# Backplane

The second subsystem in Ocean’s 7’s project is the backplane. This is a board used to route all power traces and PWM signal traces throughout the hull of the Robosub AUV. The backplane will contain connections to the merge circuit, ESC, power converters, controls and batteries. To this end, this subsystem will be:

* Power traces: 5V, 12V, 14.8V, 19V and two traces of 48V
* Wire-to-board Nano-Fit Power Connectors to connect power traces to CPU, DVL, electromagnetic actuators and camera.
* PWM signal traces from controls board to the ESCs.
* Digital Components: Molex Nano-Fit Power Connectors
* 8x Motors: 3-pin header
* Board-to-Board Molex ExtremePower Edge Connectors for merge circuit board, power conversion board, ESCs and controls board.

## Proof of Concept Results

* **Communication Failures due to EMF:** At PoC, we experienced a loss of data along the backplane due to electromagnetic interference from a power drill. Further testing showed that this is very rare, but potentially harmful. Our mitigation plan is to move all peripheral drivers (DVL, IMU, etc.) to the CPU via shielded cables, and plug a shielded USB cable directly from the CPU to the microcontroller board, thereby eliminating communication traces from the backplane.

Integration Testing Results

* The backplane was able to distribute power to all necessary components. In addition, we were able to measure accurate PWM signals from the relevant header pins.

Acceptance Testing Results

* The backplane was able to distribute power to all on board components, as well as through the Nano-Fit connectors to the Power-Over-Ethernet injector, as well as the main computer.

## Risk Assessments And Mitigation Plans

Below is a list of risks and our contingency plans for the backplane:

|  |  |
| --- | --- |
| Risks | Contingency Plan |
| PCB delamination due to high temperatures within the UAV | Epoxy the entire board |
| Trace failure (due to heating, soldering, etc.) | Liquid electrical tape |
| Hole flooding due to a leak in the hull | Use mineral oil to fill the hull |

## Bill of Materials

Bill of Materials for the Backplane subsystem (Detailed bill of materials included in portfolio):

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Price ($) | Quantity | Subtotal ($) |
| 2-layer PCB | 43 | 1 (x3 revisions) | 129 |
| Power MOSFETs | 6 | 12 | 76 |
| MOLEXs | - | 30 | - |
| Misc. Parts | - | - | 80 |
| Shipping | - | - | 50 |
|  |  | **Total ($)** | 335 |