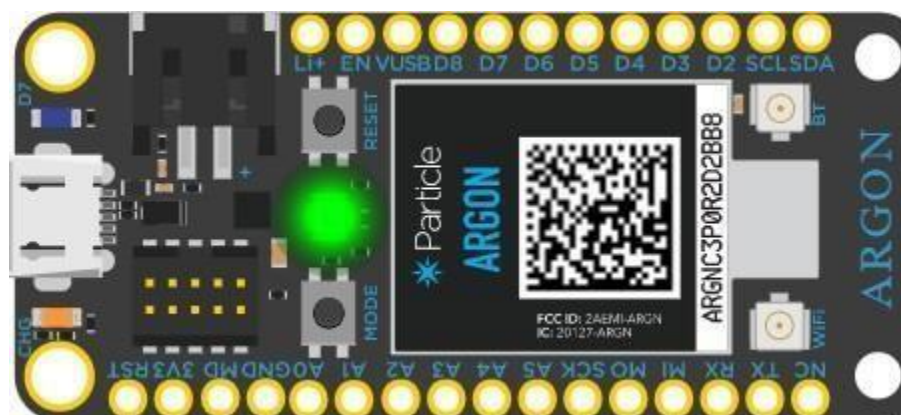
- Magenta (red and blue at identical time, safe mode)
- Yellow (DFU mode)
- Fast blinking yellow (restore mill firmware)
- Fast blinking white (factory reset) This will:
- Restore the mill backup user microcode (if present)
- Clear mesh credentials
- Boron: Clear any saved APN and default to internal SIM
- Argon: Clear Wi-Fi credentials
- LAN: Clear the victimization Ethernet flag
- Clear the setup complete flag, to force setup mode once more

Troubleshooting Modes

These modes allow you to understand a wide range of unusual problems that your system might be experiencing. Use this segment to troubleshoot any unusual colours you can see on your computer.

CLOUD IS NOT CONNECTING

When your computer is wired to Wi-Fi but not to the internet, it can emit a green glow.



particle argon cloud not connected

RAINBOWS/NYAN

Using the Signal choice within the net IDE, or the particle cloud nyan user interface command, you'll be able to have a device's standing LED show a rainbow pattern. this can be handy if you've got multiple devices near and don't seem to be certain that one.

RED BLINKING BASIC ERROR

Blinking red shows a large number of defects.

When connecting to the Cloud, the RGB LED will blink cyan, accompanied by:

- 1 orange blink indicates a decoding mistake.
- Two orange blinks indicate that you were unable to connect to the internet.
- 3 orange blinks: Connected to the internet but unable to connect to the Particle Device Cloud. This is usually yellow or red which shows unsafe server keys.
- 1 magenta blink: Flaw in authentication.
- 1 red blink: Flaw with the generic handclasp. The computer might have the wrong keys or has actually experienced a generic error during the handclasp process.

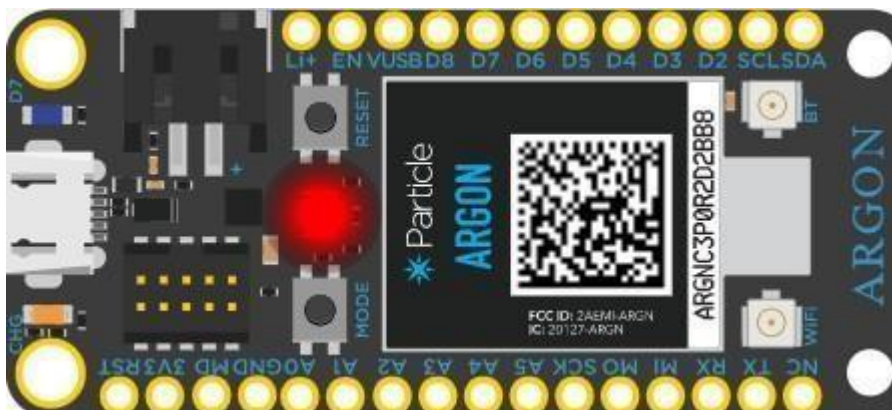
RED FLASHING SOS

Is your screen displaying a red light?

The microcode blinking causes a series of ten red blinks. The sequence is three short blinks, three long blinks, three short blinks (SOS pattern), followed by a variety of blinks based on the mistake, and finally the SOS pattern.

Join safe mode, fine-tune your microcode, and try again!

You can also reset your computer to a known state by following these instructions.



particle argon red flash sos

HEAP ERROR (14 BLINKS BETWEEN 2 SOS PATTERNS)

SOS+14 signifies:

- Semaphore lock timeout
- Since 0.8.0 sixty seconds terminated whereas attempting to accumulate a semaphore lock, probably because of dynamic memory allocation
- Since 1.2.0 different heap-related error, like allocating memory from Associate in Nursing ISR

Prior to 1.2.0, {attempting trying making Associate in Nursing attempt} to apportion memory from an interrupt utility routine would generally work, and generally corrupt the heap inflicting the software package to crash someday later, whereas doing one thing utterly completely different. Since this is often terribly troublesome to correct, currently a SOS+14 is thrown forthwith.

Some locations that area unit interrupt service routines:

- ISRs connected victimization attach Interrupt
- System event button handlers (just button status, button click, and button_final_click handlers, not all system events)
- SPI group action call backs
- Spark Interval timer library timer call backs

Things you shouldn't do from Associate in Nursing ISR:

- Most API functions, with the exception of pinSetFast, pinResetFast, and analogRead.
- delay or different functions that block
- Log.info, Log. Error, etc.
- sprintf, Serial.println, etc. with a little bit of (float) price.

