



POSITIONING SYSTEM FOR MOBILE OILFIELD EQUIPMENT

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HALLIBURTON

Introduction

Due to an abundance of equipment located in and around oilfields, keeping track of the equipment's position is vital to ensure proper functionality. A common piece of equipment that is kept track of is a pump truck used in fracking. The current method of monitoring position requires manual input of the trucks location into the control system, which is proven to be inefficient. Our project forms a different system that precisely locates the truck's positions using GPS and relays it using Ethernet in a low-cost device.

Objective

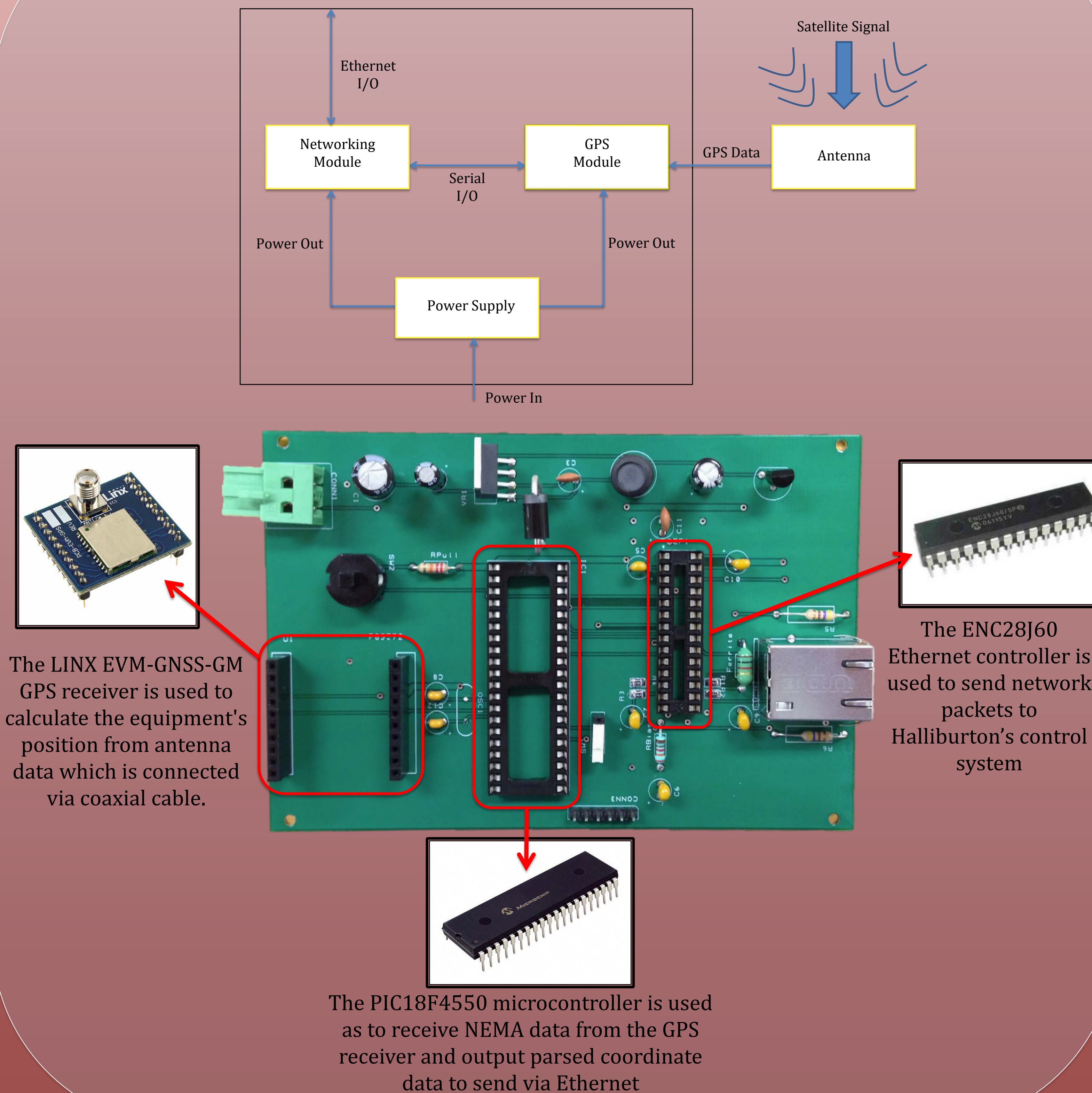
To construct a positioning system using GPS with Ethernet functionality for Halliburton's pump trucks. The system receives the equipment's location via a GPS Module. The coordinates are processed and sent to Halliburton's control system via their propriety networking protocol, thus securing it from outside access. The device must be small enough to fit securely inside the pump truck's control system enclosure, withstand extreme climate changes, and vibration during transport and operation.

