

# Robotronics®

*The Leader In Safety Education Products*

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## Pluggie Robot Operating Manual

Version 6.6

# Pluggie Robot Operating Manual

**Congratulations** on your purchase of a ROBOTRONICS, Inc. robot. Your robot has been carefully constructed of the highest quality components. Its design is the result of years of experience building robots. You will find it an extremely effective spokesman for your organization. It is built for ease of operation, maintenance and repair. It is built so that you can easily expand its functions making its usefulness grow as your needs grow.

Please read this manual carefully. It will help you make the most of your robot. Attention to maintenance and proper training will greatly prolong the life of your robot. Most problems you encounter will be minor and the manual will provide an answer. Please feel free to contact us if you have unanswered questions relating to operation, maintenance, and repair. Also, if you have technical questions relating to expanding the functions of your robot, we would be most happy to help.

Sincerely,

**ROBOTRONICS, Inc.**

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\* These sections can be used to place additional notes that you would like to record, during your use of the robot.

## Limited Warranty

All robots and accessories have a limited one year warranty, which covers all parts and labor. This period covers the normal burn-in for electronic components. Experience has shown that this warranty period catches most component defects and other possible flaws. If you have a problem, we are anxious to help. Our desire is to be certain you receive a quality product and excellent service.

Warranty work is specifically limited to correction of defects by repair or replacement of faulty equipment or parts. The robot shall be repaired or replaced at Seller's option. Equipment returned to the factory for repair must have pre-authorization from our service department and must be sent freight pre-paid, and will be returned freight pre-paid by UPS ground or common carrier. If you need parts sent by air shipment you will be responsible to pay the additional shipping charges.

In no event shall ROBOTRONICS, Inc. be liable for any incidental or consequential damages in connection with or arising from the use of the robot.

The buyer is further responsible to ensure that proper and complete training be given to those operating the robot system as all aspects of such operation cannot be covered in a brief manual such as this.

In no event shall ROBOTRONICS, Inc. be liable for any incidental or consequential damages in connection with or arising from the use of this manual or any procedures contained herein.

### Record The Robot's Vital Information

<p>Record the vital information from your robot here for future access</p> <p>Date Received: _____</p> <p>Customer Number: _____</p> <p>Robot Model Number: _____</p> <p>Robot Serial Number: _____</p> <p>Brand of Radio Control: _____</p> <p>Frequency of Radio Control: _____</p> <p><u>Voice Frequencies</u></p> <p>Operator Transmitter: _____</p> <p>Operator Receiver: _____</p>
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### If You Have A Problem

- Call our service department and explain the problem. The phone number is (801) 489-4466. Most difficulties are minor and can be solved easily over the phone. If possible, have the robot near the phone when you call.

**Important:** Have the robot serial number and model number ready. This will help our technician identify the model of robot you have. The serial and model number sticker is located under the cap. Pop the cap off and it is on the plastic cross piece.

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- If you must return a part or the robot for repair, pack it carefully and send it prepaid according to instructions. You must obtain a return authorization number from the service department before shipping the robot or a part to the factory.
- Parts of the robot are best sent by a carrier such as UPS, Fed. Ex. or U.S. mail, because shipping is based on the actual weight of the package. Be sure to insure the shipment for the correct value. A freight company such as Roadway should be used only for the complete robot, because their shipping charges are based on 100 pound minimums.
- For international shipments, you will be responsible for paying customs duties, taxes and other fees. The shipment must be labeled on the paperwork and on the outside of the container that it is “**For Educational Purposes**”. If it is a “**warranty replacement**” or a “**repair return**” this also must be indicated both ways on the customs documentation. Contact your customs agency on how to document the shipment correctly to avoid unnecessary customs charges.

## **After The Warranty Repair and Help**

Our technical staff is always available to help with your questions. Again, most problems are easily solved. The robot is design is very modular to make removal of a part of the robot very easy. For example the main electronics box, which houses most of the electronic circuitry, can be removed from the frame of the robot. If you do need technical help or replacement parts, call our Service Dept. We can usually ship them the following day you call. Please call our service department for a return authorization number before sending a part or your robot in for repair or modifications.

**Service Department: 801-489-4466**

# Part 1 General Operating Instructions

## CHAPTER 1 Getting Started

### OPERATING TIPS AND SAFETY INFORMATION

ROBOTRONICS, Inc. robots are a unique and exciting tool in the hands of a skilled and trained operator. The operator provides much of the excitement the robot conveys. The selection and training of the operator should be done carefully, so as to provide a person with good judgment and an outgoing personality. The operator is the single most important feature that the robot has. Nevertheless, with a little practice anyone can learn to operate the robot and even those with a shy personality can be very effective using the robot. It is important that you observe the following safety guidelines. Include this in any operator training. Practicing with the robot and having a program outline or script will help you have success the first few times out.

- Keep the robot indoors with the cover on when not in use. This will keep the robot clean and the color at its best.
- Operate the robot with charged batteries in the transmitter and robot.
- **Never operate the robot out of line-of-sight.**
- **The operator must have the radio control in their hands when the robot is on. If you need to set the radio control down, turn the robot off first.**
- Always have a trained person posted near the robot to help in crowd control, and to protect the robot from vandalism. This person is also available to answer questions and interact with the robot.
- Operating distance should never exceed **100 feet**. When moving the robot through crowds, the robot should be operated slowly and smoothly without any sudden changes of direction. Walls, turns, and other obstacles are hazards to be avoided. Safe clearance should be maintained between these obstacles and the robot.
- Never leave the robot "ON" when unattended or in direct sunlight for extended periods of time.
- The robot is designed to be operated on hard, smooth surfaces and carpet. Avoid extra deep shag carpet, dirt, gravel, or grass surfaces. Avoid steep inclines or large uneven surfaces such as curbs, gutters, or uncovered electrical lines.
- **When using the robot on a stage, the area just in front of the stage should be clear of children for at least 10 feet.**
- When attempting to operate the robot for the first time, do so in a large flat area without obstacles. The operation of the controls should be done in a smooth, fluid manner. Avoid jerking starts and stops or overreacting to the controls. When first practicing movement, it is sometimes helpful to follow behind the robot, as robot movement will match stick movement. (Controls respond opposite when the robot is facing the operator.)

The robot can be a highly successful tool for education and entertainment. Appropriate jokes, stories and general conversation can be very effective. Children of all ages are strongly attracted to the robot. They will talk to it, hug it, kiss it, and generally treat it as a good friend. The smaller sized robots are very effective with children. They are light in weight and just the right size to communicate with children. The most important ingredient to the use and effective operation of the robot is common sense. The following instructions will help you get set up and start using the robot.

## **SETUP AND HOW TO OPERATE THE ROBOT**

### **Step # 1**

Read and study this manual completely before operating the robot.

### **Step # 2 Install and charge the batteries**

To put the robot battery in the robot, tip the robot slightly to access the wing nut on the battery door. This is located on the bottom back of the robot. After removing the wing nut, open the door and lay the battery on the door with the battery wire harness running from left to right. Attach the Battery connector (square black and red), to the robot connector (also square black and red). Match red to red and black to black and connect them.

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Note: The battery connector and robot connector look identical but they do connect together.

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The battery door can now be closed and the wing nut put back on.

Be certain that the robot battery and radio control transmitter battery are fully charged before operating the robot. Plug the RC battery charger into the side of the radio control and the charging light will come on. The Pluggie battery can be charged in the robot or out. See the Pluggie battery charging chapter.

### **Step # 3 Powering up**



Turn the Radio Control Transmitter "ON" first and then turn the robot "ON". Check that the Radio Control Transmitter battery level meter reads to the right. The "ON/OFF" switch for the robot is located on the bottom left of the robot if you are standing behind the robot. Push the switch forward to turn the robot on (On/Off positions are labeled). The back position of the switch is the charging position.

### **Step # 4 Set the Volumes**

Check that the volume of the voice and MP3 player are at the level that your want. The MP3 player volume can be changed on the audio amp (Road Rage) which is located on the right side panel inside the robot. To remove the cap, just grasp the bottom of the cap with your hands and give a short pull up. The cap will pop off. The volume for the voice is on the UHF wireless voice receiver, which you need to remove the body to get to. If you want to remove the body, there are instructions under the cap for how to do this.

### **Step # 5 Test all the functions**

Test all of the robot's functions: voice both ways, cap, eyelids, eyes, tape, siren, and drive movement for proper operation. The voice modifier option can be turned on and off from the RC with the voice switch. The robot is now ready to operate.

### **Step # 6 Optional Accessories Setup**

For information about these, see the optional accessories section. This includes options such as the voice modifier and water squirter. These sections will give you step by step instructions for setup and related diagrams.

### **Step # 7 Powering Down**

To turn off the system, turn the main switch to the "OFF" position. Finally turn off the Voice Transmitter, Receiver and the Radio Control Transmitter.



**Step # 8 Charge the batteries again**

Connect the Robot battery to the charger and bring it back to a full charge before leaving the robot. This battery should not be left with a partial charge. The transmitter battery should be charged if it is low.

- **All of the major functions of the robot each have a section in the manual with more details and diagrams. Refer to these for more in depth information. The Appendix has pictures and diagrams of where various parts are in the robot. These will help you become familiar with where the parts are located and their function.**

## TRANSPORTING THE ROBOT

The vehicle that you use to transport the robot should have adequate shock absorption. Vans and cars used for passengers would be the best. Transporting the robot in a trailer is not recommended because trailers typically do not have the same level of shock absorption as a car or van. A good rule of thumb to follow is that if the vehicle is adequate for transporting a computer it should also be fine for the robot.

Double check that the body latches are secure. These two latch pins are found under the cap. They push into the body latch blocks. The cap nut on the top of the cap rod should be tight also.

Before strapping the robot to the cart, always put the robot cover on first. The robot cover protects the body from getting scratches, keeps UV light off it, and helps the keep the cap on during transport. Lift the robot on to the cart and place the wheels in the recess of the plastic platform. Run the bunji cord around the robot enough times to hold it on tight.

You can leave the robot on the transport cart while the robot is in transit, to keep the robot from rolling around.



### **CAUTION**

**If the robot is being transported in an open truck, the robot cover should be over the robot and tied down tight around the bottom to prevent the cap from getting blown off. If you do not have a cover you could take the cap off and put in the cab.**

## Part 2 Subsystems of the Robot

Functionally, the robot is made up of the following basic subsystems:

- A. Radio Control System
- B. Voice System
- C. Cassette Tape Player
- D. Siren
- E. Robot Battery Systems
- F. Drive Motors
- G. Eyelids and Eyes Left and Right

The systems block diagram found in the Appendix shows how the various subsystems and their components are interrelated.

Following are explanations of each subsystem, some operating instructions, and trouble shooting hints where appropriate.

## CHAPTER 2 Radio Control System

The Radio Control System consists of the control transmitter unit held by the operator and the receiver with its associated components in the robot.

The Radio Control Transmitter converts movements of the control sticks and switches into a coded radio signal, which is transmitted by radio to the Radio Control Receiver within the robot. The signal is received and then decoded by the micro-controller, which is on the main circuit board in the vehicle. The micro-controller controls functions based on what was sent from the radio control transmitter.

### **RADIO CONTROL OPERATING INSTRUCTIONS**

Refer to the diagram showing the radio control transmitter for the location of controls. Check all of the trim adjustments on the transmitter and make sure they are in their center position. Extend the Radio Control Transmitter Antenna 1/4 to 1/2 way. Turn the Radio Control Transmitter on first and then turn on the main robot power switch. It is necessary for the robot to always have an operating signal when it is on, if there is no signal you will not have full control of the robot.

The right hand joystick controls movement of the robot's drive wheels. Pushing the stick forward will cause the robot to move forward. Pulling the stick back will cause the robot to move backward. Moving the stick to the right or left will cause the robot to turn to the right or left respectively. Movement is fully proportional so any variation or combination of movement is possible. The horizontal and vertical trim tabs to the left and below the joystick are for centering and should be typically left in the center. The only time that you would need to move these trims is if the robot started moving slightly on its own. In this case move them slightly until the robot stops.

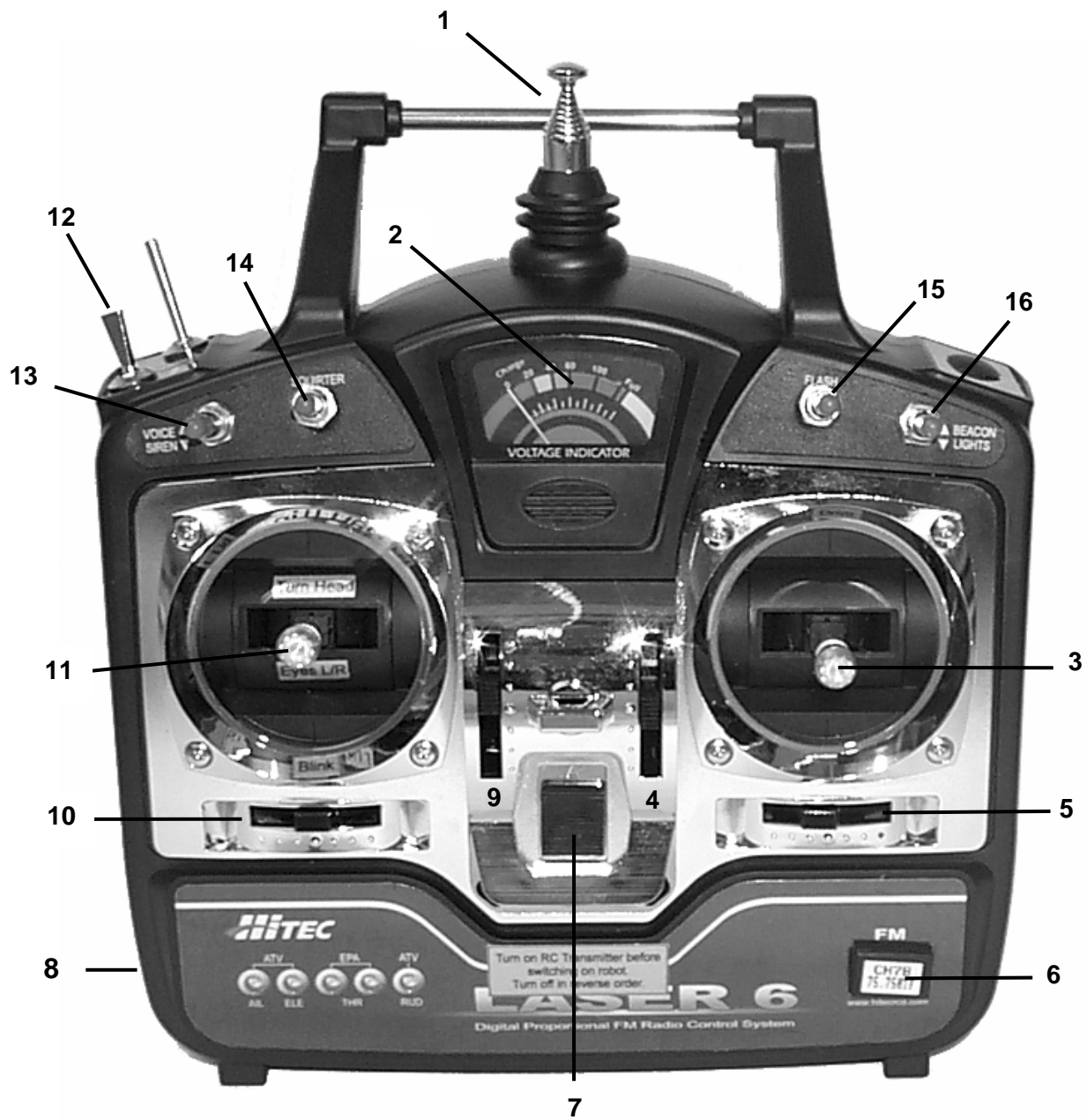
Control of the left and right eyelids is on the left joystick. The left and right eyelid are controlled in the corners forward and blink to the back. The eyes left and right move when you move the joystick left and right.

