

# CrustCrawler Nomad HD Rover Project



Robotic  
**CrustCrawler**  
Design & Development

## Introduction

With the introduction of CrustCrawler's new Nomad HD Rover, the staff at CrustCrawler decided to put together a Nomad Rover with the electronics and control systems they thought would be most useful on this type of Robotic platform from spare parts we had within our lab. This project can of course be very useful for you ,our customer, in providing just one way of many to configure this rugged and useful mobile platform.

As additional electronics is added to our project Nomad HD Rover, CrustCrawler will update this guide accordingly. We hope you find this guide useful in providing some ideas for your very own Nomad HD Rover.

If you have any questions about what you see in this guide, please feel free to contact us on our forums or e-mail CrustCrawler at: [support@crustcrawler.com](mailto:support@crustcrawler.com).

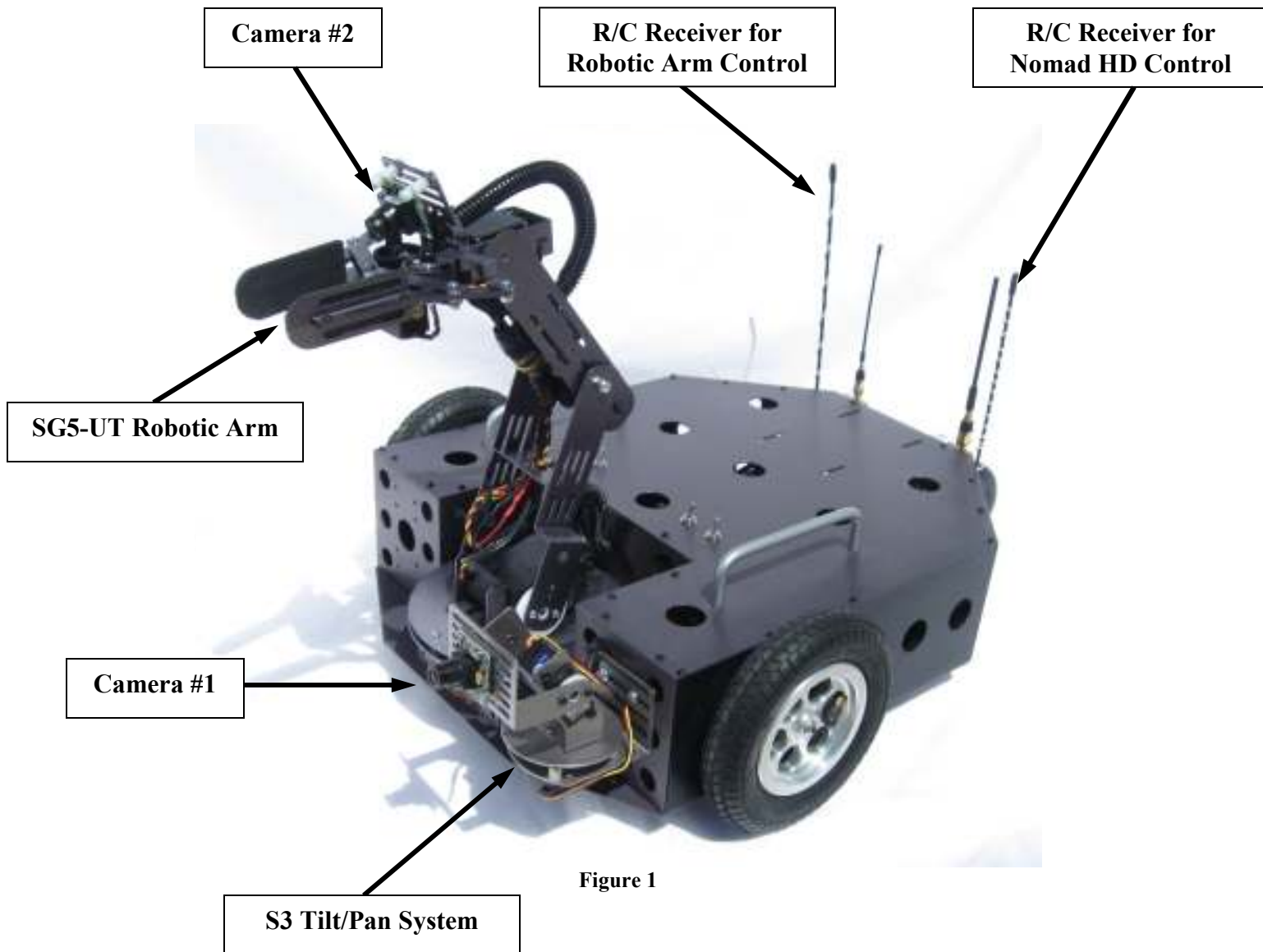
## Parts List

- S3 Tilt/ Pan Full kit
- (2) CCD Cameras ([www.Supercircuits.com](http://www.Supercircuits.com))
- (2) CCD Camera Transmitters([www.Supercircuits.com](http://www.Supercircuits.com))
- (1) 4 Channel camera receiver ([www.Supercircuits.com](http://www.Supercircuits.com))
- (2) R/C Antenna tubes
- (2) R/C Radios
- (2) 7-channel R/C Receivers ()
- (2) 12V, 3.8A/h Sealed Batteries
- (2) R/C receiver batteries
- (3) 6A single pole switches
- (1) Parallax Board Of Education (USB version)
- (1) Parallax BS2P24 Stamp
- (1)Parallax Servo Controller (PSC)
- (1) 2X10 Sabertooth R/C Brushed motor controller
- (1) 3-output voltage regulator
- (1) small breadboard
- (1) SG5-UT Robotic Arm
- Male / Female Jumper wires various lengths
- Hitec servo wire extensions – 6” – 18” lengths
- Small tie wraps for neat cable bundling and routing
- Plastic tubing for wire routing and protection
- Double sticky back tape (for mounting the video transmitters and antennas)

