Robots, Parts, and Custom Solutions

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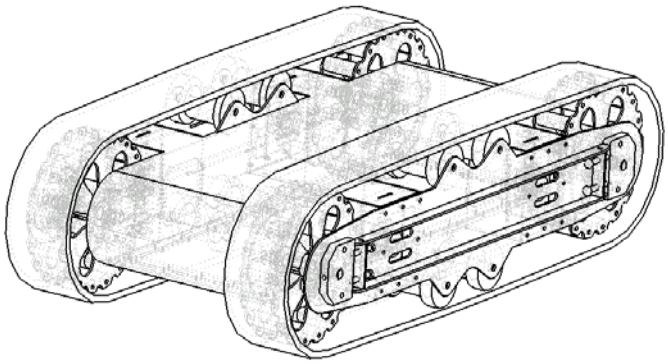
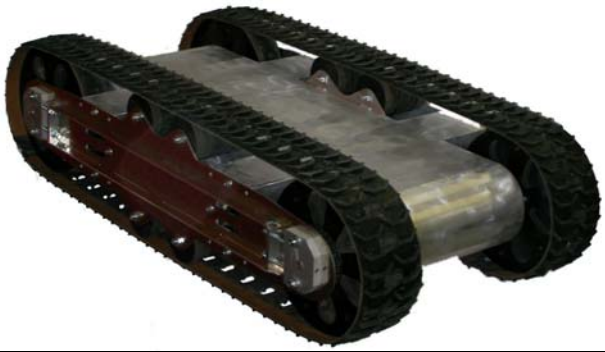
HD2 Treaded Robot





Standard HD2 Treaded Robot Features:

- Wheels supported with inner and outer race sealed ball bearings (the wheels are NOT cantilevered or direct driven from the gear motor shaft).
- Wheels are driven with powerful 52mm diameter gear motors with heavy duty #35 chains.
- The treads and four powerful motors allow this robot to ascend/descend stairs and go over most terrain.
- Robot is enclosed and can be sealed making it water tight.
- Chassis is made from aircraft grade aluminum. The design uses all laser cut parts with mortise and tenon design for precise alignment and mating of the parts. The frame is ribbed and gusseted making it very rigid. Welded construction using TIG and MIG for a solid chassis.
- The robot is completely symmetric and invertible.
- It is about 38 inches long and 20 inches wide by about 9 1/2" high (tread height). There is a very large center cavity for batteries, electronics, cameras, computers, etc. Wider chassis are also available (~26" wide).
- Weight is about 60lbs with standard motors and no batteries.
- The bottom cover is flanged and all the holes are laser cut and then hand tapped for a perfect fit and seal.
- Custom Treads with aggressive All Terrain pattern. Positive traction. The composite rubber and UHMW wheels with timed teeth that match the cutout pattern on the treads.
- NiMH Battery power options from 4-20Ahrs
- Videos are available of the Treaded ATR on our HD2 support page (http://www.superdroidrobots.com/HD2.htm).

HD2 Motor and Gearing Options:

- A large selection of motors with or without encoders.
- The robot is geared with a 1:3 reduction (gear motor to drive wheels). The OD of the wheels with the tread is about 9.4 inches, so with the recommended Type 02 IG52 290 RPM motors ground speed is about 4 ft/sec.
- Custom gearing can be requested resulting in speeds up to 6ft/sec.
- With two 10000mAHr NiMH batteries, the robot handles additional weight without issues. See our support page for a video of the HD2 carrying a 50lb weight around.
- The HD2 can also be set up with four Type 02 IG52 103 RPM motors or Type 04 136 RPM motors and it's virtually unstoppable. See our support page for a video of the HD2 pulling an F250 Truck.

Motor Configuration			Approximate Current Draw[1] (total for all motors)			
Gross Weight limit[2]	Front Motors	Rear Motors	Driving Flat Straight	Pivot Turns on Grass	Pivot Turns on Concrete	Ascending Stairs
IG52-02 24VDC 103 RPM Gear Motor						
120lbs	2	0	3.5A	12A	8A	8A
200lbs	2	2	5A	13A	9A	8.5A
IG52-02 24VDC 290 RPM Gear Motor						
120lbs	2	2	11A	40A	21A	20A
IG52-04 24VDC 285 RPM Gear Motor						
120lbs	2	0	5A	24A (~Stall)	9.5A	12.5A
200lbs	2	2	8.5A	22.5A	11.5A	16A

1. The current draw is approximate average. Higher inrush spikes, etc will be experienced.
2. The robot weighs about 60lbs with motors. The weight of the batteries, sensors, controllers, aux equipment, cargo, etc should be added to this to get the gross weight. The robot itself is designed to carry even more weight, but since its skid steering, turning in deep grass, carpet etc will be difficult with heavier loads. If using on smooth surfaces, dirt or other low friction surfaces, pivot turning with heavier loads can be achieved.