SOLID COLORS

Solid colors are uncommon. There is only one expected scenario:

Most of the time, solid colors are the product of a bug. If the programming crashes or infinitely loops with interrupts disabled, the junction rectifier animation can be stopped. The junction rectifier's color is the last color it had before failing. As an example, it could be solid cyan if it was previously respiratory cyan, or solid red if it was to output an SOS pattern.

NO LED STATUS

If you turn on your computer and the standing junction rectifier does not light up, you might have a missing or corrupted bootloader.

- Unplug the USB (and battery, if you're victimization one)
- Hold down the SETUP button whereas plugging within the USB power

If you continue to see no amendment within the standing junction rectifier you most likely have a missing or corrupted bootloader.

TEMPERATURE SENSOR (AM2302)

The AM2302 may be a wired DTH22 clone enclosed in a giant plastic shell. It's a minimal wireless temperature and humidity sensor that's easy to use. To map the ambient air, it produces an external phenomenon humidity detector and a heat resistor, and generates a discrete digital signaling on the data point (no analog input pin needed). It's easy to use, however it necessitates diligent temporal preparation in order to collect data. The only real drawback to this detector is that it can only be replaced with new batteries.



4.4.1 temperature sensor

input from it every two seconds, but when we attack our library, the detector readings will be up to two seconds earlier. Simply add the red 3-5V power cable, the yellow wire to your data input pin, and the connecting wires to the rim. And the fact that it sends data over a single cable, it is not cityscape One Wire compliant! If you want sensors installed, each one should have its own data.

THERMOELECTRIC PELTIER COLLER

The thermoelectric Peltier system is used mainly in high temperature system. This system creates cool temperature at the point of intersection of two or more different types materials are at contact. The thermoelectric Peltier device act as a refrigerator the changes temperature of one side of the device to the other side of the same device using thermal and electric energy. This device is an active device, since it works only when energy supplied to it. This device generally used to reduce the temperature. This thermoelectric Peltier device is commonly called as thermoelectric current Peltier pump, Peltier apparatus, high performance white goods etc.

The thermoelectric current technology is not mostly used in the industries or in any purposes. This is a function in refrigerator. The vapor-compression refrigerator is most widely used than the thermoelectric Peltier. This is due to the less presence of moving elements like current liquid. The drawbacks of this type of thermoelectric device are less longevity, leakage current is more and small in size. The main advantage of thermoelectric Peltier device is the standard of cooling of is more and low power potency.

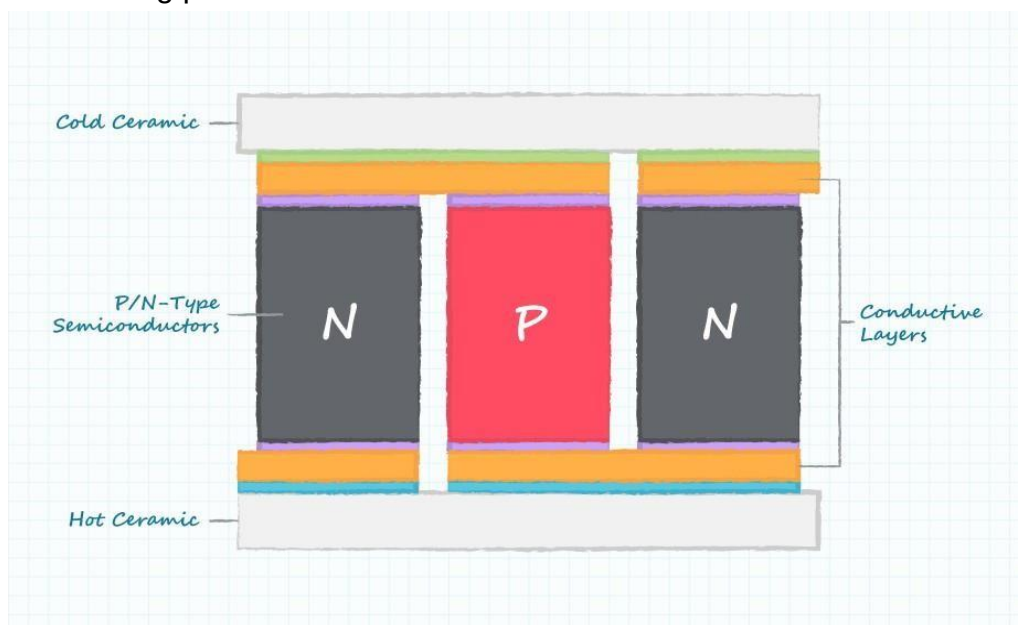
A Peltier cooler can also act as a thermoelectric generator. Or used as a cooler, a load is generated through the device, causing a temperature difference to form between the two sides. When used as an engine, one facet of the unit is heated to a higher temperature than the opposite facet, resulting in a voltage difference between the two sides (the Seebeck effect). Even so, a very well Peltier cooler is a mediocre thermoelectrical generator, and vice versa, due to very different styling and package requirements.

OPERATING THEORY

The Peltier device is used to cool a substance. When a direct current is given to the Peltier device the surface temperature of the Peltier device changes. When the voltage is applied the surface temperature of one side absorbs all the temperature of another side. By absorbing the heat energy, one side of the device gets hotter whereas another side will be cooler. These Peltier devices are cascaded so that the cooling effect gets maximum.

