

Task List

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- Wiring Diagrams/Schematics
 - Determine free software to use for wiring diagrams
 - Potentially something like Fritzing, but we want to add custom components such as the [Jetson Nano](#) or [Ping Echosounder](#)
 - Multiple users, free, easy to add and share custom components
 - How long the wires are (from the mechanical team), what's the maximum current the wire can take (wire rating), indicate the current/voltage requirements
 - Maximum continuous current & voltage
 - Maximum peak current & voltage
 - 2 Batteries for the wiring diagram at the system architecture diagram
 - Focus on the GPS sensors (IMUs - yoban also works on it, plus the wireless communication options)

Most products such as Jetson Nano or Ping Echosounder can't be just custom imported from the web simply because they are products that are first not available in famous libraries such as digikey and hence not open-sourced. However knowing their pinout structure and datasheet (technical specifications) means that one can easily create a new component based off of those specifications and still perform like the specific component.

Most popular wiring software diagrams include:

Software	Multiple Users	Free?	Easy to Add and Share Components		
Fusion 360	Y	Y, for students			
AutoCAD	Y	N			
EdrawMax	Y, with pricing	Y	Y		
Concept Draw		N			
SmartDraw		N			
Circuit Diagram	N	Y	Y		

- Start creating hookup diagrams or custom components for known components
 - [UBEC](#) - Takes battery voltage and steps down to consistent 5V power for microcontrollers
 - Arduino
 - RaspberryPi - V3 Rev B

- <https://www.raspberrypi.com/products/raspberry-pi-3-model-b/>

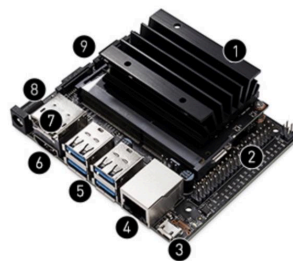
You'll need (not included):

Micro SD card with Raspberry Pi OS installed

Micro USB power supply (2.1 A)

■ Jetson Nano

- <https://www.amazon.com/gp/product/B084DSDDL7/>



Developer Kit Layout

The Jetson Nano 4GB Developer Kit features four USB 3.0 ports, an MIPI CSI-2 camera connector, HDMI 2.0 and DisplayPort 1.3, Gigabit Ethernet, an M.2 Key-E module, a MicroSD card slot, and a 40-pin GPIO header. The dev kit can be powered by either the Micro USB port or a 5V DC barrel jack adapter.

1. microSD card slot for main storage
2. 40-pin expansion header
3. Micro-USB port for 5V power input, or for Device Mode
4. Gigabit Ethernet port
5. USB 3.0 ports (x4)
6. HDMI output port
7. DisplayPort connector
8. DC Barrel jack for 5V power input
9. MIPI CSI-2 camera connectors

- Component Research
 - Look into ROS compatible GPS modules we can consider that also have software packages available
 - GNSS refers to any satellite constellation providing **positioning, navigation and timing (PNT)** information to users on the Earth.
 - One needs a **GNSS receiver** to interpret radio signals transmitted by GPS satellites
 - Communication protocol whether serial or not is compatible with ROS.

What Does IMU Stand for?

The term IMU stands for “Inertial Measurement Unit”. An IMU only consists of a magnetometer, accelerometer, and gyro. Sometimes magnetometer is not included in the package. It will not have a smart-system.

What Does AHRS Stand for?

AHRS stands for attitude heading reference system and includes a GPS but no Kalman filter. It has all the benefits of the IMU, plus GPS position. This is a good fit if there is already a filter in mind to be designed or already incorporated.

What Does INS Mean?

INS is an inertial navigation system. It takes all the sensors, fusing them into one system. It knows exactly where it is in the world based on just that output. An inertial navigation system is not a GPS. It has a Kalman filter in it, which is how the sensor itself fuses all the individual parts into one and gives navigation output with everything incorporated. It has a sensor fusion built into the device, giving a more accurate output, and includes a gyro, magnetometer, accelerometer, and GPS. This allows your robot to understand where it is in the world.