Revision Date: December 17, 2008

HD2 Treaded Robot Additions:

- Custom HD2 robots all come standard with two (2) 10Ahr batteries, IG52-04 285 RPM Gear Motors, and complete assembly. The following add-ons can be selected:
- ***Change HD2 to wide Chassis (26" total width)***. The HD2 standard width is 20". Select this option if a wider chassis is needed for extra room.
- ***Change Gear Ratio to 18:30 Motor to Wheel Gear Ratio.*** The gearing is changed resulting in the robot travelling about twice as fast, but. With this gear ration the robot travels close to 8ft/sec.
- ***Include Power Distribution and Current Monitor Board.*** We offer a power distribution board for the 24VDC system. This board allows you to switch between batteries with TTL signals and monitors your current. This is upgrade is intended for two 10000mAhr batteries. The board has two switched and fused relay buses that are controlled with 5V TTL signals. It also features a onboard 1A 5V switching supply, 50A current monitor, and status LEDs. With a WiFi control system or other two way data control system the robot battery's current and voltage readings will be reported back to the control program.
- ***Sand Blasted and Powder Coated***. The HD2s are made from aluminum, so they will not rust. They are generally supplied with a wire brushed look. This option sand blasts the exterior of the chassis and powder coat it with a satin or flat color of your choice.
- ***Front Mounted Lights***. This option includes high intensity LED lights mounted to the font of the HD2. The option also includes the control batteries or regulators to power the lights. The lights will be controllable from the control console/program.
- ***HD2 Top Roll Cage***. This option includes a heavy duty ¾" round tube frame structure bent and welded to protect top mounted camera systems from accidental roll over.
- ***Add encoder feedback.*** We offer IG52 gear motors with encoders. This upgrade will add encoders to the motors (only one set of the motors need encoders since the wheels are tied together by the cleated belts they will stay synchronized). This upgrade also includes upgrading the controller board and programs to read the motors to provide speed and distance measurements of the left and right tracks. This add-on is only valid with a WiFi control system or other two way data control system since the encoder readings (distance the robot travels) for each side (left and right treads) will be reported back to the control program.

Video and Control Options:

- Below are common video and control packages. We also offer many other custom control choices. Video is a very common addition to our robots. The video can be used for surveillance and/or control (to see where you are going).
- Video transmission and robot control is tricky and can be affected by several factors such as walls, electrical interference, landscape, other RF interference, etc. We offer many different methods for video transmission. The range (distance) you can achieve is greatly influenced by the above.

o RC Controller Option: Standard versions include the following:
o 2.4GHz frequency spectrum control system (searches for best most reliable channel) with a Fail Safe long range dual receiver
o Tested urban range 200+ yards (effective operation range for video and control with multiple building structures, wireless interference, etc. Concrete and steel walls will reduce range further)
o Tested rural line of site range 1000+ feet
o 7" color wide screen LCD for viewing video
o Full range of speed control for drive motors.
o Position control of camera pan and tilt
o Extra channel(s) for lights or other custom options.

o Handheld System:
o Spektrum remote with custom water jet cut mounting bracket for holding battery, 7" LCD and video receiver
o Light weight and portable.
o Fully assembled and tested

o Pelican Case System:
o Pelican case with 7"LCD mounted in the lid and controls mounted in base.
o Light weight can be carried and operated or placed on hood of car or table and operated
o Convenient transport case doubles as operator console, just flip it open, erect antennas, and turn it on.

WiFi Controller Option: The robots can be controlled via a Wi-Fi connection so you can use your laptop to control the robot from a remote location. We provide a program so all the driving and control of the robot is done using the using the robot control program using your mouse or the provided USB game pad controller. With the WiFi system the data is two way, so the robot's status is relayed back to the PC. If options such as encoders or current monitoring are selected, they will be reported back to the program too. Set up of the robot to interface with your network will be required or we can set up your PC to communicate directly with the robot.

Using the same WiFi connection an IP camera options can be viewed and controlled.