CONSTRUCTION & DESIGN

There are two types of semiconductors are mainly used in designing of Peltier meter, they are P-type semiconductors and N-type semiconductor. The arrangement of the P-type semiconductor and N-type semiconductors makes the Peltier device works. The same semiconductor is arranged alternatively and the semiconductor devices are connected through thermal conducting plates on each side

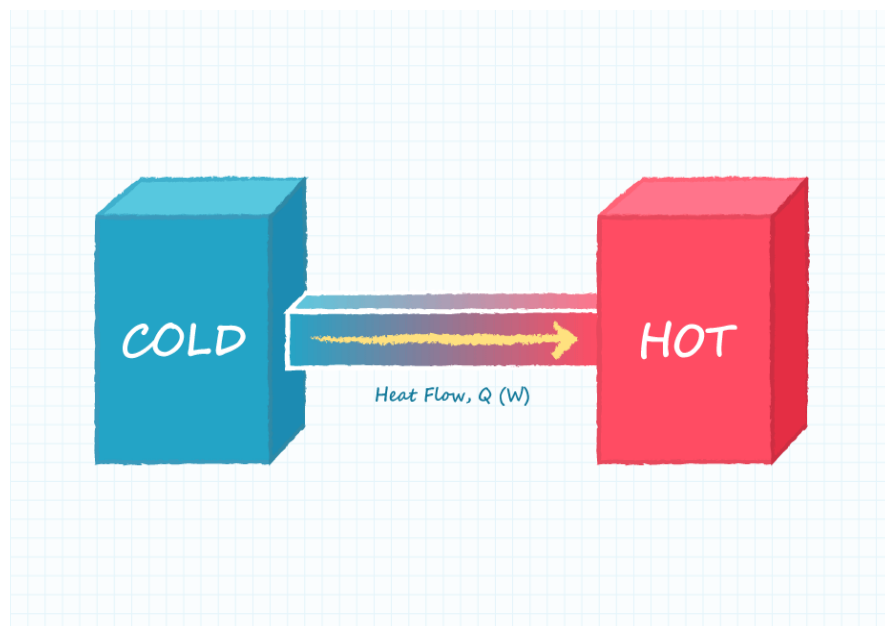


PELTIER METER

A Thermoelectric module contains number of Bismuth Telluride semiconductors. All the semiconductors that are used in the construction of a thermoelectric module are dope with any substance. Mainly the semiconductors used in the construction of the module are P-type semiconductors and N-type conductors. The P-type and N-type semiconductors are connected in series toward the electrical property and connected in parallel toward the thermal property of the materials. The ceramic substances in the module will provide the electric contact between each pallet. The ceramic materials used for interconnects provides strong mechanical, thermal and also increases the electrical bind between the pallets. The use of ceramic materials also insets the integrity among the pallets.

THERMAL CONDUCTION IN PELTIER MODULES

The sum of heat transmitted from the cold side to the hot side by a Peltier module is denoted Q and is measured in Watts. This parameter may be the heat emitted by an object to be cooled or the heat conducted to the surrounding atmosphere by the object being cooled. It should be noted that Peltier modules are not capable of absorbing thermal energy. Peltier modules only transfer thermal energy, and the energy transmitted must be dissipated on the module's hot side.



heat flow

TEMPERATURE DIFFERENCE IN PELTIER MODULE

The temperature difference (T) defined in a Peltier module datasheet is calculated on the outside surfaces of the module's two ceramic plates. It is critical in determining whether or not there is a temperature differential between the Peltier module plates and the external device temperatures of concern. The diagram below depicts five theoretically distinct temperature regions of a Peltier module structure.

