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Remote Sensing Satellite (BTS)

(Lower Orbit Monitoring Satellite)

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Abstract: In this project we will talk about satellite. Satellites are mainly of two types. Artificial satellite and natural satellite. Satellite can provide data in open source. It can be of many types on the basis of work like point to point and point to multi point satellite. Satellites are made on the basis of their work like Discovery Satellite, Planetary Satellite, Geostationary Satellite, Lower Orbit Satellite, Weather Monitoring Satellite. The satellite made by my group is a lower orbit satellite. Who will monitor the weather. I have used four transponders inside this satellite. It can also receive the audio signal from the earth station. After the receiving signal from the earth station, it amplify and filtering the signal again retransmitted signal on earth at the multipoint. In this satellite, I have used four transponders, which are used in different types, all these transporters are connected to each other, for charging the battery in this satellite, I have installed solar panels, this satellite will monitor the data of the lower orbit and Continuously sends the collected data, a Geo Stationary Orbit transponder is used inside it. This satellite will revolve around the earth 500 kilometers above the earth, whose speed will be 7.9 kilometers per second. Inside this satellite I have used SSB (single side band) technology through which we can transmit and receive single data only, we can use DSB technology to transmit and receive double side band data or It is a project model so I have used SSB technology in it.

Introduction

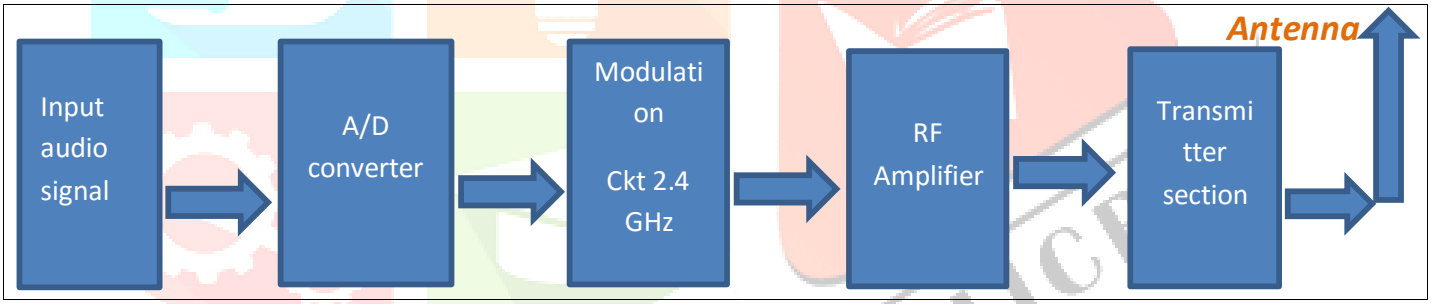
The satellite made by me in this project is a model satellite which can transmit and receive data from 2 km open sky but satellites located in lower orbit transmit and receive data from 500 km to 800 km height. And there is something different from my satellite, then the RF amplifier which can transmit the data to a greater distance by amplifying the signal more, my satellite has a 1.65 watt amplifier, so that the transmitter can be in the range of 2 kilometers. The first transponder inside the satellite is 24 hours active data, which is always connected to our earth station, it also controls the rest of the transponders. When I need the transponder, I give the command to the first transponder and it turns on the second transponder, when I do not use the other transponder, then I turn off the other transponder, so that the battery of our satellite And the life span increases and electricity also costs less and the satellite remains active for 24 hours. The first transport works to manage the other 3 transponders, the second transport monitors the weather data of the lower orbit through sensors and reads and writes the monitored data, writes the read data and sends it to the rough amplifier. Is. Amplifier antenna that transmits the data. The third transport receives the data coming from the earth. Converts the digital signal coming from the earth to analog form. After that filters that signal. Band pass filter has been used here as a filter, through which only a limited band of frequencies can pass. After this the signal is input to the fourth transport, it converts the received signal into digital form, and inputs into the high power rough amplifier, whose watt is 1.65, and it transmits data from one point to multipoint. Does.