For a detail of other functions, see the radio control diagram on the next page. All of these functions are labeled on the radio control itself.

A charge plug is provided on the transmitter for recharging its internal battery. The transmitter power switch must be in the off position before charging the batteries. A charge light on the charger will come on while charging.

There is a RC battery(2-3 hours) provided with all robots. There is an extra Ni-MH battery(5-6 hours) provided with the package. Each of these batteries has its own respective charger.

# RADIO CONTROL TRANSMITTER (Hi-Tec)



# RC TRANSMITTER CONTROLS

**Note:** The following information on the transmitter controls includes information for a variety of similar robots.



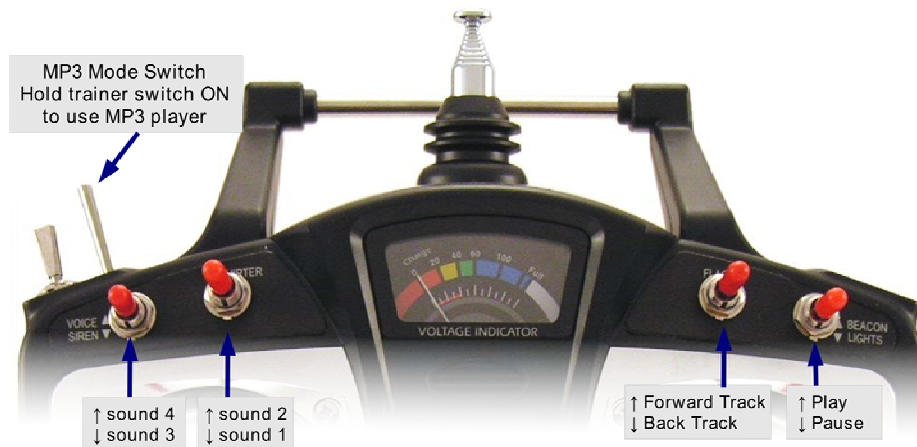
1. Telescopic Transmitter Aerial.
2. Transmitter Battery Voltage Meter (Expand Scale Voltmeter)
3. Right control Stick-  
Up and Down – Robot drive motors, forward and reverse.  
Right and Left – Robot drive motors steering. Left and right turns.
4. Forward/Reverse Trim lever for right control stick. Normal = Center. Neutralizes the drive motors. If the robot is moving slightly slide this a few clicks until robot stops moving.
5. Left and right Trim lever for right control stick. Normal = Center. Neutralizes the drive motors. If the robot is moving slightly slide this a few clicks until robot stops moving.
6. Crystal.
7. On/Off Switch.
8. Recharge jack. Plug the RC battery charger in here to recharge the internal battery. The charge light will come on, on the charger.
9. Forward and reverse trim lever for the left control stick. Normal = Center. Unused.
10. Left and right Trim lever for left control stick. Normal = Center. Centers the head on robots with head movement (Character in Vehicle).
11. Left Control Stick  
Left and right movement - Turning of the head left and right (Character in Vehicle) and eyes left and right.  
Up – Left lid and Right lid  
Down – Blink

## Top Switch Functions

12. Tape player
13. Not needed
14. Not needed
15. Up- Squirter  
Down- Siren
16. Up- Cap  
Down- Voice

### Controls for the Integrated MP3 Player Option

The MP3 player is located in the robot and has a SD or MM memory card that you can load music onto. If you have the MP3 player option then your switches will take on other functions when the MP3 mode switch is held on. Two of the switches are for sound effects on the SD memory card. The other two are for playing and selecting songs that you load on to the SD card. You can also change the volume with the left stick.



**Hold the MP3 switch on to use MP3 Player and to change volume with the left stick.**



Switches must stay in the normal position except for mixing which should be off.

## THE NICKEL METAL HYDRIDE (NI-MH) RC TRANSMITTER BATTERY

The NI-MH RC transmitter battery will last about 5-6 hours on a full charge. Charge the battery for **16 hours**. A charge jack is provided on the transmitter for recharging its internal batteries. This round jack is located on the right side of the radio control. (See the radio control diagram) The RC power switch must be in the off position when the charger is plugged into it and must remain in the off position while charging. A light on the charger will be on, when charging.



**Caution:** Do not overcharge the batteries as this could cause permanent damage to the transmitter batteries. (Doubling the normal charging time is the type of over charging that is meant here, and the battery getting hot.) When the battery level needle goes in the red, the robot should be turned off because the robot could act erratic without the transmitter signal.

To avoid a RC battery going dead during a presentation, start the program with a fully charged battery or be aware of how much charge there is left in the battery. If you have an extra battery or the optional 110 Volt RC Power Supply, you can connect one of these and keep going.

To install the NI-MH battery pack you need to take the battery cover off the RC. Disconnect the RC battery and put the NI-MH battery in its place.

### RC Battery and Charger Specifications

RC transmitter battery	9.6 Volts	700mAH
RC transmitter battery charger	11.6 Volts	70mA

### NI-MH RC Battery and Charger Specifications

NI-MH RC transmitter battery	9.6 Volts	1300mAH
NI-MH RC transmitter battery charger	11.6 Volts	130mA



### **Adapter for Charging an Extra NI-MH RC Transmitter Battery**

If you have an extra NI-MH RC battery, you can charge this outside the RC. You may want to do this while you are using the robot or if you need to charge both batteries at the same time. The adapter needed to do this is in the control case or it is on your charger. It has a white connector on one side and a connection on the other end that will go directly to your battery. The charging time is still 16 hours.

### **110 Volt RC Transmitter Power Supply Option**

The 110V RC Power Supply is a power unit that plugs into a standard electrical outlet and in to the RC transmitter. This allows you to have continuous power without using batteries. This connects into the same connection as the battery. To make the connection you need to take the back cover off the RC. The wire feeds through a slot in the RC case. When you re-close the case be sure that the wire is not pinched. With this option, you do need to stand near an electrical outlet or have an extension cord.

## CHAPTER 3 Wireless Voice System

The Voice System consists of two separate communication links. One link transmits the operator's voice to the robot. When you speak into the headset mic, this audio goes to a transmitter on your belt. This audio is transmitted to a receiver in the robot. The audio signal then goes from the receiver through a mixing circuit on the main board. It is then fed into the amplifier which amplifies the signal through the robot's speakers.

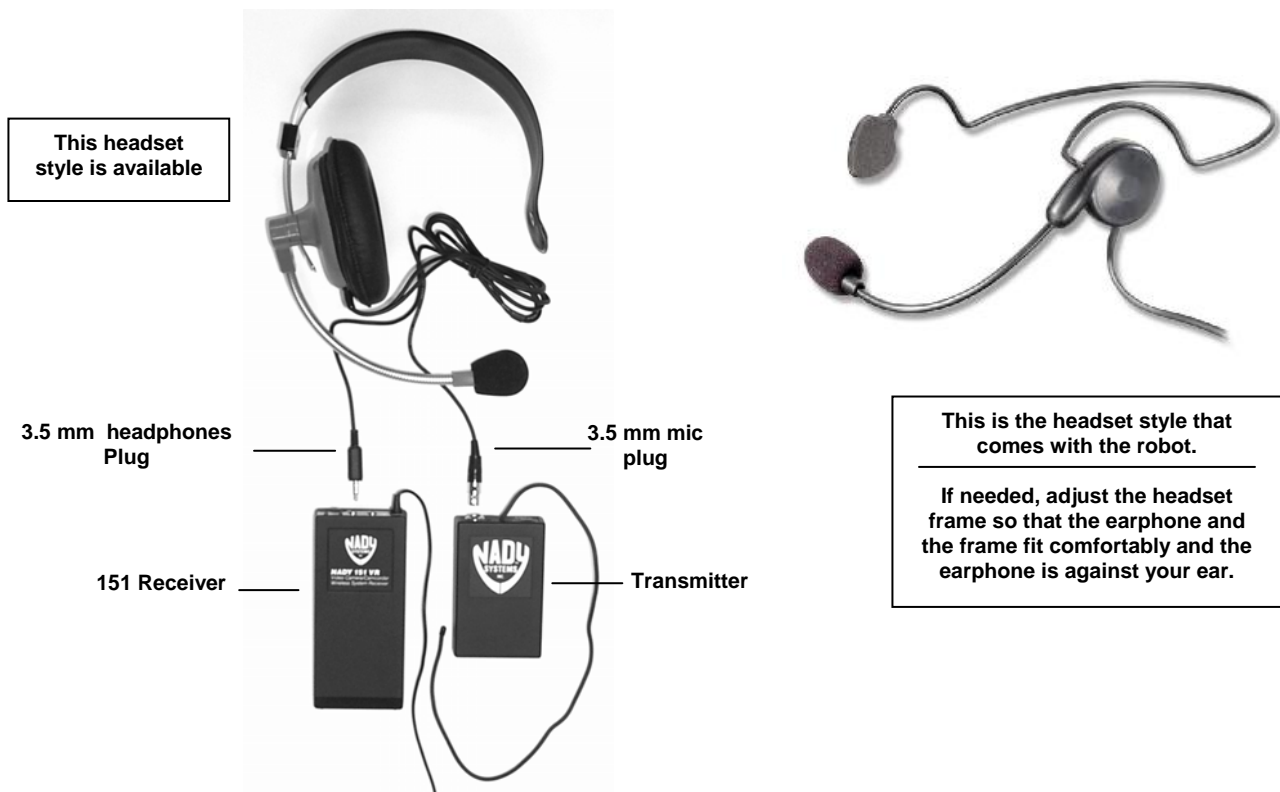
The second voice link transmits the audio detected by the Mic element (located in the front of the robot) to the 151 receiver (which is worn by the operator). This is amplified and sent to the speaker in the operator's headset. When putting the headset on, adjust the earphone so that you can hear well and the mic so that the volume is good.

**Note:** The operator's transmitter and receiver can be worn next to each other. If you want you can use a belt pack. The 151 Receiver antenna can be put in your pocket.

### Location of Voice Units

Voice Transmitter-	Operator wears
Voice Receiver-	On the main electronics box in the lower robot.
151 Transmitter-	On the frame in the robot. The robot mic connects to it.
151 Receiver-	Operator wears

Operator's Voice Transmitter, Receiver, and Headset



## How to Operate the Operator's Transmitter

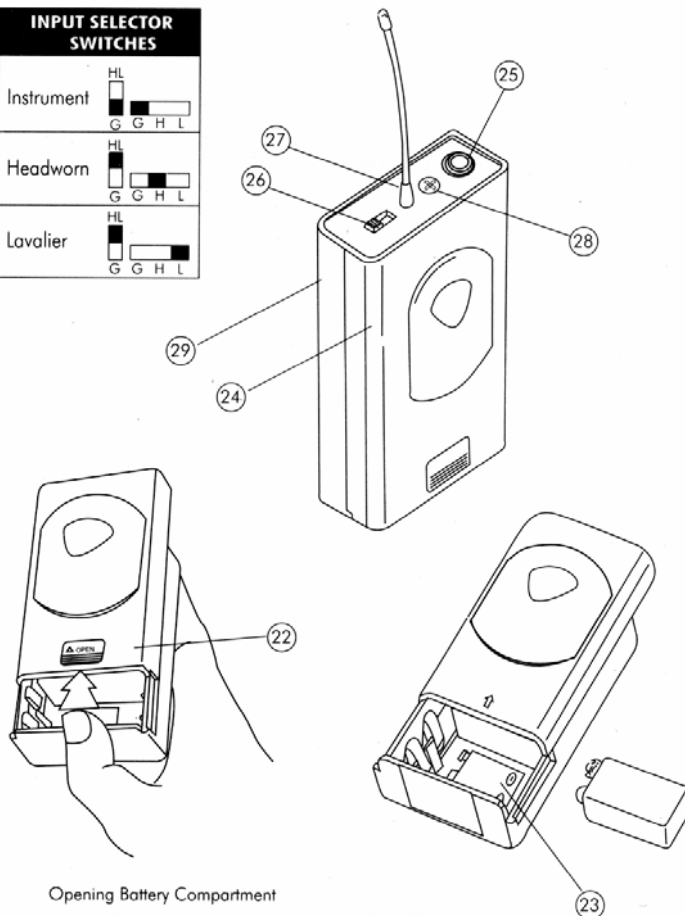
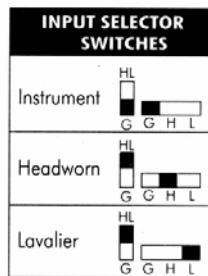
1. Open the battery door.
2. Use a 9 Volt alkaline battery and insert it according to the diagram inside the battery compartment.
3. Place the headset on your head and adjust the microphone to approximately 1 inch from your mouth. If needed, adjust the headset frame so that the earphone and the frame fit comfortably and the earphone is against your ear.
4. Plug the mic plug from the headset into the top of the transmitter.
5. Move slide switches to the "ON" position.
6. On the UB4 there is a Volume input level adjust on the unit.