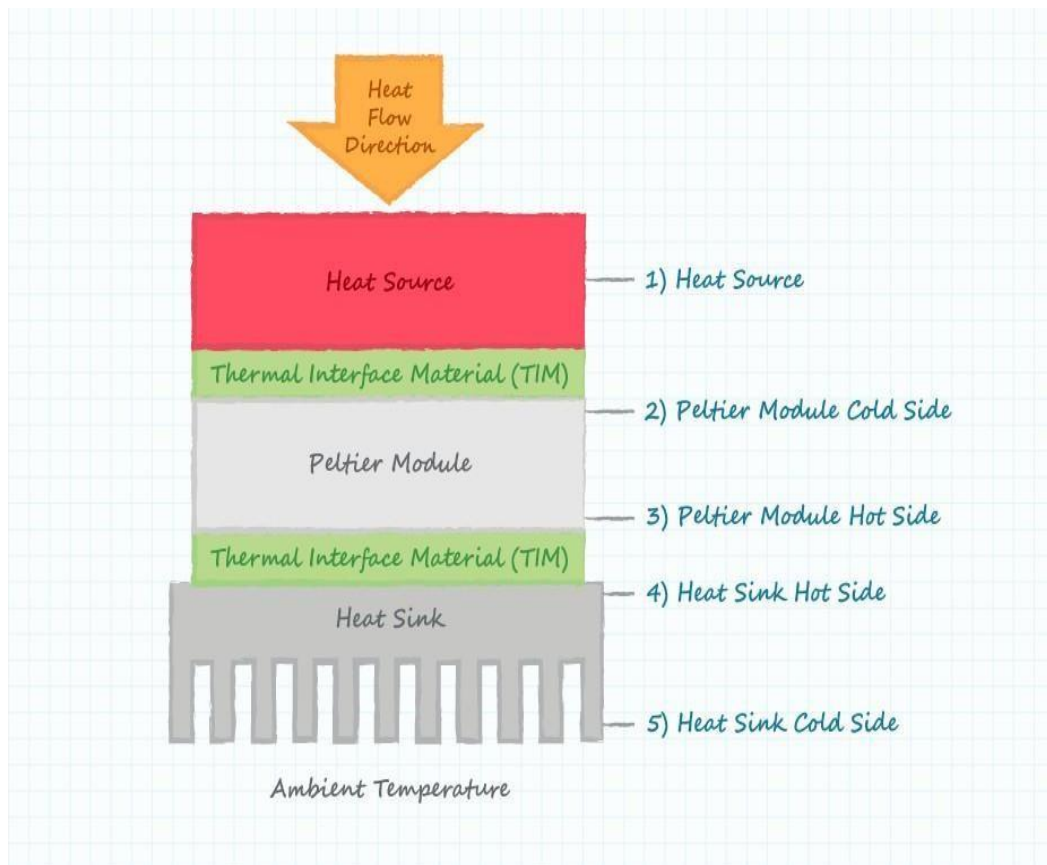


Diagram showing the various temperature regions of Peltier modules

TEMPERATURE OF HOT SIDE OF PELTIER MODULES

Peltier module properties vary with ambient temperature. CUI Devices, for example, provides specification data for more than one operating temperature. Since configuration data for the software's precise operating temperatures is unlikely to be usable, the nearest available data can be used.

SURFACE AREA OF PELTIER

Peltier modules' outer layer is usually specified depending either on the area of the object to be cooling or the area usable for thermal transfer. A low thermal impedance heat surface can compensate for an area imbalance between the usable area and the area of the Peltier module. Aluminum or copper can be used to make a simple heat dropper.

OPERATING CURRENT REQUIREMENTS

Peltier modules are current-driven gadgets like LEDs. The ideal working boundaries are most advantageously accomplished by driving the module with a controlled current source and permitting the current source to give the necessary burden voltage (the voltage consistency of the current source). This is comparable to giving a particular voltage to a voltage-driven gadget and afterward allowing the voltage to source give the necessary current (for example giving a voltage to a microchip and guaranteeing the voltage source can give the necessary burden current).

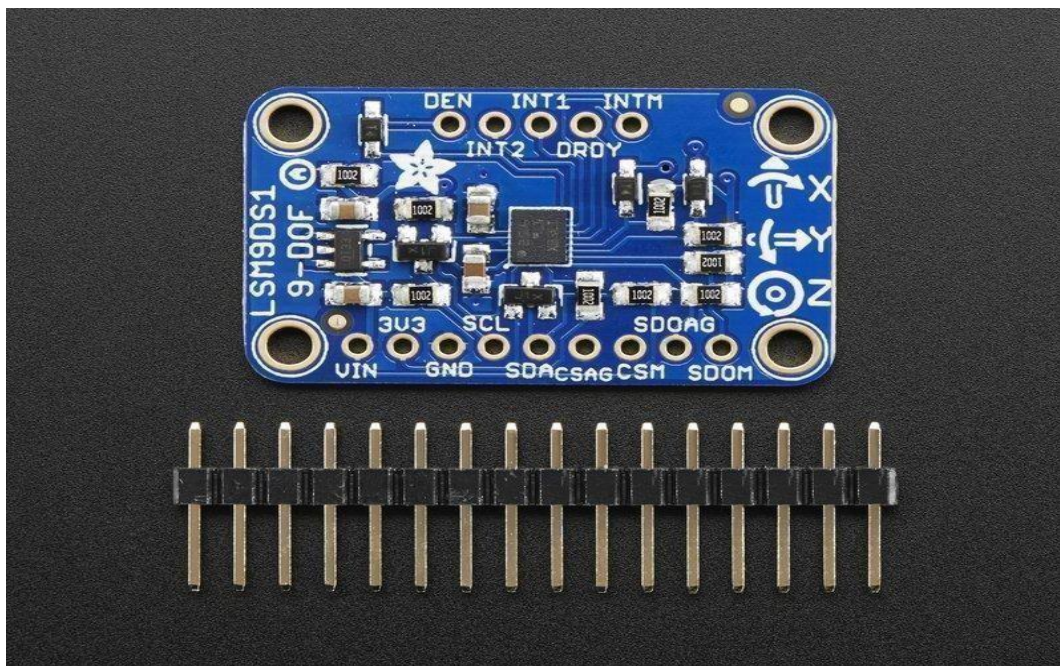
Peltier modules can be driven with voltage sources however doing so will make it harder to precisely control the warmth stream and temperature distinction across the module.

THREE AXIS MEMS VIBRATION SENSOR

Why vibration? in an exceedingly good world, there would be no vibrations from bearings, shafts, and alternative parts of rotating machinery. These vibrations area unit thanks to inevitable imperfections, balance problems, and slightly bent shafts and rotors, and aggravated by current wear and use. Since the important world is never good, differing types and aspects vibration can reveal a good deal concerning gift conditions, further give insight into worrisome trends and even close at hand failures of bearing, shafts, and machine tools

For bearings, the initial signs of wear and tear generally produce high- frequency noise that needs wide-bandwidth, low-noise sensors for early detection of initial bearing wear, that is usually thanks to the impacts created by little fragments of metal.

For shafts and motor frames, refined changes in alignment and balance that may adversely have an effect on motor performance demand low-noise, very stable accelerometers.



4.6.1 tri axial vibration sensor

- The LSM9DS1 has an I2C serial bus interface that supports commonplace associated fast mode (100 kHz and 400 kHz) and an SPI serial commonplace interface.
- Magnetic, measurement unit, and gyro sensing may all be allowed or deactivated to improve power control.
- The LSM9DS1 is available in a during an in a very plastic land grid array kit (LGA) and is guaranteed to run over a wide temperature range of -40 °C to +85 °C.