- **PROJECR PLANNING**

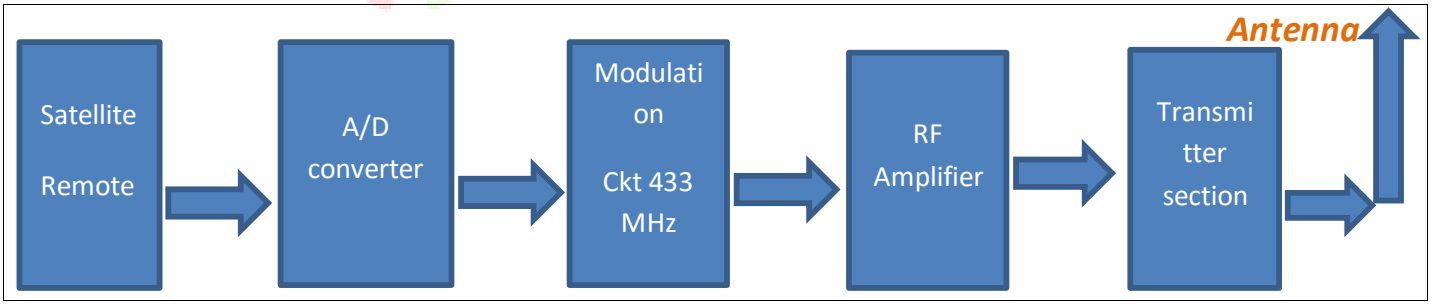
In the planning of the project, first of all we will see its block diagram. Through the block diagram, we will understand main components, which we will use in designing this system. Block diagram is the main component of any project. Through which we can understand about the components used in it. And its practical image which you can understand in your mind. Block diagram makes it easy to design a project. And its design also becomes easy which we can easily understand. So we will first look at the block diagram, after that we will talk about the material of the project, which components will be used in the project material and will also see its connection diagram. So first of all let us talk about the source of block diagram. Before planning this project, I have carefully observed and understood many things. So that there is no problem in making this project. I have collected all the components according to the plan of my project, and I have done the designing of all the circuits by my own hands. Because this is my idea and I will make it based on my common sense. It took a long time to make this project because it is a very big project. There are many parts of this project such as Satellite Transporter, it is the main part of the project. Satellite transport will be installed inside the satellite. Transmitter station from where we will send the data and manage the satellite. Multiple point receivers will receive the data coming from the satellite at multiple points. To read the sensor data coming from the satellite, a separate system has to be designed which displays the data of the sensors. Antenna has a very big role in this project, through which we will transmit and receive the data, an effective height and width is needed to transmit and receive the data. so that the proper data can be communicated from the antenna.

- **TRANSMITTER SECTION**

The satellite made by me is completely based on the programming of RD No. In its transmitter section, I have input analog signal and I have set all the pins of ID No in 0 step in programming, so that the incoming input data is converted into digital form. Can turn into And it inputs the data converted into digital form into nrf24 l0 1 IC, so that the signal of 10 KHz is modulated here and it turns into 2.4 GHz, the power of this signal is increased by a rough amplifier. and it is transmitted through the antenna. I assembled all the components needed for the transmitter section.

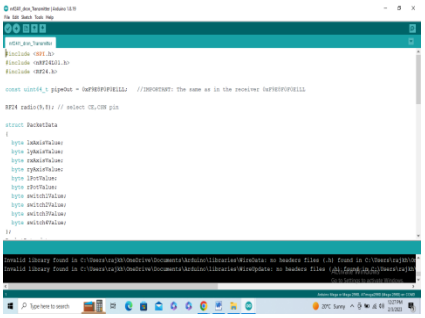


Audio **Transmitter Block**



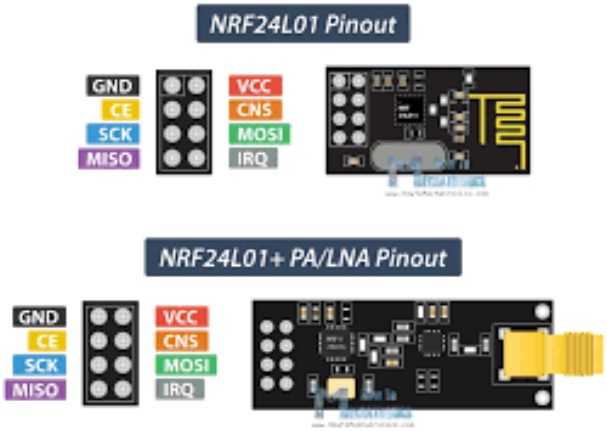
Block diagram of Remote for satellite control Transmitter circuit