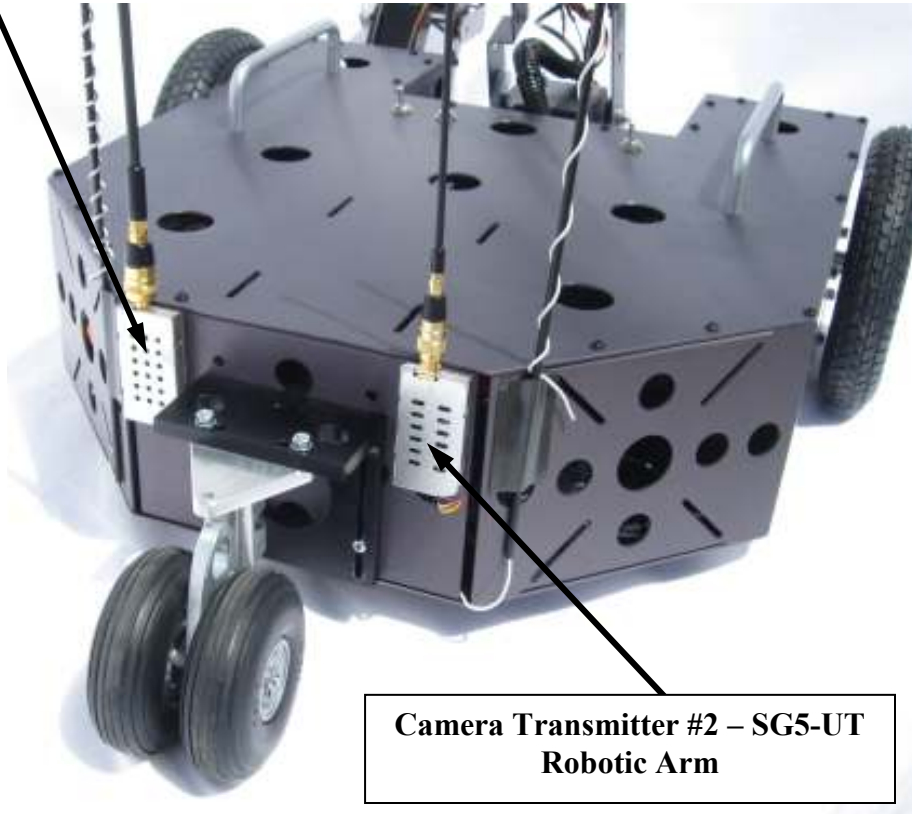
## Tools Required

- Soldering gun
- Solder
- Heat shrink tubing
- Wire cutters
- Small socket set or wrench
- Screwdriver