Design



A Microstrip Patch Antenna, Multichannel GPS Receiver, a PIC18F4550 microcontroller and an ENC28J60 Ethernet controller are the components used in this design. The antenna was fabricated onto a printed circuit board and requires a low noise amplifier. The main PCB is located inside the controls enclosure and needs to be mounted on DIN rail. To ensure the PCB can survive the harsh environment, it needs to be potted with a thermally conductive epoxy

System Overview



Results

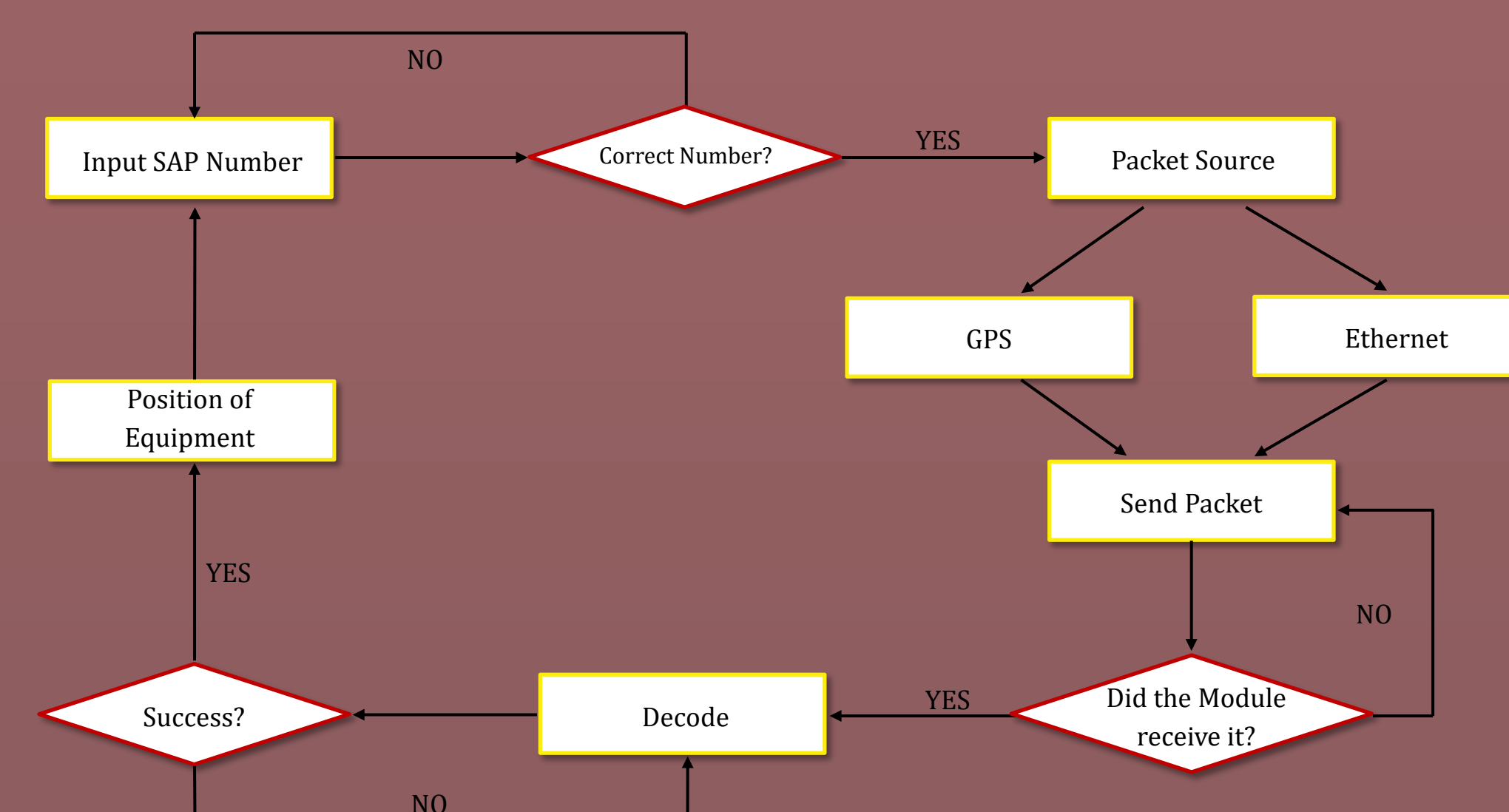
- Successfully built power supply
- Designed & fabricated Microstrip Patch Antenna
- Fabricated PCB is under 6"x6"x6"
- Device can operate at temperatures between -40° to 80°C
- Device can calculate position within 3 minutes
- Board contains reset button & switch for system maintenance
- Board contains drill holes for mounting in case
- Overall project did not exceed allotted budget
- Device is not outputting Ethernet packets

Conclusion

In conclusion, the hardware of the system works. We were able to sustain sufficient power throughout the device. The PCB was checked for continuity and proper voltages. We were also successful in receiving position data from GPS satellites, calculating position and transmitting the NEMA data. We could not get the MCU and Ethernet controller working.

In the future, this device could be potted with thermally conductive epoxy and tested for vibration and climate stability in a stress test. As well as be enclosed in a protective casing and attached by DIN rail to the controls system panel located on the pump trucks. We have these parts of the project, but could not pot or test without working code

Software



The protocol for receiving networking packets to the Ethernet controller is Halliburton's proprietary JLAN protocol. It sends all the information from the microcontroller. In our project, we will use a software named Wireshark. It is the world's foremost network protocol analyzer. It lets users to see what's happening on the network at a microscopic level.

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