Arduino uno



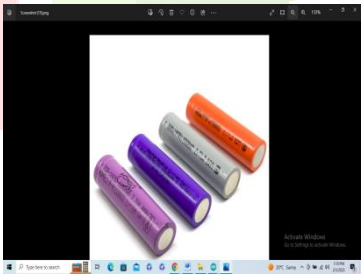
Arduino software

We can program Arduino Uno with the help of Arduino software and this program will be for transmitter. It only supports c programming.



nrf24l01 frequency transreceiver module

nrf24l01 is a RF frequency module. Which transmits the freqwancy 2.4 GHz and can also receive. It operates on a single 3.3 V supply. It has 6 pins out of which 2 are for power supply and two are for MISO and MOSI, and one is for SCK and the other is CE. It comes in the market in the range of 100 meters and 1 kilometer. In the model of 1 kilometer range, a Rf amplifier is used in front of the transmitter IC which qualifies the frequency.

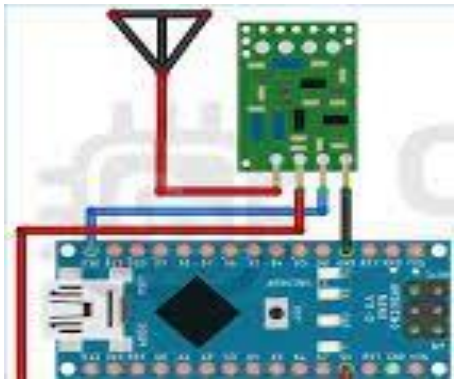


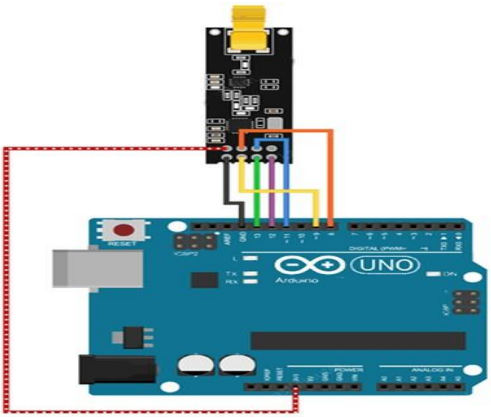
Lithium ion battery

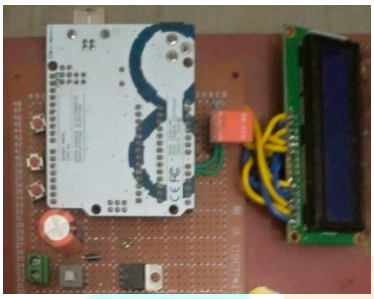
In transmitter and receiver section, I have used 12 volt lithium ion chargeable battery, which can be recharged after power down, and this will allow our robot to continue working and transmitter and receiver section will always be on.

- **TRANSMITTER CIRCUIT**

In the transmitter section, I have used two RF amplifiers, the first RF amplifier operates at 2.4 GHz and transmits audio signals to the satellite, and the second RF amplifier operates at 433 MHz frequency, which monitors, manages, and controls the satellite. Signals are transmitted through a single antenna. Different Arduinos have been used to control all these signals, and different programming has been used. I designed all of these on a single PCB. I arranged all the components according to the circuit diagram on the zero PCB and soldered them. After the circuit is complete, I programmed the arduino and observed its frequency response on the CRO.







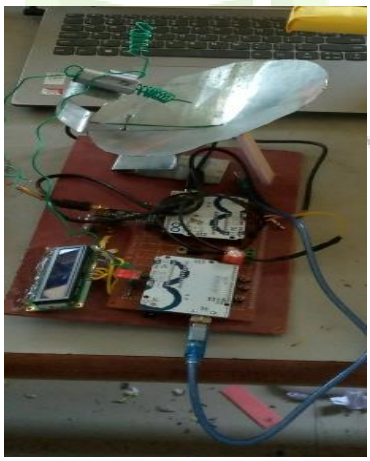
Remote for satellite control Transmitter circuit

Audio **Transmitter circuit**

I have also connected a display in the satellite managing transporter so that it can tell us the current position of the transporter of the satellite. I have used aux cable to input audio signal in transmitter section.

COMPLETE TRANSMITTER CIRCUIT FOR SATELLITE

The satellite base station made by me operates on 5 volts, it will continue to work on 5 volts for 24 hours. It will not need any other voltage. I have connected all the components to the arduino as per the circuit diagram and by programming very carefully I have successfully tested the transmitter section on the CRO.