**Frequency channel- Located on the back of the transmitter.**

### Function of the LED

When turning on the power switch, with a fresh alkaline 9-Volt, the battery light will blink on momentarily and go out. This indicates that it is powering up and that the battery is good. Because the light is a low battery indicator, when the light is on constant, this indicates the battery is too low-below 7 Volts. Replace with a new alkaline battery.

**Tip:** The operator's voice units both have metal clips that contact the posts of the 9-volt battery. These must be bent out from time to time to keep this contact good.



- 22. Sliding door
- 23. 9 V Alkaline Battery
- 24. Front Cover
- 25. 3.5 mm jack
- 26. Off/Standby/On switch
- 27. Antenna
- 28. Volume- Input Level Control
- 29. Belt Clip

**Frequency is listed on the back.**

Opening Battery Compartment

## How to Operate the Receiver (in Robot)

There are two adjustments on the receiver. The **volume** is on the back of the receiver, which you may set to the desired volume. On the UHF UB-10 you can change the volume on your belt transmitter *on the fly*. The other adjustment is the **sensitivity**. This is factory preset to maximum sensitivity. This effects how sensitive the receiver is to the transmitter signal. Typically you would never need to adjust this. The only exception would be if you get squelch when the transmitter is off. You can deal with this by simply turning on the belt transmitter whenever the robot is turned on. You could turn the sensitivity down slightly but turn the adjustment as little as possible, because adjusting it will affect the range.

**Frequency label- Located on the side of the receiver.**

### Function of the LEDs

**TX LED-** This indicates that you are receiving a signal from the transmitter. On some units it is a single TX light. On other units it may have an A or B that it will alternate between.

**AF LED-** This light indicates that audio is going through the receiver. It will flash as you speak into your headset mic.

**Tip:** For best range extend the receiver antenna(s) as much as possible, not allowing it to touch metal.



1. Power On LED Indicator
2. Diversity LED Indicators
3. AF Peak LED Indicator
4. Antennas
5. Power Switch (Leave On)
6. Frequency Label
7. Audio Output
8. DC Input Jack 12V
9. Aux. Volume Control
10. Balanced Mic Audio Output XLR
11. Squelch Control

## How to Operate the 151 Transmitter (in Robot)

No adjustment is needed. The switches will be preset to on at the factory. It receives its power from the robot. No 9 Volt battery is needed.

### Function of the LED

When the robot is turned on, this light flashes and then goes out. This indicates that the transmitter is getting power.

## How to Operate the 151 Receiver (Operator)

1. Remove the battery door.
2. Use a 9-Volt alkaline battery and insert it according to the diagram in the battery compartment.
3. Plug the small round connector from the headset into the headphone jack on the top of the 151 receiver.
4. Turn the volume knob clockwise to the desired volume (if volume is too loud you will hear a loud high-pitched feedback noise. Turn the volume down until the feedback is gone.

**Frequency label- Located on the back of the receiver.**

### Function of LEDs

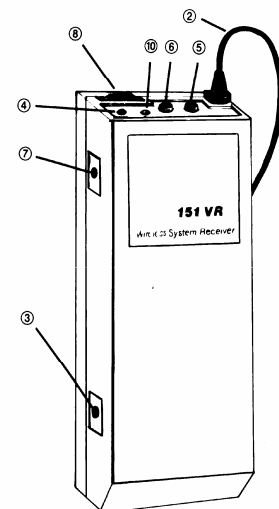
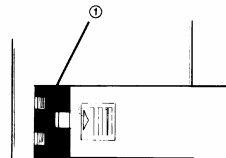
When turning the volume knob on with a fresh alkaline battery, the red light will blink on momentarily and go out. This indicates that it is powering up and that the battery has enough charge on it. As labeled, the light is a low battery indicator. When the light is on constant, this indicates that the battery is below 7 Volts. It then would need to be replaced.

**Tip:** The operator's voice units both have metal clips that contact the posts of the 9-Volt battery. These must be bent out from time to time to keep this contact good.



1. Off/Mute/On Switch
  2. Low Battery Indicator
  3. Audio Level Trim
  4. Audio Jack for mic
  5. Antenna
- 9 Volt Battery not needed in robot.**

Frequency listed  
on back



1. Battery door
2. Antenna
3. Mute control- Used if RF causes squelch. Leave Fully counter-clockwise for best range and reception.
4. Green TX LED- Indicates signal being received.
6. Headphones jack
8. Volume On/Off
10. Low Battery LED- On steady means low battery



### **Warnings**

1. **Do not unplug or plug in the DC power plug on the robot receiver with the robot power on.** If the power is left on, the plug will short out and could damage the receiver. The fuse in line on the power wire that is plugged into this receiver may blow. This fuse is a round black fuse holder. If this fuse is not blown but no RX power light is on, check the audio fuse on the main fuse block in the electronics box.
2. Do not leave the voice units in direct sunlight or in a damp place for any length of time.
3. Remove batteries if voices will not be used for an extended period of time.
4. Keep voices and headset in the carrying case when not in use.
5. Generally when the robot is on, the operator's transmitter should be on. This will avoid the receiver on the robot picking up radio frequency interference and putting out static (see intermittent static problem of Voice System Troubleshooting).
6. Turn off the 151 receiver or remove the headset before turning off the robot. You can get a squelch in your headset when you turn off the robot.

## **Troubleshooting the Voice**

**For any voice problem, perform the following steps first:**

1. Check to see that the batteries are good in the operator's transmitter and in the 151 receiver. Normally when you turn the 151 receiver on, the low battery light should blink on and go off. When turning on the power switch of the transmitter, the light should blink on and go off. If either of these lights stays on constant, the 9-volt battery is too low and must be replaced.
2. Check that the battery is in the correct polarity and confirm that the battery contacts are making a solid connection to the spring clips inside the compartment. Bend them out slightly if necessary. If the battery is making intermittent contact in the Transmitter, try a different brand battery. Certain brand batteries are bigger than others.
3. Check all switch positions both on the operator and robot voice units. This includes the audio and the power switches. See the Voice Unit Diagrams for details about the correct position of these switches.
4. Check all plugs to and from the voices for proper connection.
5. Check the LED lights. When operating normally, the Receiver in the robot has a red TX light on. The UHF UB-10 Receiver has two LEDs, A and B to indicate that a signal is being received. The 151 Receiver has a green TX light. These lights indicate that a signal is being sent from the respective transmitter and that the receiver is receiving this signal.

**See the next page for specific problems and their solutions.**

Problem	Cause	Solution
<b>Voice System</b> <u>Always do the following first:</u> <ol style="list-style-type: none"> <li>1. Replace the 9 Volt batteries with new ones. USE ALKALINE!</li> <li>2. Bend the battery contact out for better contact with the post of the 9 Volt battery.</li> <li>3. Check power and audio switches, and lights on all voice units.</li> <li>4. Check plug to and from the voices for proper connection.</li> <li>5. Check if the transmit (TX) lights are coming on.</li> </ol>		
Operator cannot talk	1. Low Battery. LED on steady or no LED flash.	1. Replace the 9 Volt battery. Is battery inserted in correct polarity?
	2. Battery posts not touching the metal clips in the operator's transmitter.	2. Bend out the metal clips. Put foam under clips.
	3. No power to the 101 Receiver. If yes, continue.	3. Check the in line fuse to the Receiver in robot and audio fuse on main fuse block.
	4. No TX light on the Receiver. If yes, continue.	4. Check Sensitivity adjustment on back of Receiver. It should be on Max. Sens.
	5. Audio wires going through pitch shifter connected wrong.	5. The wire should go from audio out of receiver to <b>input</b> of pitch shifter, then from <b>output A</b> into the main box and plug on to the main board.
	6. Headset plug to transmitter broken.	6. Take apart and look for broken wire or solder joint. TEST- Connect robot mic to transmitter. If it now works, problem is in headset. Repair or replace.
	7. Still not working. Call Robotronics.	Send transmitter, receiver, and headset in.
Operator cannot hear	1. Low Battery. LED on steady or no LED flash.	1. Replace the 9 Volt battery.
	2. Battery posts not touching the metal clips in the operator's receiver	2. Bend out the metal clips. Put foam under clips.
	3. Headset plug to 151 RX has a broken wire.	3. Unscrew cover of plug and look for broken wire.
	4. Robot 151 transmitter not turned on.	4. Turn on audio and power.
	5. Power plug to robot 151 transmitter unplugged.	5. Find wire and plug it back in.
	6. If you have no TX light on 151 RX mute could be out of adjustment	6. Adjust the mute on the 151 RX to max. which is fully CCW.
	7. Robot microphone in robot is bad.	7. Order a replacement. TEST- Plug your headset into the robot transmitter in place of the robot microphone and test.
	8. Still not working. Call Robotronics.	8. Send robot mic, transmitter, receiver, and headset.
Voice Operates but cuts out. Should get 50 feet without any cutouts.	1. Low Battery.	1. Replace the 9 Volt battery.
	2. Sensitivity Adjustment down too far.	2. Sensitivity adjustments should be at max. on the 151 Receiver and robot receiver.
	3. Broken, loose or retracted antenna	3. Extend robot receiver antenna or replace broken antenna.
Squelch coming from robot	1. No signal being sent to the robot	1. Turn on the operator's transmitter.
	2. Sensitivity is too sensitive.	2. Very slightly adjust sensitivity down from max. (This will decrease your range)
Squelch in headset when turning robot off.	1. 151 Receiver slightly too sensitive.	1. Adjust 151 RX mute slightly CW
	2. 151 RX picking up interference in your area.	2. Always turn off 151 RX and remove headset before you turn off robot.

## Flashing Eyelights

Function- The Flashing eyelights is a feature where the Eyelights flash as the operator speaks through the robot. The amount of the flash is affected by the level of volume of the voice. This level is affected by the Receiver volume level and the position of the headset microphone to the operator's mouth. The sensitivity is set based on a typical voice volume and the headset microphone being about 1 inch from the operator's mouth.

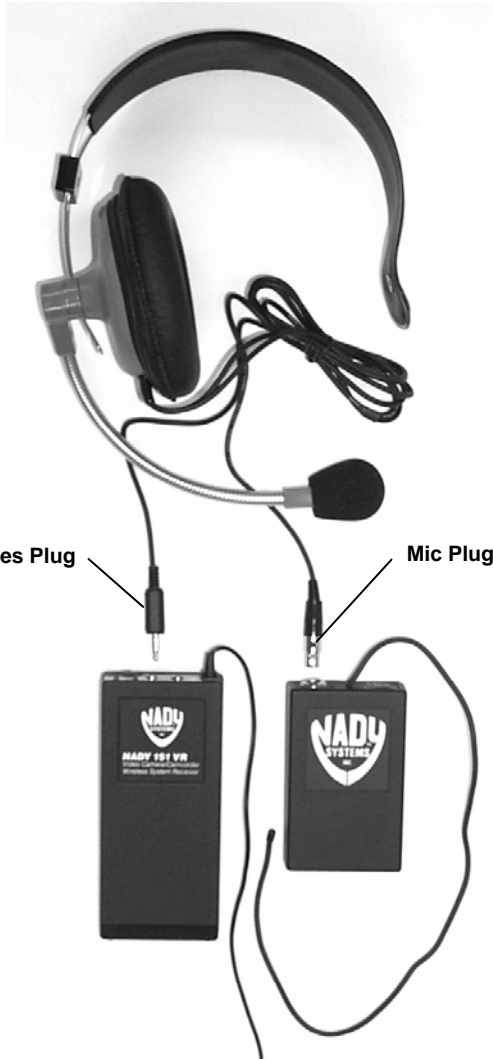
Adjustment- The adjustment is preset at the factory and should not need any adjustment. If an adjustment is necessary, see the Main Circuit Board diagram in the Appendix for the location of it. It is labeled eyelight sensitivity. When this pot is adjusted clockwise this makes the lights more sensitive to your voice and turning it counter-clockwise makes it less sensitive.

### Location of the Adjustment

Main Electronics Circuit Board.



# Operator's Voice Transmitter and Receiver



3.5mm Headphones Plug

Mic Plug - 3.5mm



Headset style that comes with the robot.

## CHAPTER 4 MP3 Player Integrated

### Integrated MP3 Player Features

- Ability to play MP3 files through the robot.
- Memory Storage Card: SD Card.
- Four sound effects stored on the card (horn, rev engine, screeching tires and crash).
- Space on the card to load your own music.
- Selection of songs is done with the RC.

The Integrated MP3 player will only play mp3 format files. The 128kbps compression rate is the best choice for this player for best cueing speed. File names cannot be more than 20 characters long. Abbreviate your file names to accommodate this. When loading music it is important that you load your songs outside the soundfx folder on the card or they will not play.

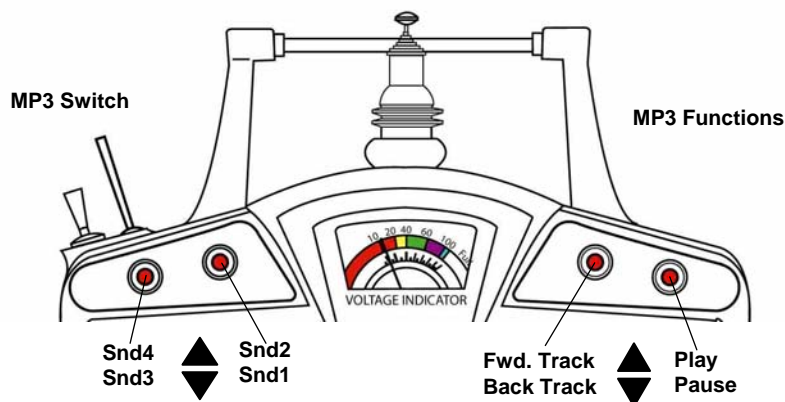
To use the MP3 player you will need access to software that converts audio files to the mp3 format, hardware to put the files on the memory card, and feel comfortable doing those two things.