PCB

A computer circuit board could be a rigid structure that contains electrical electronic equipment created from embedded metal wires known as traces, and bigger areas of metal known as planes. Electronic parts square measure soldered to the highest, bottom, or each layers of the board onto metal pads. These pads square measure connected to the board electronic equipment permitting the parts to be interconnected along. The board is also composed of either one layer of electronic equipment, electronic equipment on the highest and bottom, or of multiple layers of electronic equipment stacked along.

Circuit boards square measure designed with a stuff core material with poor electrical conducting properties to create the electronic equipment transmission as pure as attainable, so interspaced with further layers of metal and stuff pro re nata. the quality stuff material used for circuit boards could be a flame-resistant composite of woven covering material and epoxy referred to as FR-4, whereas the metal traces and planes for the electronic equipment square measure typically composed of copper.

Printed circuit boards square measure used for a spread of functions. you'll be able to realize straightforward circuit boards in toys or controllers, whereas advanced circuit boards square measure utilized in computers and telecommunications.

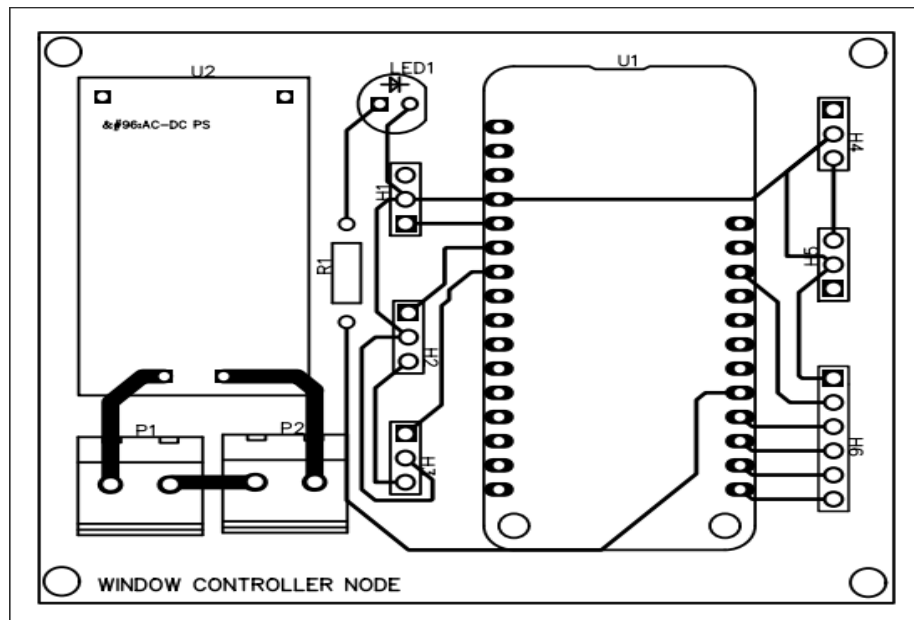
Some boards square measure created with versatile materials thereby permitting them to be utilized in distinctive cases and enclosures that need them to bend around alternative options of the device. Some boards square measure designed with specialized materials because of the high frequencies that they operate at, whereas alternative boards have serious layers of copper in them for top steam- powered circuits utilized in industrial management panels and alternative similar applications.

There square measure boards designed for extreme environments like underground sensors or the engine compartment of your automobile. specialised circuit boards square measure used for aviation, space, and military applications that impose strict tolerances on their producing and performance.

Although there square measure many alternative applications for computer circuit boards, they're typically designed following a standard method. this is often what we are going to examine next.