## External Image References



**Camera Transmitter #1 – S3  
Tilt/Pan System**



**Camera Transmitter #2 – SG5-UT  
Robotic Arm**

**Figure 2**

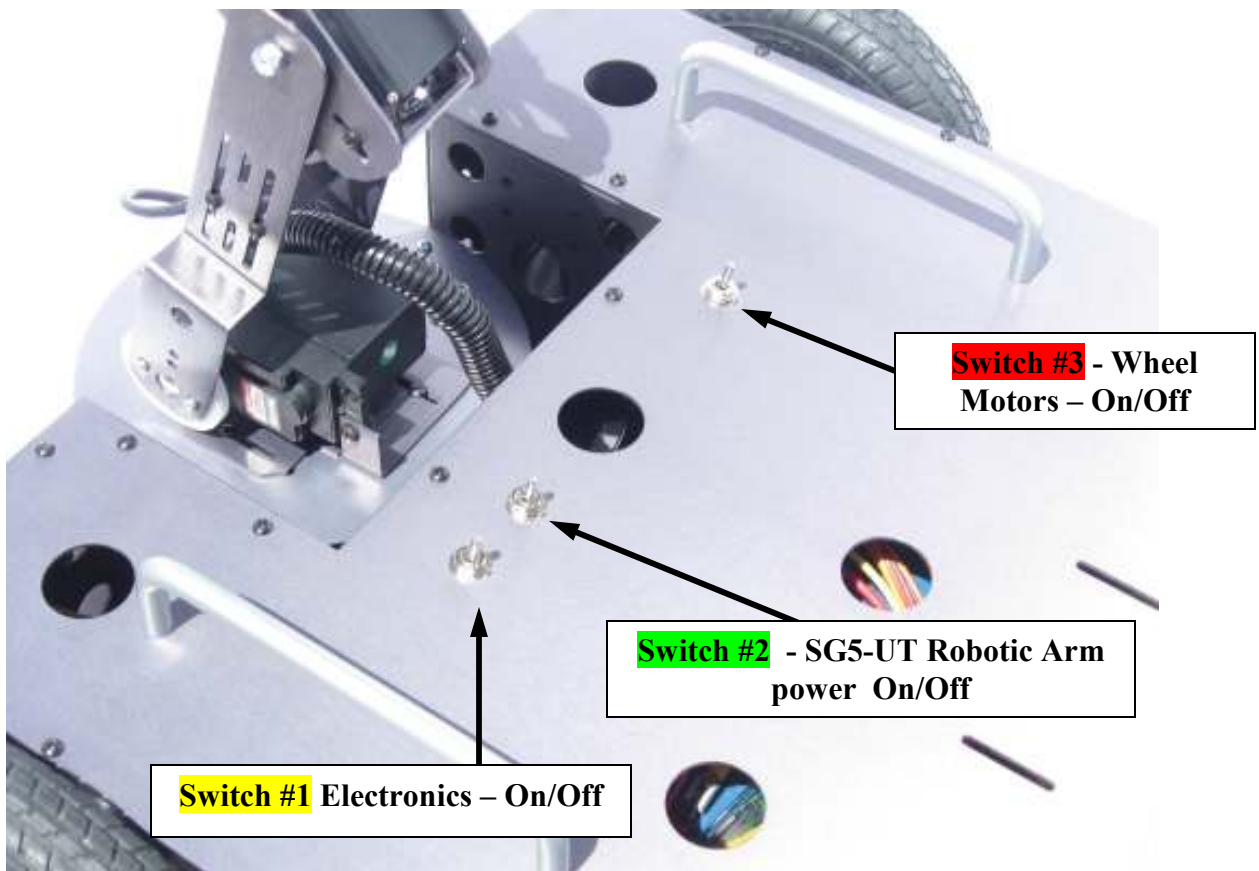


Figure 3

### Power Distribution Notes:

We divided the power into 3 separate “zones” as shown in figure 3 above. This had the advantage of:

1. Allowing us to turn off the SG5-UT Robotic Arm when not in use
2. Allows us to turn off the motors that drive the wheels on the Nomad HD
3. Easier troubleshooting overall
4. Saving power

Further power distribution for the internal electronics is done with a 3-output programmable voltage regulator. The main power requirements of the internal electronics include 9 volts, 12 volts and 7 volts. Here is the breakdown of the voltage requirements by component:

- Parallax Board of Education - 6 – 9 volts
- Parallax Servo Controller – 6 volts
- CCD cameras – 12 volts
- CCD Camera Transmitters – 12 Volts

- 3-output voltage regulator – 12 volts
- 2X10 Sabertooth R/C Brushed motor controller – 12 volts
- R/C receiver #1 – 9.6 volts (use the R/C receiver battery)
- R/C Receiver #2 – 4.9 volts (use the R/C receiver battery)

## **Key Notes about Power**

Here are a few good pointers when determining your power requirements and the distribution of that power.

- Always have a separate power supply for driving motors and servos. Motors are electrically noisy devices and will affect your other lower power electronics in various ways. For example, the quality of the video output for cameras and their transmitters will be affected if they are connected to the same power source as your motors and servos. Fuzzy video, lines across the video screen and brown outs are common symptoms of shared power with motors / servos.
- Always ensure you have enough battery power for the job. Refer to the amp/hr rating of the battery you are choosing to ensure that your battery has enough current to last a long time without a re-charge. CrustCrawler uses (2) 12 Volt 3.8 Amp / hr. batteries for this project.
- Always route your power wires logically and neatly. This goes a long way when you are troubleshooting any power issues you may encounter. It also helps to label your wires especially when they are tie wrapped with other power wires so you know which wires are feeding which devices.