#### Important

To load your own music on the card you will need to obtain a card reader that accepts SD or MMC cards. Card readers connect to a USB port on your computer.

### Play Music

To play a song, hold the MP3 mode switch and push the play switch shown on the diagram below.



Hold the MP3 switch on to use MP3 Player  
and to change volume with the left stick.

### Tips

- After you move forward or back to a new track, the music will start right when you release the switch.
- When you scroll to the last track it will stop there. If you want to go to the first track you need to back track.

- If you stop on a song, it will remember that position when you start the mp3 player again, unless you turn off the robot.
- If you want to change the volume of the music/sound effects you can go to the **Road Rage audio amp** and adjust the volume. When you do this, you may also need to adjust the volume of the voice on the voice receiver. Do not turn the amp up too high; not much past 1:00, because you may get some audio distortion.
- You can customize the songs and sound effects that you use for different programs by getting additional cards and adding your own set of sound effects and music.

### To Load Music on the Memory Card

Place the card in a card reader. Go into 'My Computer' on your desktop and find the drive that represents the card. Open this and you will see the sound effects folder. Open the source folder where you have your MP3 music or sound effects to transfer to the card. Drag and drop a copy of these files to the card. Make sure to put these files separate from the sound effects folder. You can place the files in the order that you want to use them. Put the memory card back in the MP3 player.

### Play Sound Effects

If you want to play a sound effect, hold the MP3 mode switch while you hit the sound effect you want (See the diagram above). You can play any of the sound effects: snd1, snd2, snd3, or snd4 with the switch as shown. If you add sound effects or songs to be played in the place of snd1-4 they must have the filename of **snd1, snd2, snd3, snd4** to play in their place. The sound effects files must be in the soundfx folder.

### Removing the SD Card

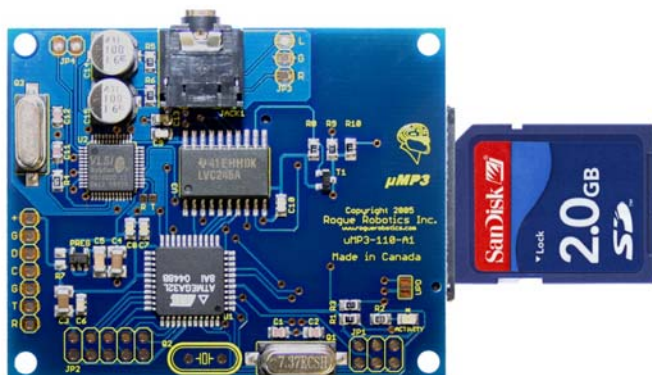
Open the back door of the robot to locate the MP3 player. Push on the memory card and it will slide out part way. Remove the card. Now you can load music on the card. If you need more storage space, get a card with additional capacity. If you need to add the sound effects to a new card, make a copy of the folder with the sound effects on and place it on the new card.

### Changing the Volume

While holding the MP3 switch, move the left stick right for volume up and left for volume down.

### Order of songs playing

The songs will play in the order that you transfer them to the SD card.



MP3 Player Board  
This shows black box inside view

## MP3/CD Player Adapter Option

The MP3 player and adaptor is an additional audio source to play music or other audio. The MP3/CD player adaptor goes between the headset mic and the voice transmitter. You can also use a CD player with the adaptor. It has one connection to go to the MP3 player. You can use the voice system without the adaptor also. The diagram below shows how to do the hook up.



### Using the MP3 Player (See the operating manual in the control case).

1. Install a fresh battery in the MP3 player.
2. Install the software from the CD on your computer to download songs to the player. Connect the USB cable provided from the MP3 player to your computer.
3. Make sure the lock switch is off which locks the controls.
4. Press and hold the play button. Select the music menu and select a track.
5. For more volume, go in to the menu-output settings and change to line out. This will give you a higher volume adjustment.
6. Start the track with the play button. You can pause with this same button. To select a track, use the forward and reverse track buttons.

#### Auto Shutoff Feature

The auto shutoff feature shuts off the MP3 player if not in use for a designated amount of time. You can change this from 1 minute to 60 minutes. Just go in to the settings menu, auto shutdown. We recommend a setting of at least 25 minutes so that it does not shut off while you are doing a program.

## CHAPTER 5 Siren

The robot siren is operated by remote control from the Radio Control Transmitter. The siren circuitry is located on the main circuit board. See the Main Electronics Box diagram, in the Appendix, for the location of the siren volume, mode select and oscillation frequency adjust. The **volume of the siren** is controlled by a trim pot on the main board. Turning the pot clockwise will increase the volume of the siren. Turn the pot counterclockwise to decrease volume. Three different sirens are available. Choose the siren you want by moving the jumper located on the **siren mode select**. To control the oscillating speed, adjust the **siren frequency trim pot** in the siren circuit. The siren mode select is set to the common siren for your robot. If the siren mode select is changed, the siren frequency will very likely need to be adjusted.

**NOTE:** The volume and oscillation are preset at the factory and do not need to be adjusted unless you want a different volume level or oscillation speed.

### Troubleshooting Siren

1. Check if the audio booster is working by testing the voice or activating the cassette player. If you get no voice or cassette audio, check the audio fuse on the fuse block in the main electronics box. Also check the speaker connections at the speakers.
2. Call the Robotronics' Service Department for assistance.

## CHAPTER 6 Robot Battery System

### ROBOT BATTERY

The battery in the robot is a rechargeable sealed lead-acid Gel type battery. This type of battery is very dependable and safe. It can be repeatedly charged and discharged.

To recharge the robot battery, plug the charger into the robot recharge jack located on the bottom back right of the robot. You may have to tip the robot slightly to make it easier to plug the charger plug in. Switch the main **on-off-recharge** switch to the **recharge** position which is typically to the back of the robot. Finally connect the line cord of the charger into a 110 volt AC outlet. You will see the red charge light come on. This light indicates that the battery is being charged. It will be bright red to start with, and will become dimmer as the battery is charged. When the battery is fully charged, the light will be very dim and flashing or pulsing. If the light is so dim that you cannot see it, cup your hands around it or turn out the room lights so that you can see that it is dim and flashing. The charger is an automatic charger because when the battery is fully charged it will charge at a trickle charge. It will recharge the battery full in 10 to 14 hours. This type of charger will not overcharge the battery if left "ON" indefinitely. Avoid leaving it charging for more than 5 days. Generally, remove the battery from the charger when the charger indicates a full charge. If you have two robot batteries and want to charge the battery outside of the robot, follow the instructions given next.

#### Charging the robot battery outside the robot:

Locate the Pluggie charging cable adapter. This is a cord with a red and black rectangular connector on one side and a round connector on the other side. First connect the round side to your robot battery charger. Next, connect the red and black rectangular connector to the battery. Connect the line cord of the charger into a 110 V AC outlet. The red charging light should come on bright immediately. If the red charge ever cycles on and off in intervals of 3-4 seconds, you may have incorrect polarity problem or a bad battery. Call the Robotronic's Service Department for assistance.



Batteries are provided with a polarized connector to avoid connecting the battery backwards and damaging the robots circuitry. If these connections are disturbed, please be careful to observe proper polarity when reconnecting the battery. Use a digital voltmeter, if necessary to verify polarity of the battery and the connector at the end of the battery.

When removing and inserting the battery in the robot battery compartment, slide the battery in and out carefully.

It is best not to allow the robot battery to go completely dead as this shortens the life of the battery and makes recharging more difficult.



**CAUTION:** When storing the battery for any length of time make sure the battery has been charged. If a discharged battery is stored for any length of time it will damage the battery and will result in not taking a charge after storage.

The most important thing to do to avoid damage to the battery and increase its life, is to **recharge the battery back to a full charge after each use.**

### **Trouble-shooting**

#### **The robot is not getting power:**

1. Charge the battery fully. When connecting the charger, make sure that the red charging light is coming on. If it is not the charger could be bad or you could have a bad battery connection (wires leading from the charging jack through the main on-off-recharge switch and back to the battery).
2. Pull the battery connector apart and see if one of the four pins has slipped in the connector. If it has, slide it forward and re-connect.
3. Check the fuses on the main fuse block, especially the fuses for the processor and the radio control receiver.

#### **The robot is operating slow and the robot battery does not last the normal 4-5 hours:**

This could be caused by a bad battery or battery charger. If the battery was stored on less than a full charge for 2 months or more this could have damaged the battery.

# Robot Battery Specifications

## Model EP12120 12 Volt 12 AH

### Specifications

**Nominal Voltage:** 12 volts (6 cells in series)

**Nominal capacity of battery to a cutoff voltage of .4 volts per cell below initial closed circuit voltage.**

At 20 hour	rate load of	600 ma	12.0 A.H.
At 10 hour	rate load of	1050 ma	10.5 A.H.
At 5 hour	rate load of	1950 ma	9.7 A.H.
At 1 hour	rate load of	7200 ma	7.2 A.H.
At 30 minute	rate load of	12000 ma	6.0 A.H.
At 15 minute	rate load of	20000 ma	5.0 A.H.

**Weight:** 11 pounds approximate (5000 grams)

**Energy density @ 20 hour rate:** 1.1 watt-hours per cubic inch

**Specific energy @ 20 hour rate:** 13.1 watt-hours per pound

**Internal resistance:** 60 milliohms

**Maximum discharge current with standard terminals:** 80 amperes

**System:** fully gelled electrolyte lead dioxide battery

**Operating temperature range:**

Discharge: -40° to 140°F (60°C)

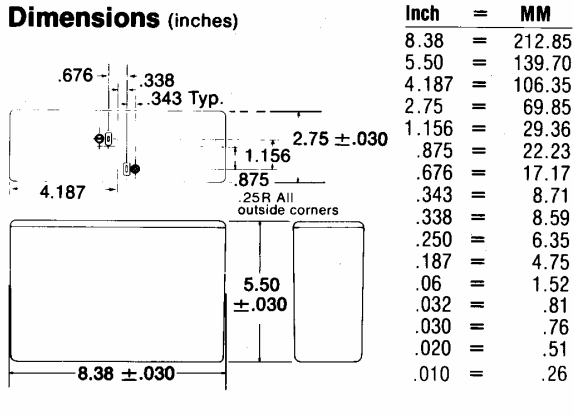
Charge: -4°F (-20°C) to 122°F (50°C)

**Housing Material:** case is made of high impact polystyrene

### Terminals

**EP12120-1 type:** Quick disconnect spade type, positive is .250 inches x .032 inches and negative is .187 inches x .020 inches.

### Dimensions (inches)



### Care & Application Instructions

**1. Recharging Methods:** The life and performance of the battery are very much a function of the charger used. In all cases the initial charging current should not exceed 1.70 amperes. The battery is fully charged when the voltage, at room temperature, is maintained at 2.4 volts per cell and the current drops to a level between 24ma and 60ma. At this point the charger should be disconnected or switched to a float voltage of 2.25-2.3 volts per cell. It is important to consult Elpower's Technical Reference Manual for more detailed information.

**2. Sealed construction** allows the battery to be operated in any position. The battery is protected against internal pressure buildup of more than 6 p.s.i. by self sealing vents, which pass only dry non-corrosive gasses. The gasses consist of hydrogen and oxygen, which are explosive. When installing in equipment care should be taken to insure that the battery's safety seals are free of obstruction and that the battery's compartment is ventilated.

**3. Depth of Discharge:** Although battery design tolerates deep discharges, for maximum life a low voltage cutoff circuit is recommended for discharges below 1.66 volts per 2 volt cell.

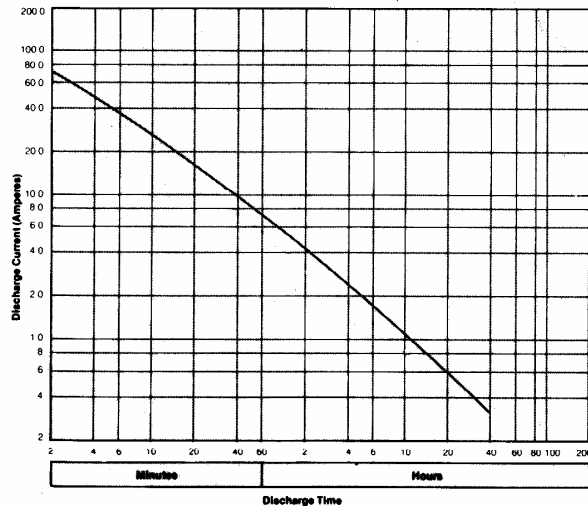
**4. Series-Parallel Connection:** Batteries may be connected in series to obtain desired voltages and/or in parallel to obtain additional capacities. Combinations of batteries present some special problems that should be considered in circuit design to maximize battery performance. It is suggested that you consult an Elpower Applications Engineer.

**5. Storage:** Batteries should be recharged as soon as possible after each use and not stored in a discharged condition. Battery life will also be prolonged by storing in cold temperatures; high temperatures on a continuous basis will shorten the battery's life. If batteries are not being used—they should be recharged every six months.

**6. Temperature vs. Capacity:** The battery is rated at 68°F (20°C); below this temperature its capacity decreases, above this temperature it increases.

**7. Additional Information:** Detailed information is available on all subjects briefly discussed on this specification sheet. Contact Elpower Corporation or your local Elpower representative.

**Discharge Characteristics:** Discharge Time\* vs. Constant Current Drain  
\*Time required for the closed circuit voltage (CCV) to decrease 0.4 V/cell at room temperature



The above curves and information on the reverse side are based upon the design characteristics of the battery and its purpose is to provide information relative to battery capacity and specific discharge rates.

Individual battery results will vary depending upon storage, temperature, state of charge, number of cycles and charger characteristics and efficiencies.

New batteries must be cycled or floated appropriately before full rated capacity is achieved.



## ROBOT BATTERY CHARGER

### Instructions for Proper Use and Operation

#### WARNING: HAZARD OF EXPLOSIVE GAS MIXTURE

When charging, a lead acid battery gives off hydrogen gas. The Gel type is a lead acid battery with pressure relief type vents. Although it only gives off a small percentage of the gas that a wet lead acid battery does, the following precautions should be observed:

1. Do not position your face over the battery, at any time while making connections while charging the battery outside the robot.
2. Do not smoke, strike a match, or cause a spark in the vicinity of the battery during charging.
3. Charge battery in a dry, well ventilated area.