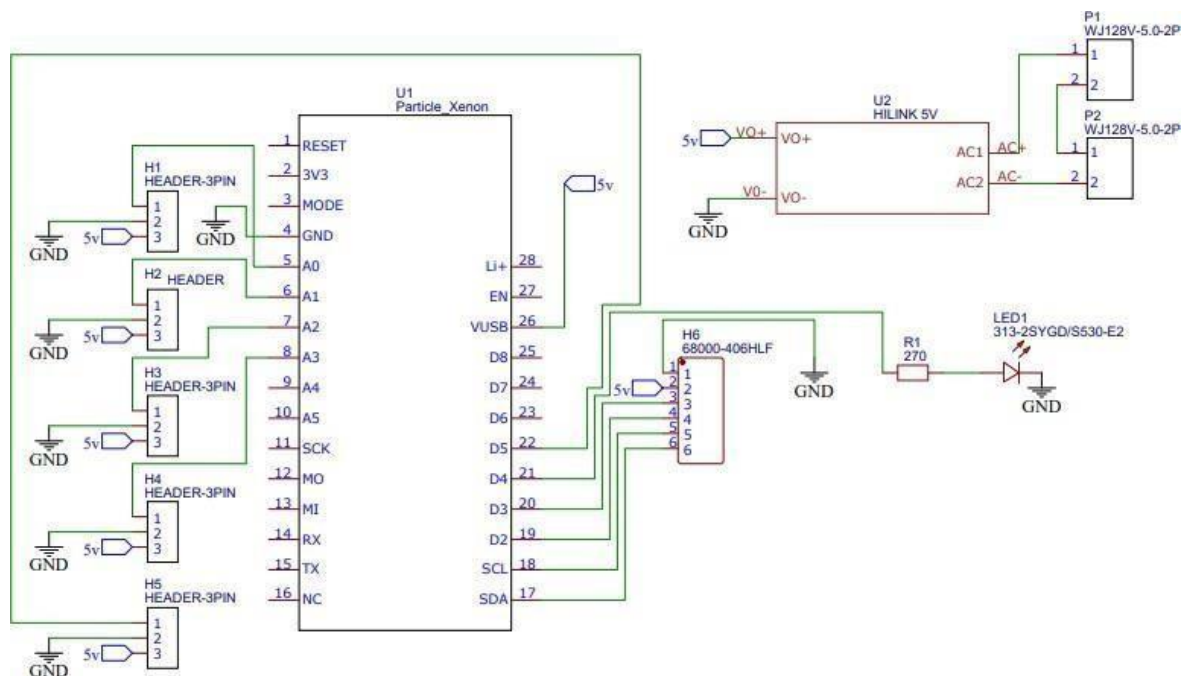
PCB DESIGN

- Particle Argon
- Analog pins
- Digital pins
- Ac to Dc Convertor
- switch



PCB design

Schematic diagram



schematic diagram

ANALOG SIGNALING

As seen in the diagram, analogue signals square measure constant electrical signals that vary with time. In other terms, connect an analogue signal is any continuous signal in which the time-varying function (variable) of the signal is a representation of another time-varying number, i.e., analogous to another time-varying signal. It generates small variations within the signal, which square measure extremely useful for, and which digital signals ignore.

Not all analogue signals differ as freely as the wave form depicted in Figure. There are small differences in the analogue signal that can be measured squarely.

To transmit the signal's data, an analogue signal makes use of some property of the medium. For example, an aneroid used to transmit pressure data employs rotary position as the signal. Voltage is the most commonly used electrical property, followed by frequency, current, and charge.

Each data is often transmitted by an analogue signal; typically, this proof is calculated the variations in the physical phenomena, like vibration, illumination, thermal , location, or force, which is accomplished by an electrical instrument.

Analog signals have an infinite resolution. In the real world, an analog signal is susceptible to noise and has a finite slew rate. As a result, each analog and digital device square measure subject to resolution and information measure limitations. As analog systems become more complex, effects such as non-linearity-related noise eventually degrade analog resolution to the point that digital device output can outperform it.

ANALOG SIGNALING (TRANSMISSION)

Despite the fact that most instruments now use digital technologies, analogue technology is still used. The labs and a few manufacturing companies continue to use the most recent technologies, namely analogue signals. And a basic understanding of how analogue signal transmission operates.

Before we get too deep into analogue signal transmission, we must first understand the relation that makes analogue signal transmission is possible. The analog signal is obtained by the relationship between voltage and current with respect to time, and electrical phenomena that allows an infinitely variable current or voltage to reflect a constant voltage. Method

Electric current is the movement of electrons, and voltage represents the amount of work done to move a unit charge of electron (1 coulomb) from one point to another point. The voltage unit is often referred to as the potential difference, or the potential unit (V). The SI unit of electrical current is the ampere, denoted by the letter 'A,' which is denoted collectively as coulomb per second (c/s).

A voltage source(V) will allow a current, I, to flow through a resistive electrical system, R. Ohm's rule, invented by the German scientist Georg Simon Ohm, describes the relationship:

$$V=IR$$

While most monophonic analogue signal transmissions use DC (direct current) or voltage variations to reflect information worth, frequency variations of alternating current (ac) may also be used to relay data. Jean Baptiste Joseph Fourier, a French physicist and man of science, discovered in the early nineteenth century that alternating current signals can be defined in terms of trigonometric feature waves. A wave is defined by three parameters: amplitude, period, and frequency. The amplitude is the peak value of the wave in either the positive or negative direction, and the duration is the time it takes to complete one loop of the wave.

PROS OF ANALOG

- The greatest benefit of associated log signals is their fine description, which allows for an unlimited number of signal resolutions. Analog signals have a greater density than optical signals.
- When opposed to complex digital signals, analogue signals square measure simpler and less complicated to method. An analogue signal can be processed directly by analogue bits, but certain processes are only available in digital form.
- Analog signals are relatively simple to generate and transport.

DIGITAL SIGNALING

Digital signals square test the one that square measures non-continuous, step-by-step adjustment. They bear pulses or digits of distinct degrees or values. The value of a pulse is stable, but there's a sudden change from one digit to the subsequent. Digital signals have two amplitude ranges known as nodes. the value of the square measure fixed jointly of two possibilities such as one or zero, HIGH or LOW, TRUE or FALSE, and so on. In fact, the values square measure anywhere within a certain range, and we outline values within a specified range

TIME SIGNALING (DISCRETE)

An analog signal is a bit of information that varies over time, such as the temperature at a particular spot, the depth of an obvious reason within a pond, or the voltage amplitude at a node in a circuit which will reflect itself as a function, with a time as the free (abscissa) parameter, and the signal as the parameter. A discrete-time signal is a recorded analog signal in which the information value is recorded at predefined times (for example, per microsecond) rather than forever.

Specific time values of a discrete-time signal are called a digital signal if, rather than being computed exactly (which would necessitate an infinite range of digits), square measure is approximated to an arbitrary accuracy that necessitates solely a selected set of digits. Quantization refers to the process of approximating the exact worth among a fixed set of digits or bits.

DIGITAL SIGNAL (TRANSMISSION)

Simultaneous transmission and sequential transmission are two methods for transferring digital data from one or more devices or contact users.