COMPLETE TRANSMITTER CIRCUIT FOR SATELLITE WITH REMOTE

- **SATELLITE TRNSPONDER**

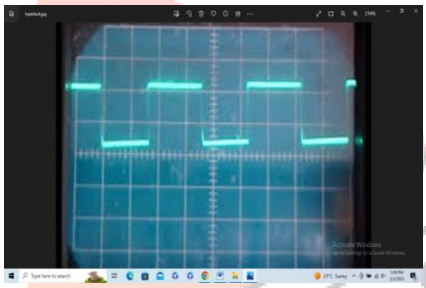
All the components of the transport have been connected according to the circuit diagram. And 3 rf transmitters have been used in it. This transporter is fitted with sensors to measure immunity temperature data communication speed, different type gas, erorr data.

Satellite Transponder

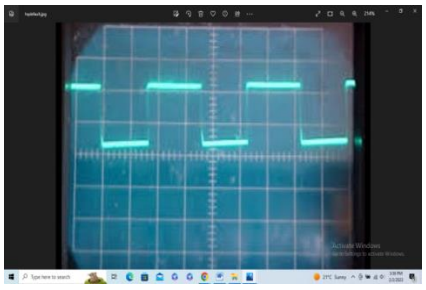
Output frequency response of all transponders

The output frequency response of my Transportation was all but the same. So that my transponders were continuously communicating with each other. And this same frequency response output was also on the transmitter section so that the communication speed was very fast and without data error.

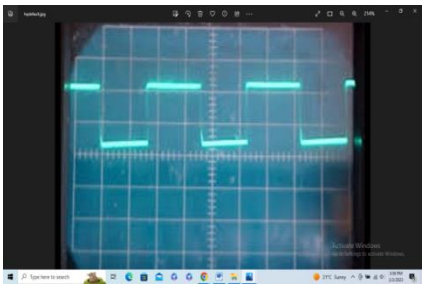
Output frequency response 1st TRANSPONDER



Output frequency response 2nd TRANSPONDER



Output frequency response 3rd TRANSPONDER

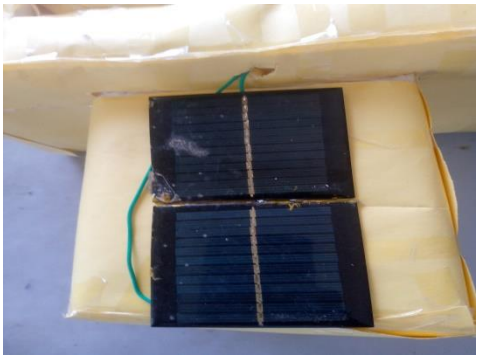


Output frequency response 4rthTRANSPONDER

The output frequencies of all these transponders are multiplexed through a multiplexer. so that a single frequency is received it is easy to transmit and receive a single frequency so a single frequency is being transmitted and received on a high gain antenna. If I change the amplifier of the transmitter, it will also start working like the original satellite, it will also start transmitting and receiving data from a distance of about 500 to 800 kilometers.

SOLAR PANEL OF SETELLITE

For charging the satellite's battery, I have installed a solar panel on the side of the satellite. Pure DC power is available from these solar panels. I have switched this power through a transistor and register. After switching, its orkut is inputted into the battery through a diode. When sunlight falls on the solar panel. So they change the light energy into electrical energy. And this electrical energy is input into the battery by switching it through transistors so that the satellite's battery is always charged.



I have designed the charging circuit of the battery on the circuit of the transporter itself, so that the charging from the battery gets cut off when the extra charge is reached, and our transporter starts taking energy directly from the solar panel. As soon as the light on the panel stops reading, immediately the transporter starts taking power from the battery and when the charging is full, we have also installed Autocut battery charging system to increase the life of our battery.

ANTENNA OF SATELLITE

I have used a high gain antenna on the side outside the satellite. It receives the signals coming from the base station of the earth and re-transmits the frequency received from the transmitter of the transponder to the earth.