As additional protection from the hazard of electrical shock:

1. Do not expose the charger to rain.
2. Replace defective cords and wires immediately.

### General Information for Charging Gel type Batteries

1. The time required to fully charge a battery will, of course, depend on the battery ampere hour rating and the amount which the battery has been discharged.

The charger red light is your best indication of the battery's state of charge. If it is bright red and it continues to stay bright red, the battery is discharged. If the light initially is bright red but then dims and begins flashing or pulsing, the battery is charged.

2.  When connecting the battery charger to the battery, if an audible click is heard and the red light goes bright on and then off in intervals of 4-5 seconds, disconnect the charger plug immediately. There is possibly a reverse polarity problem. Examine the wires making sure red goes to red and black to black. Check the connection of the wires to the battery posts. The red wires must connect to the post labeled positive (+), and the black wires to the post labeled negative (-).

If the charger does not come on at all, the battery could have a shorted cell and needs to be replaced. A battery which behaves in this way is most likely in a "sulfated" condition. The condition is caused by leaving a battery in a discharged condition for a length of time.



**CAUTION: Leaving the Globe Gel/Cell, or any lead acid battery, in a totally discharged condition for a length of time is the single most abusive condition encountered in lead acid battery usage. It is prevented by recharging the battery, as soon as possible, after discharging it.** A stand in the discharged condition of two or three days is not serious, but **two or three months most likely will damage the battery.**

3. **Important storage information:** A fully charged Gel type battery can be left in storage for, at least, three months under normal conditions. If the storage temperature is above 90 degrees F, the battery should be connected to the charger every month for 24 hours. At lower temperatures, a "boost" charge for 24 hours need only be done every three months.

4. This charger is not recommended for continuous charging of Gel type batteries. The charger should be disconnected from the battery once the red charge light shows the battery to be fully charged or approximately 14 hours of charge time. Because of the automatic nature of this charger, no harm will be done if the charger is occasionally left on for a week after the battery reaches the full charge condition.

## CHAPTER 7 Drive Motor System

Your robot is provided with two high quality industrial grade drive motors. Each motor controls a drive wheel-left and right. Steering of the robot is accomplished by varying the speed and direction of these motors. For example, when the left motor runs faster than the right, the robot turns to the right.

Each drive motor is connected to its drive wheel via pulleys and 1/2" wide rubber timing belts. The pulley set screws and bolts should be kept tight.

### Trouble-Shooting Drive

Perform the following steps first when trouble-shooting a drive problem:

1. **Do the other radio control functions operate?** Do the other RC features work such as siren and tape? If they do not, check the fuses on the robot battery and fuses on the main fuse block in the main electronics box. Especially look at the fuse labeled 5 Volt Regulator Processor and 5 Volt Regulator Receiver (see the fuse block detail in the Appendix).
2. **Check drive belts and motor pulley set screws.** Especially if you hear the motors activate but the robot does not move.
3. **Check connections to motor controls and motor leads.** These are blue and yellow wires coming from the electronics box and going to the drive motors. There is a white connector in line. The joystick could be pushed in the on position while the connector is being checked for an intermittent connection. If there is a bad connection, the connector and/or pins should be replaced. While doing the test just explained, have the robot wheels off the ground.

Perform the following depending on the symptoms indicated:

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**Note:** The best way to look at what the drive motors and wheels are doing is to put something under the back of the robot to get the wheels off the ground. You will then be able to see exactly what motor and wheel is working or not working, and in what direction.

---

**Neither drive operates:** Check the fuse on the robot battery. One of the fuses supplies power to the drive.

**One drive only does not operate either direction:** Check the specific drive fuse on the fuse block (left or right). See the fuse block detail to identify the correct fuse, or look for any blown fuses. The fuse block is located in the main electronics box. If after replacing, the fuse blows again, the **drive motor** or **drive circuit** could be causing the problem.

- **Drive motor-** If the drive motor is the problem, you would have likely heard the motor grinding or scraping before the fuse blew. To test the motor for operation, swap the motor wires. It is best to have the robot wheels off the ground when doing this test, in order to see which wheel is operating. The motor wires are blue/yellow wires hanging down below the electronics box. You may have to remove the robot battery, to make the

swap. If now the wheel/motor on the side in question operates and sounds fine then the motor is good.

**-Drive circuit-**(motor control) If the drive motor is good, the drive circuit (motor control) could be the cause of the fuse blowing. If this is the case, check for broken or shorted wires and if nothing is found, contact the Robotronics' service department for assistance.

**One drive motor operates only in one direction:** The motor control circuit is likely the cause of this. Contact the Robotronics' Service Department.

**The robot is not driving straight:** (Veering when you drive)

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**Note:** Be sure that both motors are operating forward and reverse at about the same speed, and that the motor pulley set screws and drive belts are tight. If this adjustment is done when there is something else wrong other than the adjustment, it will be difficult to get this adjustment back after the actual problem is corrected. This adjustment would be done, for example, if the robot veered beyond reasonable amounts when driving the robot forward, but both drive motors are working.

---

To locate the adjustment, see the Robot Main Electronics Box diagram in the Appendix. They are labeled **Forward Drive adjust and Reverse Drive adjust**. You will need a small flat head precision screwdriver to make the adjustment. The cover of the main electronics box would need to be removed to access the adjustment. Take the cover of the box completely off and set outside the robot so that it cannot touch the post(s) of the robot battery.



### **CAUTION**

**The robot battery posts should never contact the metal of the main electronics box or the metal of the drive base. This will result in damage to electronic components especially inside the main electronics box.**

Forward Drive Adjust Pot - Effects forward straightness of drive.

Robot veering left- Adjust it counter-clockwise

Robot veering right- Adjust it clockwise

Reverse Drive Adjust Pot- Effects reverse straightness of drive.

Robot veering left- Adjust it counter-clockwise

Robot veering right- Adjust it clockwise

If the robot veers, the reason is that one motor is going faster than the other at any given position of the joystick. For example if at full speed, the robot veers to the right, this means that the left motor is going faster than the right motor. To correct this you would adjust the forward drive adjust pot clockwise to slow down the left motor in the forward direction. You may need to do some trial and error to get it just right. To do this, adjust the necessary adjustment pot very slightly and then drive the robot to see if the robot is driving straighter. Continue the adjustment until it drives suitably for you. It is best to use full speed during the adjusting, because this will act as a good reference point.

- Contact the Robotronics' Service Department if you need any assistance or parts.

## CHAPTER 8 Eyelids and Eyes Left and Right

The eyelid and eyes left and right movement is accomplished by three servo motors in the Character or upper robot. When the switch on the radio control is activated, this signal is sent to the radio control receiver in the robot. The micro-controller in the robot decodes this signal and a new signal is sent to the eyes servo board. The eyes servo board is located on the underside of the top of the robot. To see it, the top would need to be removed and the top turned on its side. The wires connected to this board take the signal to the servo itself and operate the shaft of the servo motor to turn clockwise or counter-clockwise for opening or closing. The rotation of the servo motor shaft is coupled to the eyelid and eyeballs with a servo arm and then an eyelid rod.

### Troubleshooting Eyes

#### **An eyelid or the eyes left and right does not operate:**

1. Check the linkage from the servo motor. Look for the servo arm off the servo shaft or the eyelid off the ball link.
2. Follow the wires from the specific servo motor with the problem. The wire will run to the eye servo board. If it is disconnected, reconnect according to the eye servo board diagram. If the servo does not work correctly (wrong direction), try one of the other outputs on the eye servo board.

#### **One of the eyelids is at a different level than the other:**

1. If the eyelid rod is bent, bend it back into position.
2. If the servo saver arm (white and metal arm interconnecting the servo and the rod), is solid and secure the position of the eyelid can be positioned to match the other eyelid. To remove the servo saver arm, the set screw must be removed. The eyelid level can be changed by altering the length of the eyelid rod or changing the position of the servo saver arm on the servo motor shaft.

#### **There is no operation of any of the eye functions:**

1. The wires that bring the signal to the eyes servo board are gray and yellow. 5 Volts power is the black and red wires that connect to the eyes servo board. If these wires are connected, follow them back to the board that they originate. Wires originate at the Character board.

## CHAPTER 9 OPTIONAL ACCESSORIES

### WATER SQUIRTER SYSTEM

#### Water squirter parts and where to find them:

**Refill bottle** - Comes with robot.

**Water squirter nozzle** - On the right arm.

**Water squirter switch** – On the top of the frame on new robots. Located on the bottom of the robot next to the overflow nozzle on older models.

**In-line fuse** (5 Amp-AGC type) Located on a red wire between the switch and the main circuit board.

**Overflow nozzle** - Located right beside the water squirter switch on the bottom of the robot.

**Water line and connector** - Located on the top of the frame. Access it by removing the cap of the robot.

**Water pump and reservoir** - Located on the back of the frame. The body has to be removed to access them.

#### How to fill your water squirter system:

1. Unplug the water line coming from the water squirter nozzle and plug in the filler bottle in its place.
2. Put the main on-off-recharge switch in the recharge position. This is the fill position.
3. Hold the water squirter switch in the momentary position until water comes out the overflow nozzle (You may stop sooner if you want). Be sure that the water is filling in the reservoir. There will typically be a change in the motor sound when it is full.
4. Plug the water line back in and switch the water squirter switch to the "on" position.

#### How to operate your water squirter system:

1. The water squirter system must have water first. If not, fill your water squirter system. Operating the water pump without water running through it for more than 10 seconds is not good for the pump.
2. The water squirter switch on the robot, must be in the "on" position.
3. To squirt water move the *squirter* switch on the radio control transmitter to the on position. This is a momentary spring loaded switch so that you can get short bursts of squirting.

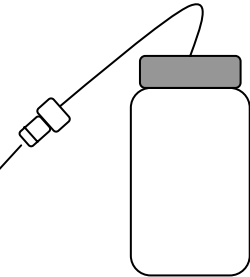


#### CAUTION

1. The water squirter system should not be operated without water in it.
2. ALWAYS make sure the water line is plugged in when using the water squirter or water may damage the electronics.

The parts of the water squirter are shown on the next page.

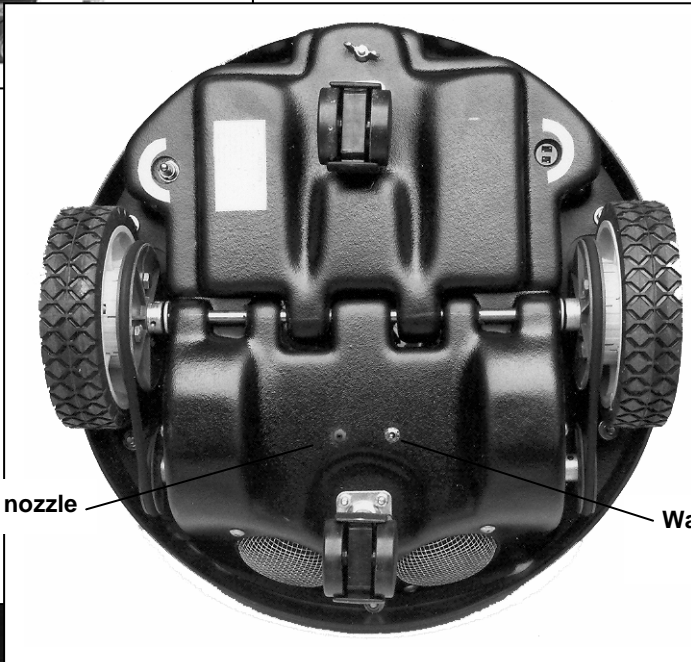
### Water Squirter System Parts



Connect Filler Bottle Here to Fill Reservoir

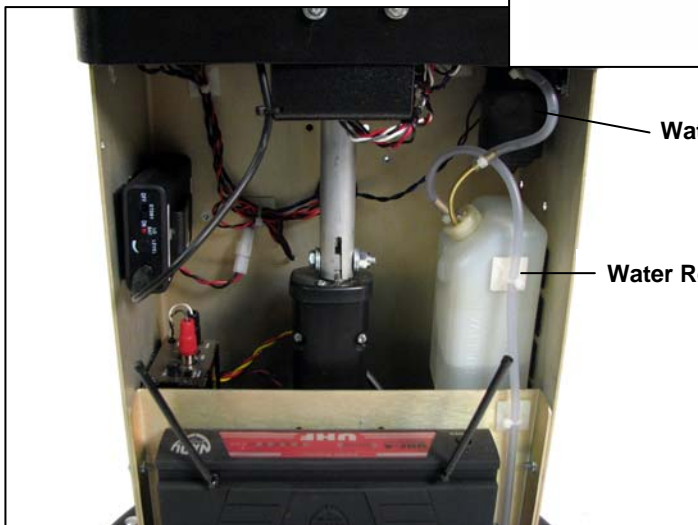
Female Water Connector

Water squirter switch on new models



Overflow nozzle

Water squirter switch Old models

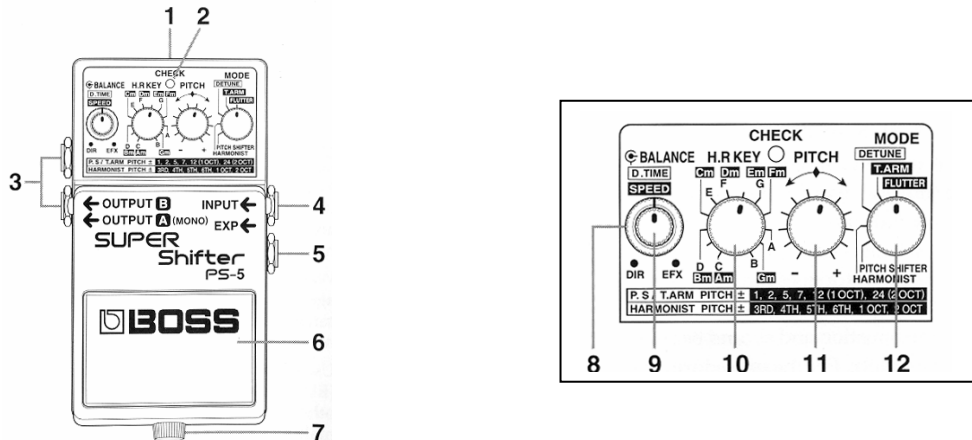


Water pump

Water Reservoir

## OPTIONAL ACCESSORIES: VOICE MODIFIER (PITCH SHIFTER) INSTRUCTIONS

The pitch shifter (voice modifier) can change the operator's voice to disguise it and create a robot character type voice. The operator's voice signal is received like normal by the voice receiver in the robot. The signal is then sent from the audio out of the receiver to the **Input Jack** of the pitch shifter. It is modified and sent from the shifter **Output A** to the voice 'audio in' on the main circuit board.