TRANSMISSION OF BITS IN PARALLEL:

Both of the bits of information signal are transmitted reliably at the same time in bit parallel communication. Transmission of bits in parallel over a sufficient number of signal lines.

The design costs a lot of money, and it's only feasible for great range. For the transmission of one computer memory chip, a minimum of nine lines, eight bits, and a reference potential are needed.

As a result, this approach is almost only used for unit buses at the moment. This application requires fast transmission speeds over short distances while avoiding conversion methods that involve an oversize number of components.

TRANSMISSION OF BITS IN SERIES:

Serial transmission can be advantageous over long distances. Only one signal line transmits the bits in this situation, another does not. As a result, data transfer takes a long time, and that's tolerable because, from the other side, installation effort and hence costs are drastically reduced.

Since all data is usually received and transmitted in bit-parallel form, the transmission should decode the information between parallel and linear, and the listener should encode it again. This process is carried out by customized shift registers that are already integrated into communication modules.

AC to DC POWER SUPPLY MODULE

Switch Power offer Module is plastic basined PCB mounted isolated switch change of magnitude power offer module. It will offer 5V DC from 120V AC – 230V AC and incorporates a power rating of three Watt. This makes it good for tiny comes that wants a five potential unit offer from mains. There square measure several blessings for these modules, like low-temperature rise, low power, high potency, high dependability, high-security isolation etc.



4.8.1AC to DC convertor

This Power offer Module voltage supply could be a switch supply; therefore, you are doing not ought to worry regarding fluctuations in voltage grid. it's designed to be mounted on the PCB and is that the ideal answer to power pads that you just take. it's wide employed in a sensible home, automation and management, installation, instrumentation and different industries.

DIRECT CURRENT MOTOR

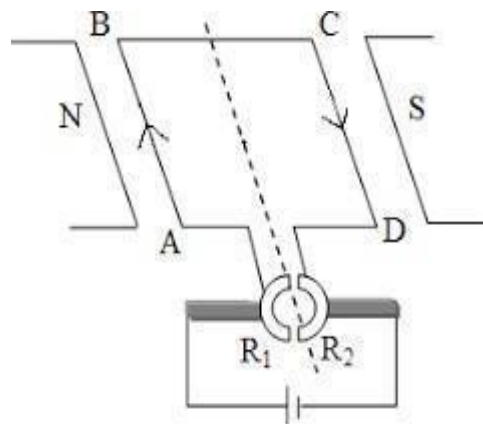
A direct current (DC) drive is a device of electrical device machine that converts mechanical energy into electric. Direct current motors use direct current to convert wattage into mechanical rotation.

DC motors control the rotation of a rotor connected to the output shaft by using electromagnetic waves created by electrical currents. Both the electrical input and the motor's configuration influence the output force and rpm.

WORKING

Any rotating electricity grid that converts direct current (DC) power into electricity is referred to as a "DC motor." DC motors differ in length and capacity from tiny mechanisms used in toys and gadgets to massive movements used to size trucks, pull elevators and lifts, and drive steel rolling mills. Will direct current motors, on the other hand, function?

DC motors are made up of two main parts: a mechanical mechanism and a coil. The mechanical device is the motor's stationary part, while the coil rotates. The mechanical system in an extremely DC motor produces a spinning field that drives the coil to spin.



4.9.1 DC motor working

A simple DC motor generates a magnetism field aligned with the coil's core by using a stationary set of magnets within the mechanical device, as well as a loop of wire with current running it through. One or two wires of coated wire square measure wrap across the center of the motor are used to concentrate the field.

The armature winding of square insulated wire connected to something like a circuit (an electrically operated transition) that induces an electrical charge to the coils. The switch enables each coil to be activated in turn, resulting in a gentle spinning power

Whenever the magnets square measure is turned in and out in sequence, a rotating field is created, which interacts with the changing forces of the stationary magnets within the mechanical structure to form torque, allowing it to rotate. These fundamental operating principles of DC motors enable them to convert direct current (DC) power into power thru spinning motion, which could be used in subject motion.

SOFTWARE REQUIREMENT

4.10.1 PARICLE WEB IDE

The Particle net IDE is an Integrated Programming Environment, or IDE; this means that you basically can-do software package development in an easy-to-use programmed that runs in your browser.

The navigation bar on the left is where the Particle net IDE begins. There are three buttons on the top that perform important functions:

- **Flash:** This code is flashed to the screen. This initiates an over-the-air microcode upgrade and loads the latest programmed into your computer. Note: Flashing OTA for cellular devices needs information, and you can consider using flash over USB instead.
- **Verify:** This compiles the code without actually flashing it to the device; if there are any bugs in your code, they will be shown in the appropriate monitor at the bottom of the screen.
- **Save:** This function saves any improvements you've made to the code.

There are four additional keys to maneuver through the IDE at an all-time low:

- Code: Displays an inventory of your microcode programmer and assists you in selecting one to edit/flash.
- Library: Browse libraries submitted by other users and build your own.
- Docs: Takes you to the Particle documentation.
- Gadgets: Displays an inventory of your devices, allowing you to choose which to flash and gain more information about each device.
- Settings: change your password or sign off.

CONNECTION

The AC prediction system contains two parts. One is the power supply part and the AC controller part.

In the power supply contains a rectifier circuit and relay switches. The rectifier is connected to main supply which is 230 volts as input and 5v as output. In the rectifier contains a transformer which is the first stage in the rectifier circuit. The transformer takes the input voltage at 230V and gives output voltage at 5V, without change in the frequency. This module operates only for the alternating current supply only. The second part of the power supply is the relay board which works on the principle of electromagnetism. The relay switches are used to change the circuit from one point to another point. This module the relay is connected between the power source and AC machine. The relay switch in the module is used to make the air conditioner on and off.