Video Transmission Options:

- The video system chosen depends on the control system.
- If a RC controller is being used to control the robot:
  - Video is sent back with a 900MHz transmitter. The receiver is mounted to the RC controller or in the Pelican case and the video is transmitted to the 7" color LCD.
  - Tested urban range 200+ yards (effective operation range for video and control with multiple building structures, wireless interference, etc. Concrete and steel walls will reduce range further)
  - Tested rural line of site range 1000+ feet
- If a WiFi System is chosen then video is sent back via the WiFi network.
  - Either a WiFi camera can be used or a video server attached to the WiFi Bridge
  - There is usually a slight latency with the video transmission
  - Video transmission is secured through the WiFi WEP security
  - Range is typical of any WiFi Network 300-600 feet. High Gain antennas and repeaters can be used to extend range

Camera Options: We offer multiple camera options:

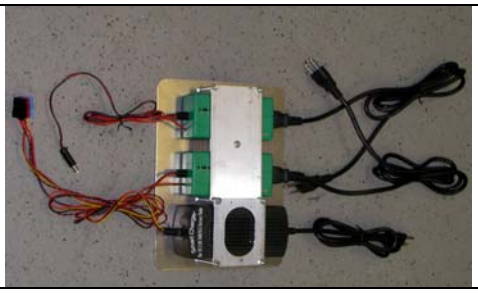
- Standard pan and tilt under a camera dome. This is a standard color camera mounted on a pan and tilt system under a small camera dome. The camera will be mounted near the front of the robot on the top. The pan will be approximately 45 degrees in each direction. The tilt will be approximately 5 degrees down and 40 degrees up.
- Heavy Duty Pan and Tilt System with Samsung SDZ-300 High Resolution, day and night 30X optical zoom camera under a camera dome. (pictured to the right) This option includes a heavy duty pan and tilt system that allows the camera to pan 360 degrees and the tilt will be approximately 5 degrees down and 40 degrees up. The high resolution very low light color camera with 30x optical zoom camera will be mounted on the pan and tilt. The user can control the pan/tilt/and zoom from the operator console.
- Camera tilt embedded in the nose of the HD2 with 36LED IR camera. This option includes a heavy duty tilt system that holes the camera in the nose of the robot. The system does not include a pan (but the robot pivots easily to look left and right). The robots nose will have a channel cut out of it and re-welded to include embedded tilt mechanism. The camera is a 36LED color camera. In daylight the image is a high resolution color image. In darkness the image is black and white and the infrared lights illuminate the area up to 30 meters away. This option has the advantage of keeping the robot low profile and keeping the top clear for future equipment such as arms, etc.
- Camera tilt embedded in the nose of the HD2 with Samsung SDZ-300 High Resolution, day and night 30X optical zoom camera. This the same option as above only it uses a high resolution very low light color camera with 30x optical zoom camera mounted to the tilt.
- IP camera mounted on a tilt bracket. This option can only be used with WiFi control system. The IP camera is mounted on a tilt bracket that allows the camera to tilt up and down (~-10 degrees to 30 degrees up).

Battery Charging Options:

- SuperDroid Robots use NiMH batteries. The batteries are lighter and hold more charge than lead acid batteries.
- NiHM batteries do not have memory issues like NiCad batteries.
- The NiMH Batteries require special charging considerations.
- We offer two different types of chargers.

Smart Charger Option:

- Multiple chargers mounted on one bracket. The chargers are for the 24V motor batteries, 12V video/control battery, and 12V control console battery.
- The chargers are fully automatic and will charge all the batteries simultaneously
- These chargers do not charge the larger batteries too fast. For the big 24V 10000Ahr batteries, charging times can exceed 6 hours.



AstroFlight Deluxe Charger with 100W Supply and Pelican Case:

- This is single charger with 100W power supply custom built into a Pelican case
- The charger can also be used to discharge the batteries
- The charger displays current input and peak voltages to verify proper charge
- Much faster charges can be obtained with this charger than the smart charger
- Charge one battery at a time
- One charger for charging all sizes of batteries (automatically detects battery size)

Other Custom Options Options:

- We specialize in custom solutions. The above are standard chassis with standard camera and control system.
- Please contact us with any questions or your custom needs.
- Below are some of the custom features we have made for the HD2 and/or or wheeled ATRs.