1. Power Jack – 9 Volts center negative
2. Check indicator – Power indicator and show whether an effect is on or off.
3. Output Jacks. Output A is what we use.
4. Input Jack.
5. EXP Jack. Not used.
6. Pedal Switch. Turns it on or off.
7. Thumbscrew. To release pedal.
8. D.Time Speed Knob – Delay time. Not used in pitch shifter or harmonist mode.
9. Balance knob – This adjust the output balance between the direct sound and the effect sound. Typically set this on EFX for the full effect.
10. H.R. Key switch. Not used.
11. Pitch Switch. Adjusts the amount of pitch shift.
12. Mode Switch. Selects the mode. Typically use the pitch shifter mode.

### How to turn the pitch shifter off

When you turn on the robot the shifter comes on. If you do not want it on, find the switch on the RC transmitter labeled voice. This will allow you to turn it on and off. Hit the switch to turn it off and hit again to turn it back on. When the pitch shifter is on, the power light labeled 'check' will be lit but you will not be able to see this because it is down in the robot. The shifter will take a few seconds to power up.

The pitch shifter has two basic effects; a digital pitch shifter and a delay. There are many variations of these two effects. When used as a pitch shifter, you can vary the shift within +/- 2 octaves. Set the mode knob to Pitch shifter and then vary the pitch knob until you get the sound of voice that you want. You can get a similar effect with the harmonist position but the pitch

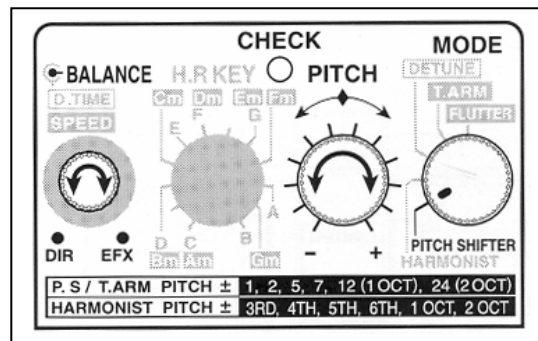


shifter gives you the best sound. These are the most common modes used because these modes give you the ability to adjust the shift of your voice to exactly what you want whether up or down. About 2:00 on the pitch knob gives you a good voice.

The shifter gets power from the robot battery; no internal battery is needed. The fuse related to the shifter is the audio fuse located on the fuse block.

Below is a typical setting for the robot voice. This will give you a good animated character or robot type voice.

Balance-clockwise  
Pitch-About 2:00  
Mode-pitch shifter



## PART 3

### CHAPTER 10 Assembly & Disassembly

#### Removing the cap

1. Put your hands on the bottom rim of the cap, a hand on each side. Give a quick pull up and the cap will pop off the cap rod. It is not necessary to remove any of the nylon bolts to remove the cap. There is a sticker on the black crosspiece listing step by step removal of the body. These steps are listed below.

#### Removing the body from the frame

1. Remove the cap of the robot as described above.
2. Unscrew the cap nut which is on the cap rod.
3. Disconnect the any and all wire and connectors connecting into the top of the frame. These include:
  - 16 pin round connector (this includes eye servo and eye lights wires).
  - microphone wire with plug.
  - water squirter hose (optional feature).
4. Unlatch the body latches that attach the body to the frame. These are located to the left and right just above the frame. Pull the latch pins inward to unlatch.
5. It is easiest to pull the body off by putting your hands down along the bottom edge of the body at the seams. Pull out slightly and then up. As you lift up make sure that the wires no wires are still connected and that the wires do not catch on the body as you pull it off.

#### Attaching the body to the frame

Reverse the above steps.

#### Removing the eye box from the body

1. Remove the three nylon bolts just below the eye holes in the body.
2. As the last one is removed, you will feel the eye box starting to come down. Hold the eye box with one hand and lower it down to the floor. Lift the body up to get the eye box off the floor.

Install the eye box in the reverse order.

## PART 4

### CHAPTER 11 Maintenance

#### Regular Maintenance Checklist

Periodically the robot should receive a thorough inspection.

1. Examine the exterior of the robot and make repairs as necessary. See the robot body repair instructions if needed.
2. Remove the body. Check all bolts and nuts for tightness.
3. Examine electrical wiring and connectors for looseness and wear.
4. Clean and lubricate mechanical parts of the robot such as the front wheel casters as needed. Inspect the drive belt and pulley system making sure that the motor pulley set screws are tight. You can use belt dressing on the drive belts if they are dry or squeaky.
5. Clean the cassette tape system according to instructions in the Cassette Tape Player pages.
6. Wash the robot body with mild soap and water and a soft cloth and reattach the body. (Rubbing alcohol may be used on stains that won't come off with soap. If this causes the finish of the plastic to become dull, apply ARMOR-ALL brand protectant. Do NOT use alcohol on the eyes.
7. Check the Radio Control System and Voice Transceiver for broken wires, controls, cases, etc. The metal clips that are in the voice units and contact the 9 Volt battery, should be bent out routinely to maintain good contact.
8. Fully charge the battery and test all robot system functions. This must be done on a daily basis when the robot is in constant use. Remember, the robot battery should be brought to a full charge after each use of the robot so that it always has a full charge on it.

To prolong the life of your robot system, always store in a safe place away from **light, dust, moisture**, and excessive heat. **To keep dust and light away from the robot, a robot cover should be used.** The robot and Radio Control Transmitter batteries should be stored fully charged. Transport and store the robot standing up. (Never upside down!)

For a list of recommended tools for a tool kit, see the next page. Ask us about the *Robot Maintenance tool kit* that is available.

**Chapter 11 Maintenance: Recommended Tool Kit**

## Recommended Tool Kit

Fuses- 1, 3, 5, 15, 20, 30 Amp (AGC Type)  
4" cable ties  
#53 Miniature bayonet bulbs (automotive panel type)  
Precision regular Phillips screw drivers  
Screwdrivers (flat head and Phillips)  
Socket and ratchet set  
Needle nose pliers  
Crimper/Wire strippers  
Wire cutters (diagonal cutters)  
7/16" & 3/8" wrenches  
Set of Allen wrenches (Especially 3/32" and 1/8" sizes)  
Extra 9 Volt alkaline batteries  
Small soldering iron and solder  
Small can all purpose lubricant  
Digital Multimeter (Volts/Ohms)

## PAINTING OF THE ROBOT BODY

The following information is only suggestions of painting methods. Contact a professional for assistance.

### Preparing the surface:

The robot body is an **ABS plastic** and should be cleaned before painting to remove oils and dirt. This is especially true if the surface has had a protectorant such as Armor-All put on it. If the body has not had a protectorant or other silicone product used on it, you could clean the area with isopropyl alcohol to prepare it. It helps to smooth the rough edges of the scrapes or scratches before painting with a 600 grit sandpaper. You can lightly sand the area to paint with the 600 grit sandpaper or a Scotch-Brite 7448 pad.

### Painting the surface:

#### Method 1

Enamel spray paints such as Krylon Interior/Exterior enamel could be used. This can be touched up easy if the paint ever got a scuff or scrape but is typically just for painting trim, bumpers, gauge plates etc. Carefully cover parts that are not to be painted with masking tape and paper, to protect against over spray.

#### Method 2

Note: If you use method 2, you should contact a professional painter that has had experience painting on various types of surfaces. These are automotive type paints and typically include a primer and base coat. For a glossy look you can use a glossy base coat or a clear coat.

#### **Brand- Dupont**

Primer: Acrylic Urethane Flexible Primer Surfacer. One brand: mar-hyde (Talsol Corporation). Other brand: 5 Star Auto body Products Maximum 2K(5404) Use with activator (5406).  
For additional flexibility: Can use Dupont Plas-stick Flex Additive (2350S) with the primer.  
Paint: Acrylic Enamel. Dupont ChromaBase Basecoat.

#### **Brand- PPG**

Primer: Check with painter.  
Paint: Deltron DBU

#### **Brand- Sikkens**

Primer: Plastoflex primer by Sikkens  
Paint: Autocryl by Sikkens (two-part acrylic urethane enamel)

The information listed includes suggestions and general information. This material is designed for application only by trained professional painters using proper equipment. If you have any questions, call our service department at 801-489-4466.

## REPAIR OF THE ROBOT BODY

### Materials

Super glue

ABS or PVC clear medium bodied glue

Fiberglass mesh

Rubber gloves

1. Hold the crack together tightly so that the glue you put on the inside of the body does not run through the crack on to the outside of the body. This would etch into the plastic.
2. If there are pieces of plastic reinforcement across the seam or crack that are unglued, PVC or ABS glue can be used between the reinforcement piece and the body. A clamp could be used to hold the plastic tightly together while drying.
3. Cut a piece of fiberglass mesh to cover the crack.
4. Position the body, so that the seam or crack is horizontal to the table. This will keep the glue from running. Apply some of the PVC or ABS glue along the seam, only on the inside of the body. Check to make sure that the glue is not running through the crack on to the outside of the body. Note: Avoid getting the glue on your hands.
5. Immediately put the fiberglass mesh on the glue and pat it down to saturate into the glue.
6. Apply some more PVC or ABS glue over the fiberglass mesh to saturate it some more.
7. It will dry to the touch in about 30 minutes. Allow 24 hours for complete drying.
8. For cracks that need more strength, glue a piece of ABS plastic across the crack with PVC glue.

### General Precautions:

Use in a well ventilated area.


Use gloves to avoid getting glue on your hands.

Avoid getting the fiberglass on your skin or clothing. The fiberglass will not hurt you, but could cause skin irritation.

For further precautions, read the super glue, PVC, and ABS container labels.

## STORAGE

Storing your robot for any length of time.

1.  Charge the robot battery. **(Storing the battery for any length of time without being fully charged will permanently damage the battery.)**
2. Charge the RC battery as per instructions.
3. Remove batteries from operator's transmitter and receiver.
4. The RC Transmitter and voice pieces should always be stored in the carrying case; this will extend the life and help insure proper operation.
5. Inspect robot for loose bolts or any additional maintenance that may need to be done.
6. Clean the body and top as per instructions in maintenance section. (If robot is stored with a dirty body it may be harder to clean at a later date, as stains may become permanent.)
7. Storing your robot with a dust cover on it will keep the robot clean and protect the body from scratches. It will also keep ultra-violet light from affecting the ABS plastic body.
8. The robot and batteries should be stored in a dry place between 55-75 degrees F. Storing the robot in a safe place will prevent scratches and extend the life.
9. After storing the robot for any length of time always test the robot well in advance of any scheduled activity as it is impossible to anticipate problems. This will ensure time to correct the problem.

# APPENDIX A



## Quick Reference Troubleshooting

More detailed troubleshooting by system is included with each subsystem. For additional help or parts call our service dept. at 801-489-4466.

Problem	Cause	Solution
<b>General</b>		
No functions operate	1. RC battery not charged	1. Fully charge until the needle is up.
	2. Broken wire from the receiver to main board	2. Resolder or repair wire.
	3. Fuse blown.	3. Check 5 Volt Reg. and processor fuse.
	4. Main board in robot not getting power	4. Check pins of battery and robot connector. Check on/off switch wires. Check ground wires.
	5. Radio Control transmitter or Receiver Crystal broken.	5. Replace crystals. Send RC and Receiver in to determine if it is a crystal.
<b>Voice System</b>		
<u>Always do the following first:</u>		
6. Replace the 9 Volt batteries with new ones. USE ALKALINE!		
7. Bend the battery contact out for better contact with the post of the 9 Volt battery.		
8. Check power and audio switches, and lights on all voice units.		
9. Check plug to and from the voices for proper connection.		
10. Check if the transmit (TX) lights are coming on.		
Operator cannot talk	Low Battery	Replace the 9 Volt battery.
	No power to the 101 Receiver.	Check the in line fuse to the Receiver in robot and audio fuse on main electronics box.
	Battery posts not touching the metal clips in the operator's transmitter.	Bend out the metal clips.
	Headset plug to transmitter broken.	Take apart and look for broken wire or solder joint.
Operator cannot hear	Low Battery	Replace the 9 Volt battery.
	Battery posts not touching the metal clips in the operator's receiver	Bend out the metal clips.
	Headset plug to 151 RX has a broken wire.	Unscrew cover of plug and look for broken wire.
	Robot 151 transmitter not turned on.	Turn on audio and power.
	Power plug to robot 151 transmitter unplugged.	Find wire and plug it back in.
	If you have no TX light on 151 RX mute could be out of adjustment	Adjust the mute on the 151 RX to max. which is fully CCW.
Voice Operates but cuts out. Should get 50 feet without any cutouts.	Low Battery	Replace the 9 Volt battery
	Sensitivity Adjustment down too far.	Sensitivity adjustments should be at max. on the 151 Receiver and robot receiver.
	Broken, loose or retracted antenna	Extend robot receiver antenna or replace broken antenna.
Squelch coming from robot	No signal being sent to the robot	Turn on the operator's transmitter.
	Sensitivity is too sensitive.	Very slightly adjust sensitivity down from max. (This will decrease your range)
Squelch in headset when turning robot off.	151 Receiver slightly too sensitive.	Adjust 151 RX mute slightly CW
	151 RX picking up interference in your area.	Always turn off 151 RX the robot.
<b>Cassette Player</b>		
No tape operation	Tape player no on tape mode	Put mode select to tape
	Play button not pushed	Must push play button before hitting the switch on the radio control.
	Tape is too tight.	Loose with a pencil by spinning.
	Power wire or plug is broken or not connected.	Replace plug or re-connect the wire.
	Radio control or tape circuit not working	Contact Robotronics for help.
No siren, or voice either.	Audio fuse blown.	Replace the fuse. See fuse block diagram.
Poor quality sound or slow.	Belts worn out and slipping.	Replace cassette player or belts.
<b>Siren</b>		
No siren	Audio fuse blown.	Replace fuse. See fuse block diagram.
Siren volume not loud enough	Booster problem if tape and voice vol. also are not loud enough	Replace or have booster repaired.
	Adjust siren volume if tape and voice okay.	See siren volume adjust on main board.