The second part of the circuit contains the controller part. In this part the elements that are used to calculate the values or the readings from the machine are present. The elements that are present in this part sensors like, vibration sensor, temperature sensor, Peltier meter. The processor used to collect all the data from the sensors are done through a special embedded board called Particle Argon board.

Every sensor used in the circuit consists of mainly three terminals. They are supply terminal (VCC), input or output port and ground terminal. All the supply terminals in the module are connected to rectifier output, which is 5V terminal in the rectifier circuit, and all the ground terminal in the circuit are connected to common ground terminal of the module. The inputs of the sensors are given to the specific pin in the Particle Argon board. The output terminal of the vibration sensor is connected to the digital pin 5 in the particle argon board. Output terminal which is input for the Particle Argon board which provides the raw data of the temperature is connected to the analog pin A0 in the particle argon board.

To show the status of the air conditioner in the module, an LCD display is used. In this LCD display contains a VSS pin which is a source or supply pin connected to the 5V supply pin in the module and the ground terminal of the LCD display is connected to the ground terminal of the module. To transfer the data to the LCD display uses four-bit address lines, which transfers eight bits of data from the Particle Argon board. The LCD display contains four digital pins which are used to take the data. The four data digital pins of the LCD display is connected to the port H6.

The relay board in the module contains an input pin. The input pin is connected to the digital pin 2. This pin send a a signal to the relay circuit to turn on or turn off the AC machine.

WORKING

The AC machine is a costly machine used to cool the room. The machine can make the room temperature either hot or cool. The cooling and warming of the room is done by compressor. The compressor is heated up to 150 degree centigrade. If the compressor reaches the threshold temperature, the compressor in the AC machine gets damaged. The proposed method helps in controlling the compressor, such that the lifetime of AC machine increases.

The module contains two sensors. The sensors collect the information from the AC machine and send to Particle Argon board. The vibration sensor collects the information of the vibrations done by the compressor in unit time. Whereas the two temperature sensors collect the information related to temperature of the machine inlet and another at outlet.

The temperature sensor sends the raw data to the Particle Argon board. The raw data is in analog signal. The analog signal is in the voltage level. The raw data, that is the analog signal is converted in to the Celsius or Fahrenheit. The formula used for calculating the temperature in Celsius is $C = \text{RAW}/128$ and the formula for calculating the Fahrenheit is $F = (\text{RAW}/128 * 1.8) + 32$, the formula to convert the Celsius temperature into Fahrenheit is $F = (C * 1.8) + 32$.

The vibration sensor in the module senses the vibration caused by the compressor when the module is installed. The raw data or the raw values is sent to the Particle Argon board, for further processing. The raw data is sent by the vibration sensor is converted into angles. When the threshold value is reached that is not above 80 percent and not below 20 percent.

The values that are taken from the sensors are processed and the obtained the values as temperature in Celsius and the vibrations as angles. The processed values or the obtained values are mapped with threshold values. When the values obtained are reached to the threshold values the power supply given to the AC machine is off. The threshold values to make the compressor in the AC machine off are, for the temperature, the upper limit is 150 degree centigrade and the lower limit is 4 degree centigrade. For the vibration obtained from the compressor should not exceed 80% and should not be less than 20%. If the above-mentioned conditions are not matched then the AC machine is turned off or else if the conditions are not matched then the AC machine will be on.

CHAPTER 5

RESULT

Threshold values are 37.8 for hot and 25.4 for cool temperature.

TEMPERATURE READINGS

HOT TEMPERATURE	COOL TEMPERATURE	MOTOR CONDITION
32.6	31.9	ON STATE
34.7	29	ON STATE
35.7	27.8	ON STATE
37.8	25.4	CHECKS FOR VIBRATIONS

VIBRATION SENSOR READING

X - axis	Y - axis	Z - axis	Motor
110	-103	36	On state
120	-96	22	On state
130	-128	100	Off state

We have taken different temperature readings. To observe the motor condition whether it is in ON state or OFF state. Here is sample reading



a) cool temperature reading 1



b) Hot temperature reading 1



c) cool temperature 2



d) Hot temperature 2



e) cold temperature 3



f) Hot temperature 3

5.1.1 temperature readings

From the above figures shows the readings of temperature and vibrations of the air conditioner, we observe that when temperature and vibrations reach threshold value then sensor will go to ON state values and Motor goes to off state and When temperatures are normal (that means below the threshold values) again the motor will go to on.

CONCLUSION

From then results the fault detection is reached by turning off the motor and turning on the AC machine. The values obtained from the sensors are collected to Particle Argon board and sends the statis of the air conditioner machine.

By using the Particle Agon board the tracking of the ac machine is obtained. So, the monitoring of the machine is made easy and smarter. This helps to get the status of the machine from time to time and period to period.

The smart technology used in the module will prevent the humans to reach the AC machine and helps in displays hundreds of AC machines status in single unit of display in the control point.

The automation of the monitoring system helps in decreasing the time taken to check every machine and reduces the effort also.

Finally, we conclude that the amount of air conditioner failure is mainly due to the compressor. Basically, the compressor state can be detected using the input and output temperatures if the temperatures are nearly equal to the threshold values, then if we check the vibration analysis of the compressor if there is a vibration in compressor it is proved that the system is going to fail. By using this phenomenon, we are switching off the motor.

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