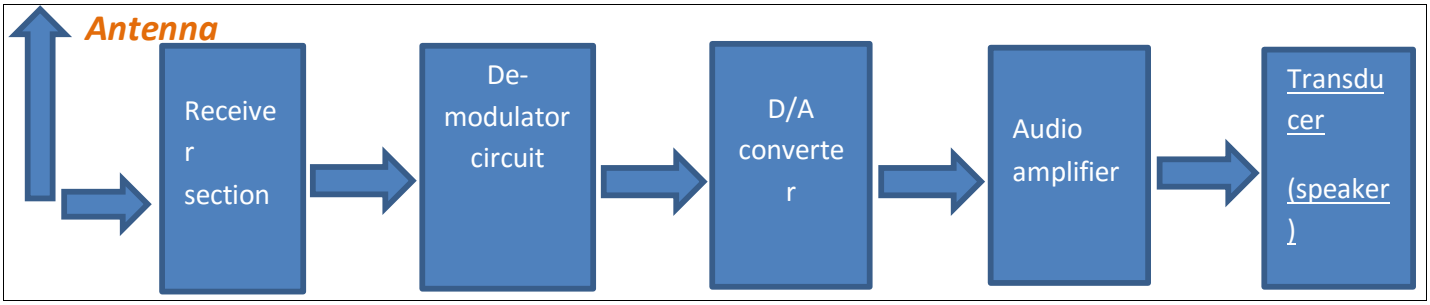
Antenna of BTS satellite

complete satellite structure

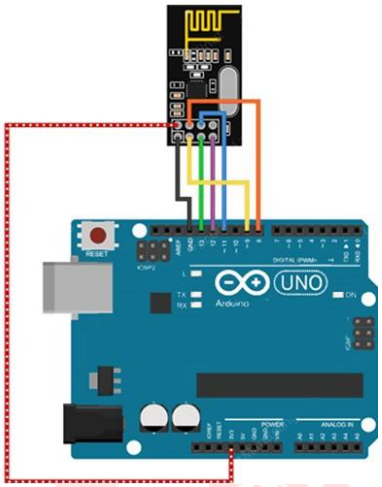
The high Gain antenna can receive and transmit different types of frequencies at the same time. To make this antenna, I have used a steel sheet, cut the steel into a circular shape and cut it at 30 degree center and then soldered it. So that the size of a proper antenna is obtained, now any frequency falls on any point of it, then it is directly reflected and received in the field in the center of the antenna.

RECEIVER SECTION

In the receiver section, I have attached an antenna first. The signal received at the antenna is input to the RF amplifier through the feed. The RF amplifier amplifies the weak signal to make it stronger and then demodulates the signal. Input the demodulated signal into a digital to analog converter. So that we get the data in the original form . This received data is passed through a band pass filter and the output of the band pass filter is fed into an audio amplifier. The output of the audio amplifier is input to the speaker.



Block diagram of receiver section



The song or speech transmitted by the earth station is heard on the speaker.

- **Conclusion-**

The commercial use of satellite communication is very high in the present time. Its use is done in Advertisement, Other Planet Communication, Weather Monitoring, GPS Technology, Rocket Vehicle Launch, Other Satellite Launch, Other Satellite Communication etc. These satellites are designed on the basis of their different uses, which I have designed the satellite, it will do weather monitoring of Earth's low orbit. And we can send this monitored data to any telecom company. And as people will come to know about the weather of the coming time and the present time. He will manage himself and his work accordingly. There is a lot of use in the agriculture department because people have a lot of desire to know when it will rain, what will be the weather.

- **Reference-**

1. In this project face the many problems to create this transmitter and receiver section. so it take 1 year complete this project. This is project depend on future technology.

2. Satellite translation is a very powerful transmission. Which we need to monitor 24 hours. Because the satellite is always in motion. That is why its data has to be continuously read and written.

3. Lower orbit satellites require most of the attention. Because it sometimes comes down from its orbit, it also needs to be raised and attention has to be paid to both its data transmission and receiving. While there is no problem in Jio Stationary Satellite. And after shifting it once, only data has to be transmitted and received.

4. The satellite made by me is very unique and made in low price. Hence its transmission range is very short. If I change the RF amplifier of the satellite, it will also be able to transmit data up to long-range.

Result

After designing this project, when I tested it, its outputs were better than I expected. All transmitters and receivers were doing continuous proper work. And all the data was being transmitted and received in sequence. There was no problem in transmitting this data. Whatever the error was, it was sleeping on the display, so I was removing it through my software and the transmission and reception of continuous data was going on.