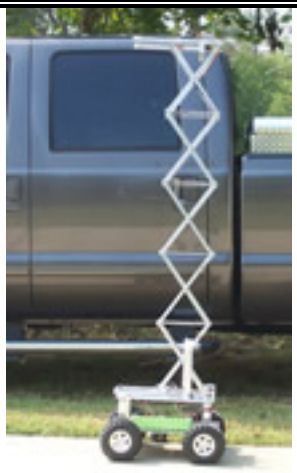
Game Pad Controller Option: Game pad controllers utilize two X-Y analog joysticks for driving the robot and controlling the camera pan, and tilt. It also has 15 function buttons for controlling things like camera zoom, lights, etc. The game pad is a PS2 controller that is connected to a custom circuit board with an onboard microcontroller that reads the PS commands and sends serial data. The serial data is sent to a belt worn wireless 2.4GHz 900MHz FCC approved transceiver, which relays the data to the robot. The data is 2-way. A LCD provides status of the robot and also operates the rumble effect on low voltage, etc. The belt worn 2.4GHz wireless data modem can control the robot at about 300+ feet. A 900MHz 100mW system can operate about ½ mile and the 900MHz 1W system can operate beyond a mile line of site and will work through multiple walls. If using video, the video and audio are received from a belt worn receiver and sent to the mounted 3" or 7" LCD.

WiFi Controller Option: This option uses a WiFi connection similar to the one above, but utilizes a Ultra-Compact PC. The Color touch screen LCD can be used to control the robot and view the IP camera(s). The PC is mounted in a custom bracket with a gamepad controller mounted to it. We provide a program so all the driving and control of the robot is done using the using the robot control program using the game pad controller and touch screen LCD.

Using the same WiFi connection an IP camera options can be viewed and controlled.

Scissor Lift system Option: This can be used with any above camera option. The scissor lift is driven by and gear motor, and jack screws lifting the camera system into the air. Two sizes of scissor lifts are available. The 18in base scissor lift will lift the camera 6ft. The 28in base scissor lift will lift the camera system 9ft into the air. The system includes all the electronics, assembly, and limit switches. The scissor lift is controlled through the custom SuperDroid Robots Program using the mouse or gamepad controller.

Camera Boom with IP camera: This option has a base that rotates 360+ degrees. The two section arm folds flat, and raises the camera. Two sizes are available for the HD2 (4ft boom and 6ft boom). The end of the arm is equipped with a camera that has more than 90 degrees of tilt allowing the robot to look straight down and up about 20 degrees when the shoulder is boomed up. When the arm is collapsed, the camera can tilt to look up or about 20 degrees down. The swivel base, two section shoulder, and wrist all have position feedback so it can drive to memorized positions. An IP camera is mounted to the camera boom. The camera boom is controlled through the custom SuperDroid Robots Program using the mouse or gamepad controller.



Enclosed Camera PTZ on a mast: This camera system is typically used with our arms. It has a 30x optical zoom camera enclosed in a weather tight housing. It uses a Samsung SDZ-300 High Resolution, day and night 30X optical zoom camera enclosed in a weather tight housing. The camera pan is more than 360 degrees. The tilt is -45 to 90 degrees up. The pan and tilt are controlled with simple RC 3.3-5V TTL servo inputs (1800us-22000us pulses ever 20ms 1500us center). The pan and tilt use position controlled and hold their position with the power turned off. A relay board for turning on and off the pan and tilt motors is provided that takes 5V TTL inputs. A DPDT Relay switch is also supplied that takes 5V TTL input to control the zoom. The camera and relay board require 12VDC and draw less than an amp. The motors take 6-7.2VDC and require a 2-3 amp supply. The boom length can be specified between 4" and 30". The boom is intended to be mounted on a HD2 Arm, but can also be mounted to the robot chassis.

Multi-Axis Arms: As pictured, the custom HD2 Treaded robot is equipped with a 5-Axis arm. We can provide from 3 to 6 axis arms that meet your needs. The base of this pictured robot ~420 degree of rotation. The shoulder has ~220 degrees of rotation. The Elbow has ~280 degrees of rotation. The Wrist/forearm has ~280 degrees of rotation and the gripper has independent fingers that can open larger than 6 inches. Each joint is independently controlled with a gamepad controller and has position feedback and speed controlled positioning. The position control can be used to hold a position or go to preset memorized positions! All the motors have speed control allowing very precise and intricate positioning. The joints also have clutches that protect the arm from overload. With the shoulder and elbow fully extended the intricate arm can lift up to 20lbs using the shoulder or elbow axis. Larger capacity arms are also available if required.