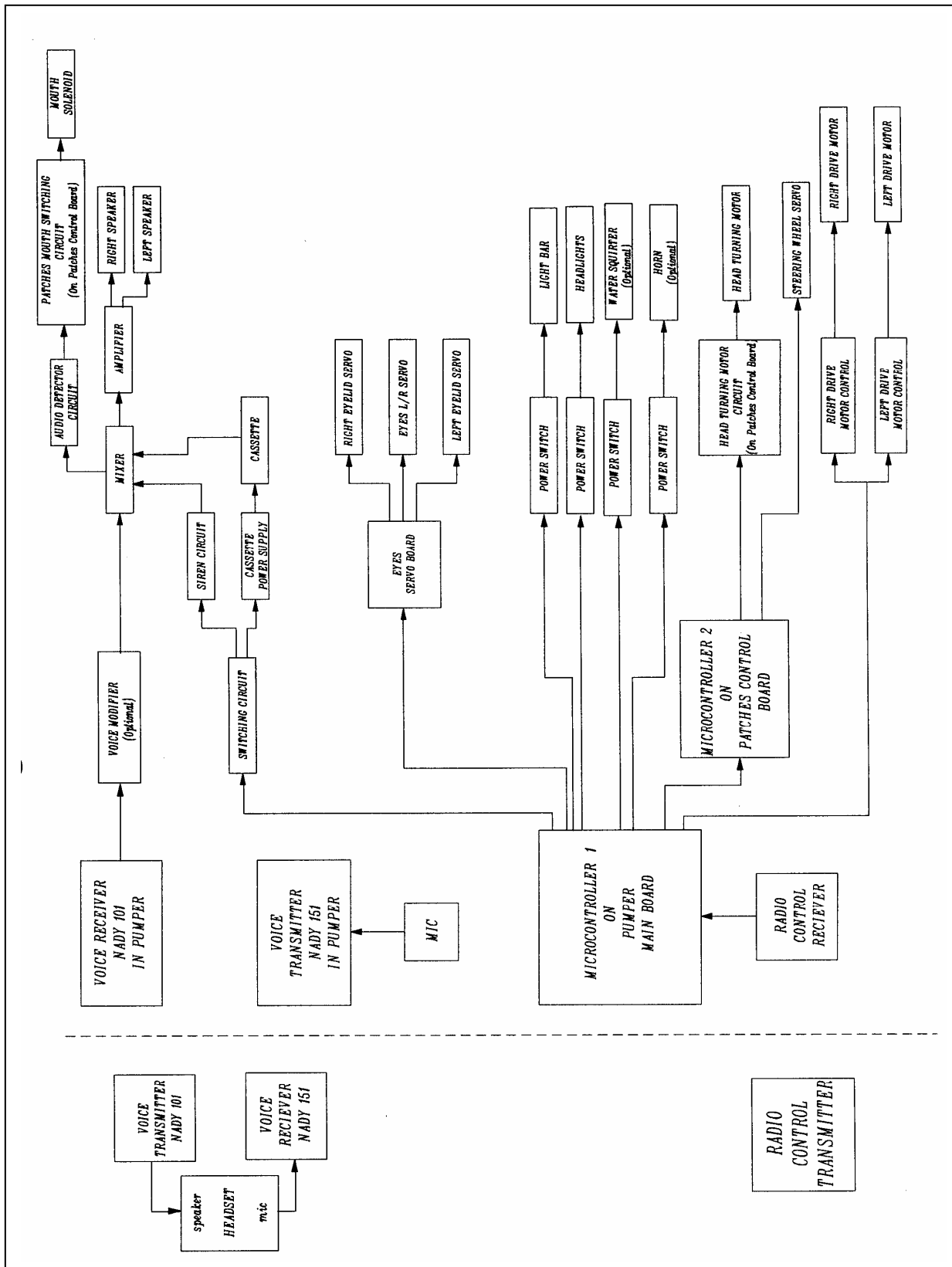
More detailed troubleshooting by system is included with each subsystem. For additional help or parts call our service dept. at 801-489-4466.

Problem	Cause	Solution
<b>Robot Battery System</b> No functions will operate.	Check wires and connector from battery to the robot.	Push battery connector pins in until it clicks in place. Pin could have slipped out of position.
	Battery is very low or bad.	Charge battery or replace if it will not charge. Also test charger.
Battery will not take a full charge. Needle on charger will not move.	Battery has not been kept fully charged	Charge and discharge repeatedly. Replace battery if it does not start charging.
<b>Drive Motors</b> Neither drive operates only. To correctly evaluate drive problems, look at wheels off the ground.	Both drive fuses blown.	Replace drive fuses on fuse block.
	Radio control drive section problem. Contact Robtronics for help.	
One drive only does not operate.  Determine first if it is the drive motor or drive circuit. To do this swap the wires that go to the motors at white connector. Same motor still not working then motor is bad. Problem switches to other motor, then problem is in main box possibly the drive circuit itself.	Drive motor pulley loose.	Tighten motor pulley set screws.
	Broken connection at motor connector.	Check blue/yellow wires and in line motor connector at motor
Drive motors moving on their own even when the stick is in the center.	Drive circuit not getting power.	Check drive motor fuses on fuse block (blue wires). Check wires coming from fuse block to motor circuit on the main board. Broken solder joint?
	Drive motor damaged.	Repair or replace motor.
Robot not driving straight.	Drive Circuit on main board problem.	Send main electronics box back to Service Dept.
	Drive trim sliders not in center.	Move drive stick sliders to center or position to neutral the robot.
	Joystick potentiometer broken.	Send to Robotronics for repair.
	One motor pulley set screw loose.	Tighten set screws.
<b>Character Head Turning System</b> Head is out of position but operates.	Straight drive adjustment needs to be adjusted.	Find adjustment on the main circuit board. See diagram of main board in Appendix.
Head motor is keeping head in not centered position	Loose head set screw or head was hit.	Re-position head and tighten set screw. Better to do this with the robot on.
Head motor is not operating	Head turning pot or pot shaft slipped	Re-center head by adjusting head turning feedback pot- blue pot below motor. Then tighten the set screws on the metal tube. See procedure in head section.
	Character board is not getting power	Check fuse on main fuse block.
	Broken wire.	Check power (red/black) and motor wire (blue/yellow).
<b>Eyelids and Eyes Left and Right</b> An eyelid or eyes L/R does not operate	Rod linkage came off.	Get to eyelid rods and ball links and re-attach.
	Servo wire broken or wire came out of eye servo board	Trace wires from servo motor of the eyelid or eyes and follow this wire to the eye servo board to find problem.
One of the eyelids is at a different level	Eyelid rod bent or eyelid out of adjustment	Straighten bent rod or change eyelid position by removing the servo arm. Then shorten or lengthen the rod by twisting the servo arm. You can also change the position of the servo arm on the servo shaft.
No operation of any eye functions.	Connection at eye servo board has come off.	Vehicle- located on underside of upper robot. Robots with Character- located in character.
	Wire(s) bringing 5 Volts and signal to servo board are not making a connection. Broken out of 37 pin connector.	Vehicles- locate the wires (red/black/gray/yellow/black) going from the 37 pin up to the eye servo board. Repair broken wiring. Robots with Character- Check gray/yellow/black and red black to eye servo board.
	No 5 Volts going to eye servo board.	Find broken wire on red/black or check fuse for eye servos on fuse block.

More detailed troubleshooting by system is included with each subsystem. For additional help or parts call our service dept. at 801-489-4466.

Problem	Cause	Solution
<b>Water Squirter</b> Cannot fill reservoir	In-line fuse blown.	Replace the 5 Amp fuse which is in-line on the wire. Follow wire from water squirter switch.
	Broken wire at water squirter switch or coming from main box	Repair break.
Cannot squirt: no pump sound.	Water squirter switch is not in on position.	On position is not the center position.
	Broken wire at pump or W.S. switch.	Repair/re-solder broken wire.
Cannot squirt: pump sound yes	Reservoir empty	Fill Reservoir with filler bottle.
	Water line is not connected to water connector	Connect it.
	Overflow tube and squirt tube are switched at the reservoir.	Swap them back. Overflow tube is the one that is in the top of the bottle and the tube runs to an outlet on the bottom of the frame.
<b>Voice Modifier</b> Voice not being modified	Modifier not turned on.	Push pedal on modifier. Light should come on.
	Audio wires not plugged in correctly	Jumper wire goes from Nady Receiver to <b>Input</b> of Modifier. Wire in <b>Output A</b> of modifier goes to the main board.