<https://inertialsense.com/difference-between-imu-ahrs-ins/>

Accelerometers = They are **typically built to measure a few G's** of acceleration

Inclinometers = are essentially a directional accelerometer. They are built to measure the direction of their own acceleration **very precisely**. Generally they have large settling times and in order to measure inclination accurately must be

stationary(<https://physics.stackexchange.com/questions/27957/what-is-the-difference-between-an-accelerometer-and-an-inclinometer>)

Modules	Links	ROS packages	Price
OEM7500	https://novatel.com/products/receivers/gnss-gps-receiver-boards/oem7500	"novatel_gps_driver"	
OEM7600	https://novatel.com/products/receivers/gnss-gps-receiver-boards/oem7600	"novatel_gps_driver"	
OEM7700	https://novatel.com/products/receivers/gnss-gps-receiver-boards/oem7700	"novatel_gps_driver"	
OEM7720	https://novatel.com/products/receivers/gnss-gps-receiver-boards/oem7720	"novatel_gps_driver"	
OEM719	https://novatel.com/products/receivers/gnss-gps-receiver-boards/oem719	"novatel_gps_driver"	
OEM729	https://novatel.com/products/receivers/gnss-gps-receiver-boards/oem729	"novatel_gps_driver"	
AsteRx-m3 Pro	https://www.septentrio.com/en/node/294/asterx-m3-pro		
AsteRx-m3 Pro+	https://www.septentrio.com/en/products/gps/gnss-boards/asterx-m3-pro-plus		
AsteRx-m3 ProBase	https://www.septentrio.com/en/products/gps/gnss-boards/asterx-m3-probase		
PIKSI MULTI	https://store.swiftnav.com/products/piksi-multi-gnss-module	"swift_ros"	
SAM-M10Q module	https://www.u-blox.com/en/product/sam-m10q-module		
MIA-M10 series	https://www.u-blox.com/en/product/mia-m10-series		29
MAX-M10 series	https://www.u-blox.com/en/product/max-m10-series		21
NEO-M9N module	https://www.u-blox.com/en/product/neo-m9n-module		27
ZOE-M8B module	https://www.u-blox.com/en/product/zoe-m8b-module		29
ZOE-M8 series	https://www.u-blox.com/en/product/zoe-m8-series		29
SAM-M8Q module	https://www.u-blox.com/en/product/sam-m8q-module		31.5
NEO-M8Q-01A module	https://www.u-blox.com/en/product/neo-m8q-01a-module		25
EVA-M8 series	https://www.u-blox.com/en/product/eva-m8-series		29
MAX-M8 series	https://www.u-blox.com/en/product/max-m8-series		21-27
NEO-M8 series	https://www.u-blox.com/en/product/neo-m8-series		25-31.5
CAM-M8 series	https://www.u-blox.com/en/product/cam-m8-series		27-31.5
LEA-M8S module	https://www.u-blox.com/en/product/lea-m8s-module		35.03
WT901C-TTL 9-Axis Vibration	https://www.amazon.com/dp/B01N03WKDV		
WT901BLECL Inclinometer	https://www.amazon.com/dp/B07T2C97WN/ref=emc_b_5_t		

- Research into wireless communication options compatible with ROS
 - Need to see what is available to determine realistic requirements for MicroFRED data **bandwidth**, communication **range**, and **number of swarm vessels** able to communicate with ground station/each other at the same time
 - <http://wiki.ros.org/Documentation>
 - Sources, link and what i'm learning to add on the google docs
 - Add the excel sheets into the browser folder.
- POS and IMUs = GPS sensor fusion - Yugi*

Inclinometers and accelerometers both measure acceleration; the difference is in how they do so and what they are used for.

radio frequency distribution (RFD) refers to the means by which radios are connected to their respective antennas so that each radio can transmit and/or receive signals.

<https://wlius.com/blog/rfid-vs-nfc-whats-the-difference/>

Difference between NFC and RFID?

NFC - Near Field Communication

RFID - Radio Frequency Identification Distribution

Range: NFC working range < 0.1m

RFID working range at distances of hundreds of feet

Communication: RFID capable of 1-way communication
NFC capable of 2-way communication

NFC is a subset of RFID