Pricing:

- Pricing is budgetary for standard systems listed below.
- Some upgrades and options can not be combined, contact SuperDroid Robots with any questions
- Select options and note any customization and SuperDroid Robots will provide a custom quote

Feature	Cost	Detail of Item
Robot Chassis Options (pick one with optional add-ons)		
HD2 Robot	$7,151.91	Assembled HD2 with 20Ahrs of batteries, motor controllers
Optional add-on	$370.00	Widen Chassis from 20 inches to 26 inches
Optional add-on	$145.00	Change from 10:30 to 18:30 motor to wheel gear ratio
Optional add-on	$129.00	Include Power Distribution and current monitoring board
Optional add-on	$399.00	Powder Coat HD2 Chassis
Optional add-on	$310.45	Front Mounted Lights with battery and controls
Optional Add-on	$262.50	HD2 Top Roll Bar
Optional Add-on (for WiFi Packages only)	$447.07	Encoder feedback for positioning and speed of the robot
Standard Camera and Control Options (pick one)		
Wireless Camera and Control System Option1	$1,836.58	Handheld 7" Video and Controller with standard pan and tilt under a camera dome
Wireless Camera and Control System Option2	$1,959.67	Pelican case 7" Video and Controller with standard pan and tilt under a camera dome
Wireless Camera and Control System Option3 (26" wide chasis required for this option)	$3,188.06	Pelican case 7" Video and Controller with Heavy Duty Camera Pan and Tilt and 30X optical Zoom under an camera dome
Wireless Camera and Control System Option4	$3,170.82	Pelican case 7" Video and Controller with Tilt and 30X optical Zoom Camera embedded in HD2 Nose
Wireless Camera and Control System Option5	$2,437.82	Pelican case 7" Video and Controller with Tilt and 30LED IR Camera embedded in HD2 Nose
Wireless Camera and Control System Option 6	$3,649.21	Pelican case 7" Video and Controller with Heavt Duty Camera Pan and Tilt and 30X optical zoom in weatherproof enclosure
WiFi Control with IP Camera Option1	$1,904.18	WiFi Control System with IP Camera and Camera Tilt System
WiFi Control with IP Camera Option2 (26" wide chasis required for this option)	$3,267.23	WiFi Control System with Video Server, 3 fixed cameras, Heavy Duty Camera Pan and Tilt, and 30X optical Zoom under an camera dome
WiFi Control with IP Camera Option3	$3,140.00	WiFi Control System with Video Server, Tilt and 30X optical Zoom Camera embedded in HD2 Nose
WiFi Control with IP Camera Option4	$2,517.00	WiFi Control System with Video Server, Tilt and 30LED IR Camera embedded in HD2 Nose
WiFi Control with IP Camera Option5	$3,728.38	WiFi Control System with Video Server, with Heavt Duty Camera Pan and Tilt and 30X optical zoom in weatherproof enclosure
Charger Options (pick one)		
Charger Option1	$429.64	AstroFlight Battery Charging Station in Pelican Carrying Case
Charger Option2	$221.90	WiFi Smart Charger Battery Charging Station (2 24V Chargers)
Charger Option3	$277.90	RF Smart Charger Battery Charging Station (2 12V and 2 24V Chargers)
Shipping		
Shipping Crate	$95.00	Custom Shipping Crate
Shipping	TBD	Shipping from NC US

Standard Payment Terms:

1. Payment via check, money order, or wire transfer is required.
2. Sixty percent (60%) of price due upon award, remainder prior to shipment.

Delivery:

1. Procurement of materials, assembly and testing is required. Lead time is typically 2-4 weeks for standard options.

General Terms:

1. SuperDroid Robots, Inc is not responsible for special incidental, or consequential damages resulting from any warranty or under any legal theory, including, but not limited to lost profits, downtime, goodwill, damage to, or replacement equipment or property, or any cost of recovering, reprogramming, or reproducing any data stored. ANY LIABILITY SHALL BE LIMITED TO REPLACEMENT OF DEFECTIVE PARTS. SuperDroid Robots, Inc. is further not responsible for any personal damages, including, but not limited to bodily and health damages resulting from any use of our products.
2. SuperDroid Robots, Inc. makes no representations as to the fitness of its products for specific uses. ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE IS HEREBY EXCLUDED.
3. Agreements shall be construed in accordance with the laws of the State of North Carolina, and the rights and obligations created hereby shall be governed by the laws of North Carolina.
4. In the event a dispute or controversy arises, such dispute or controversy (including claims of default) shall be brought in the courts of Wake County, North Carolina and the plaintiff hereby agrees to this choice of venue.

Warranty:

1. SuperDroid Robots will repair any manufacturing defects for 120 days after shipment. Damage from abuse or neglect will not be covered. Shipment of robot will not be covered in warranty.
2. Consumable items will not be covered by the warranty. Consumable items include, but are not limited to treads, chains, bearings, wheels, and batteries.