## A Look Inside

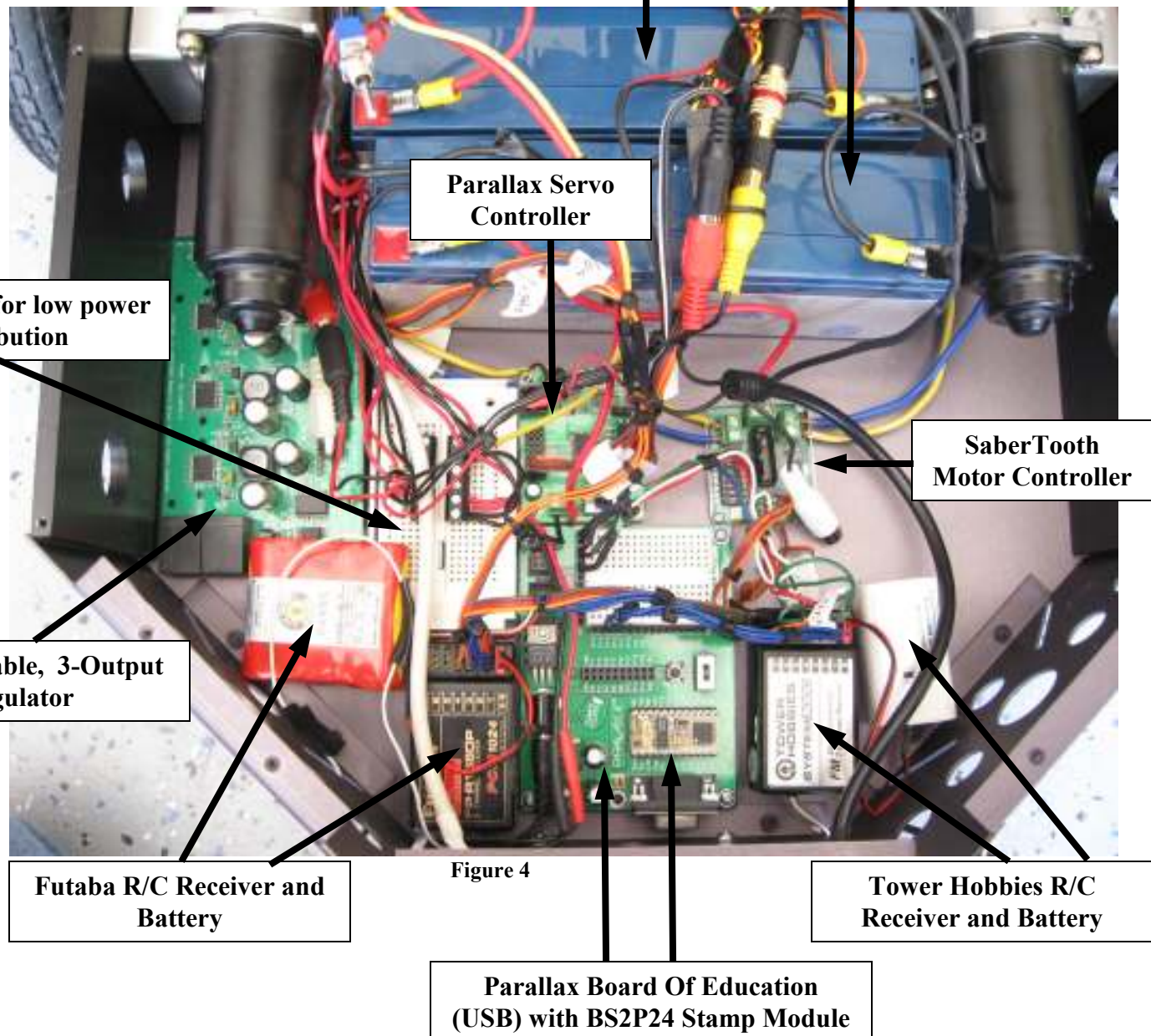


Figure 4



## **Electronics Configuration Notes**

Here is an overview of the basic configuration we used with the electronic components seen on page 8.

### **Tower Hobbies R/C Receiver**

- Used for the control of the SG5-UT Robotic Arm (Channels #1-#5)
- The R/C receiver is wired to the Parallax BOE using the application notes found in the “RC SG5/SG6 control.bsp” program which is located on the following link: <http://www.crustcrawler.com/products/Nomad/index.php>

### **Futaba R/C Receiver**

- Used to control the S3 Tilt/Pan system with Camera #1 (Channels #1 and #2)
- Also used for control of the Nomad HD Rover (Channels #3 and #4)

### **Parallax Board Of Education / Servo Controller**

- Used for the control of the SG5-UT Robotic Arm.

### **Programmable 3-Output Voltage Regulator**

- Used to power the Parallax BOE (9 volts), and the Parallax Servo Controller (7 volts).

## **Video Configuration Notes**

### **Cameras**

- Both Video cameras were purchased from [www.supercircuits.com](http://www.supercircuits.com). Our cameras are black and white versions like the PC302XS which sells for less than \$20.00 each.

### **Video Transmitters**

- Both transmitters are the AVX-900-T4 900mhz, 12V versions – Range is 1 mile line of sight.

### **Video Receiver**

- Our video receiver is the 4- channel AVX-900-R1. – Range is 1 mile line of sight.