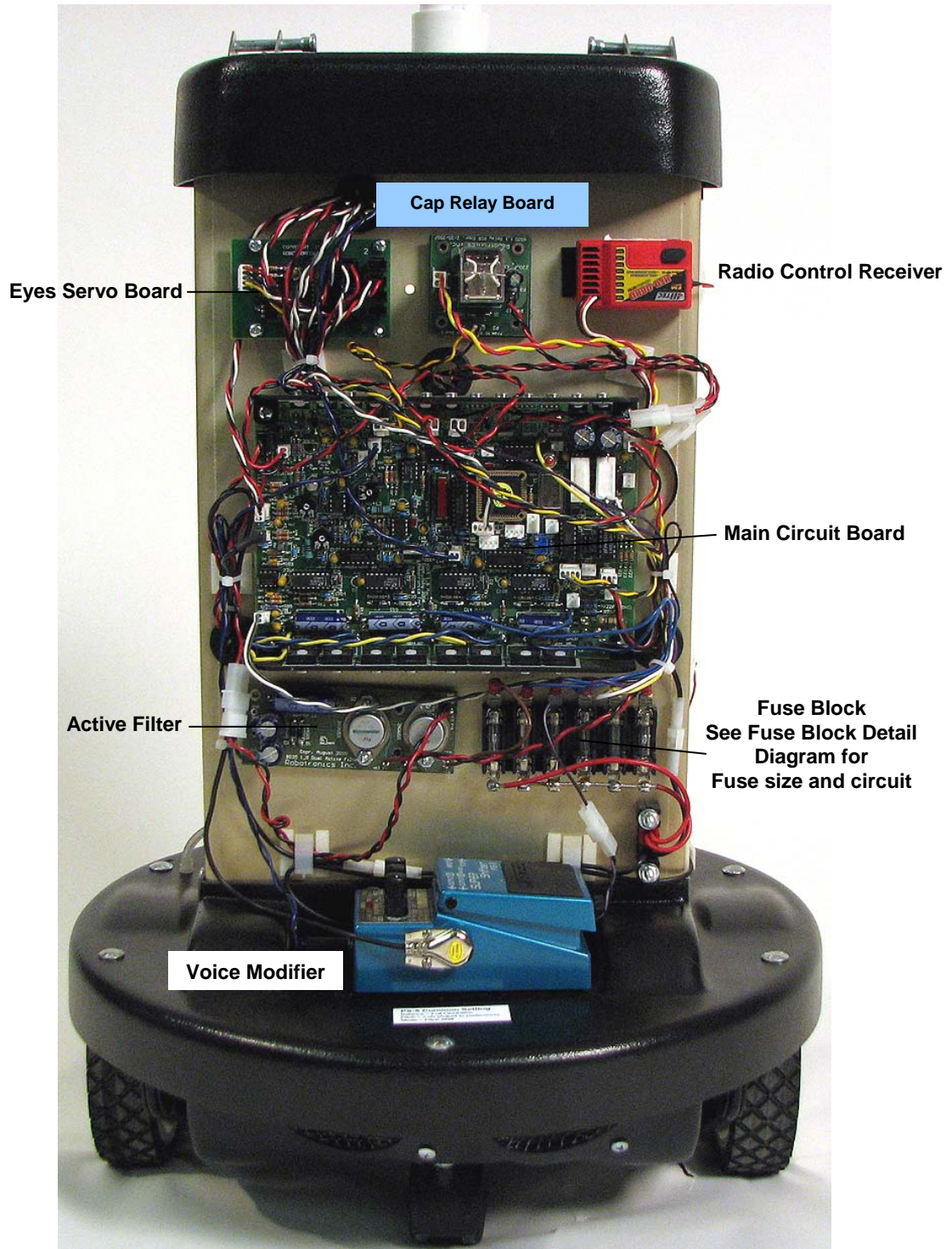
# Robot Block Diagram



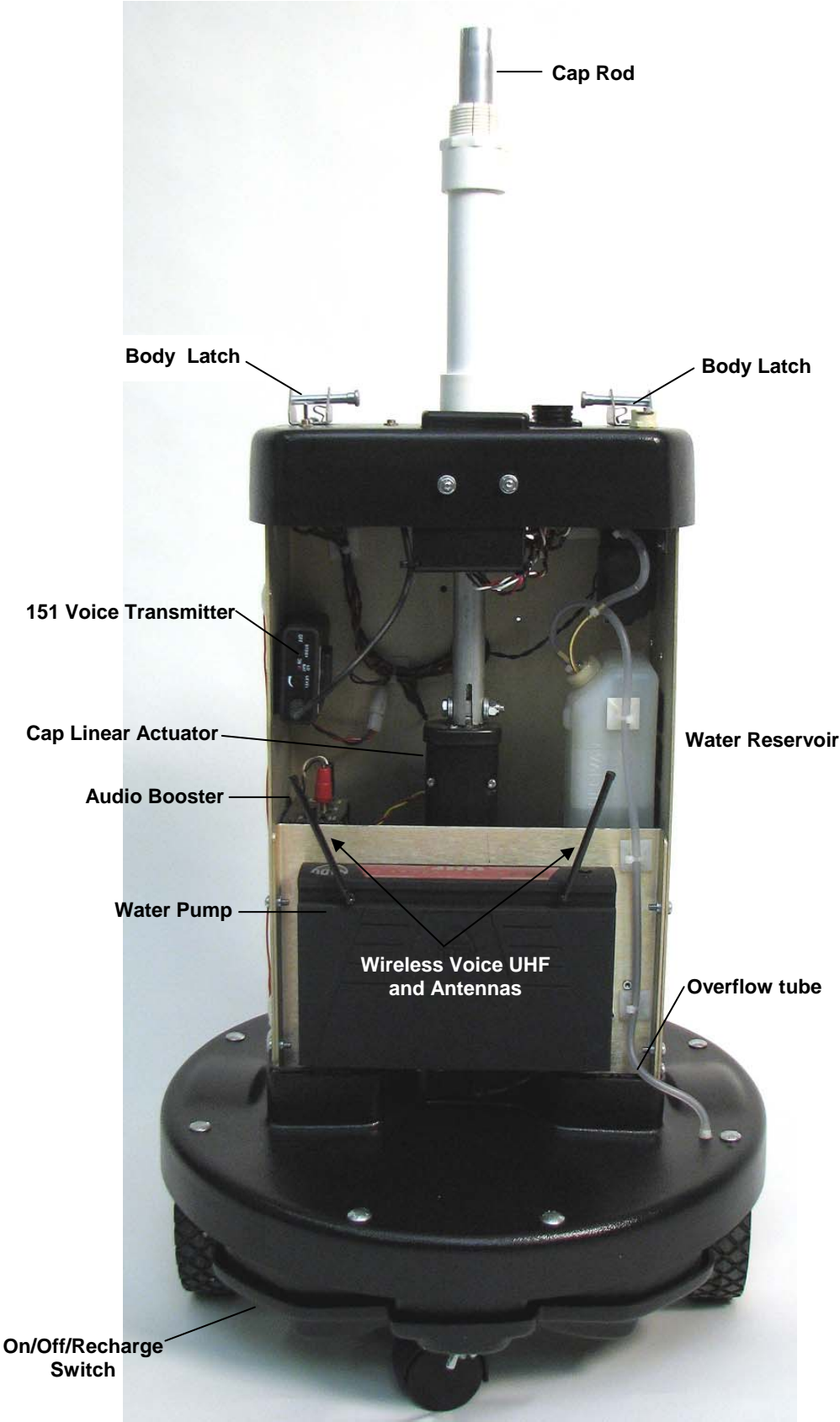
# **APPENDIX B**

## **ROBOT PARTS IDENTIFICATION**

# Robot Frame Front View

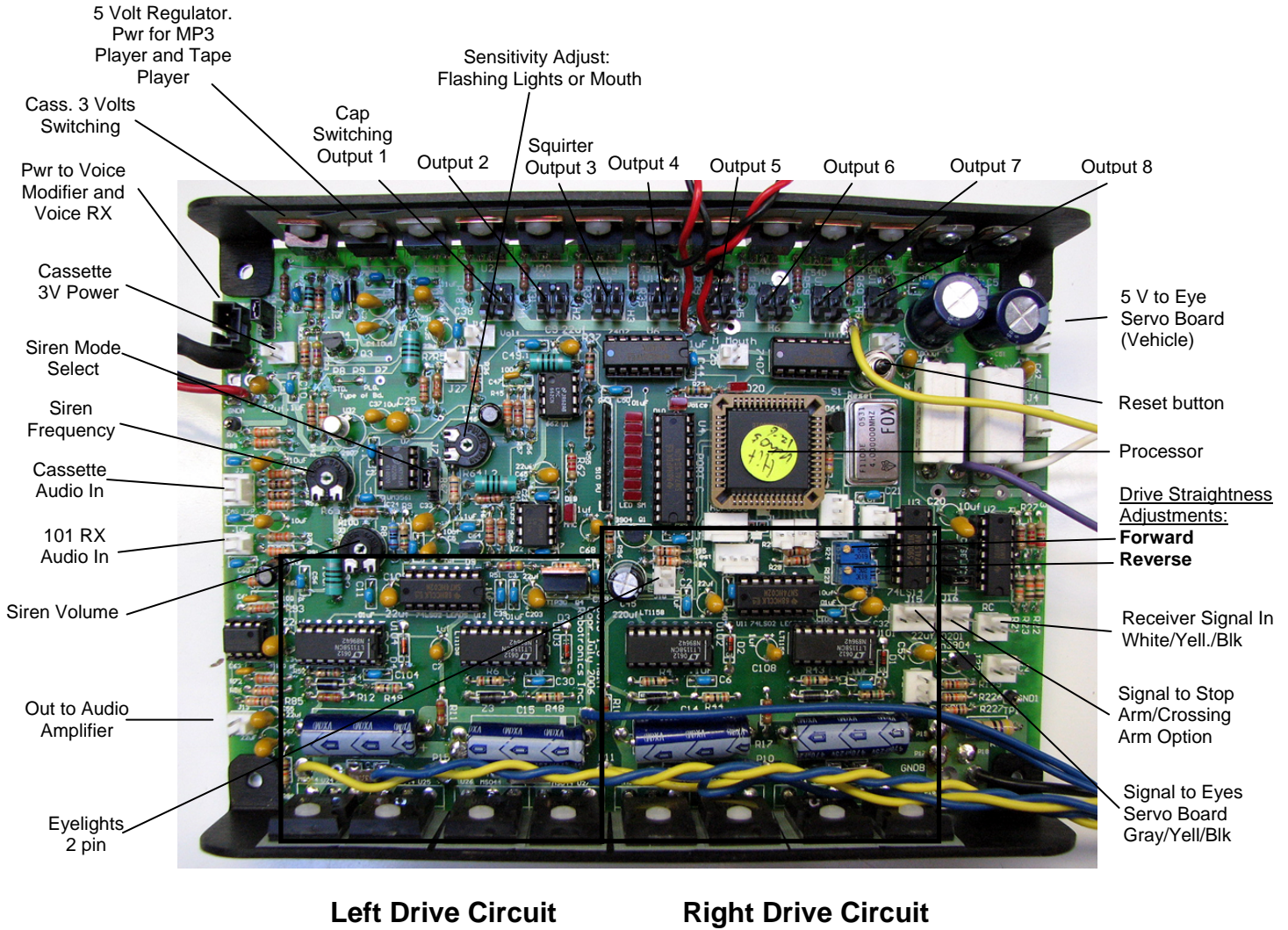


# Robot Frame – Rear View



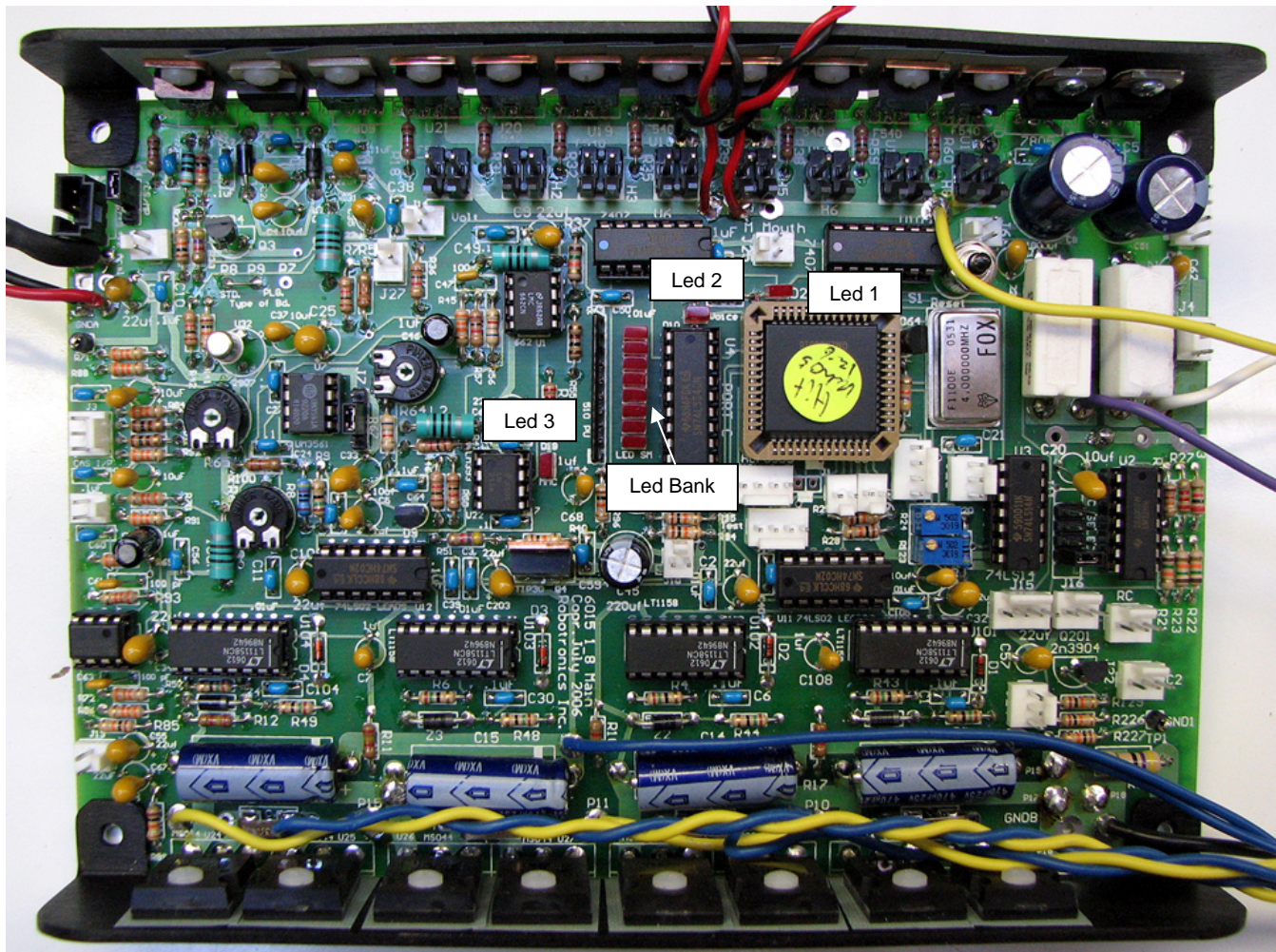


# Main Electronics Board





# Main Board – LED Functions



**Led 1-** Failsafe and presence of RC signal. If there is no signal, robot is in failsafe and light is on.

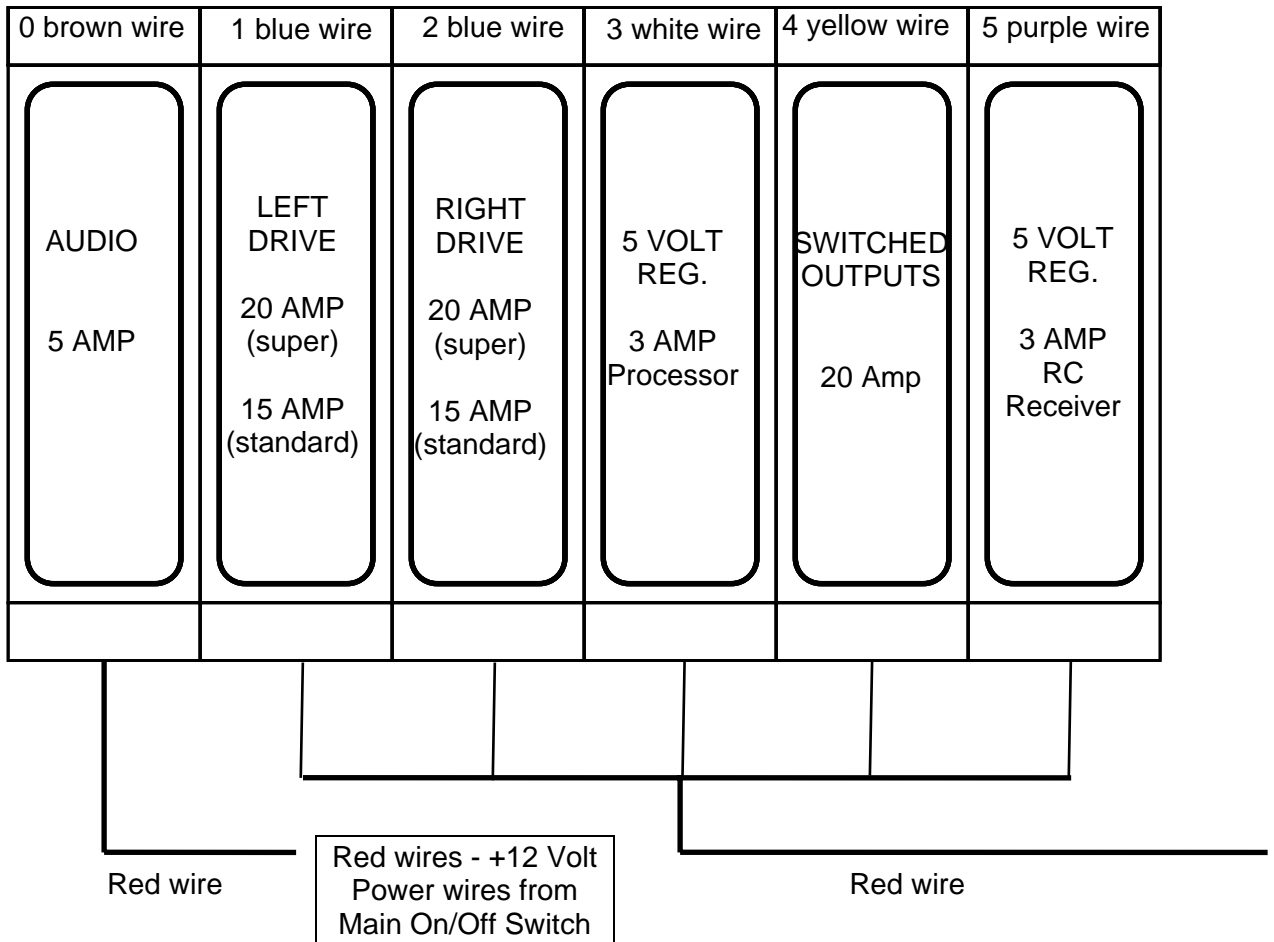
**Led 2-** Moving mouth or flashing eye-lights detection. This flashes if there is audio coming through.

**Led 3-** Half-way point of the audio detection. Flashes when there is audio present.

**Led Bank-** Used for looking at states of the processor, outputs etc. If these are on, the processor is getting 5 V.

# Fuse Block Detail

Use AGC Fast Acting Type Fuses

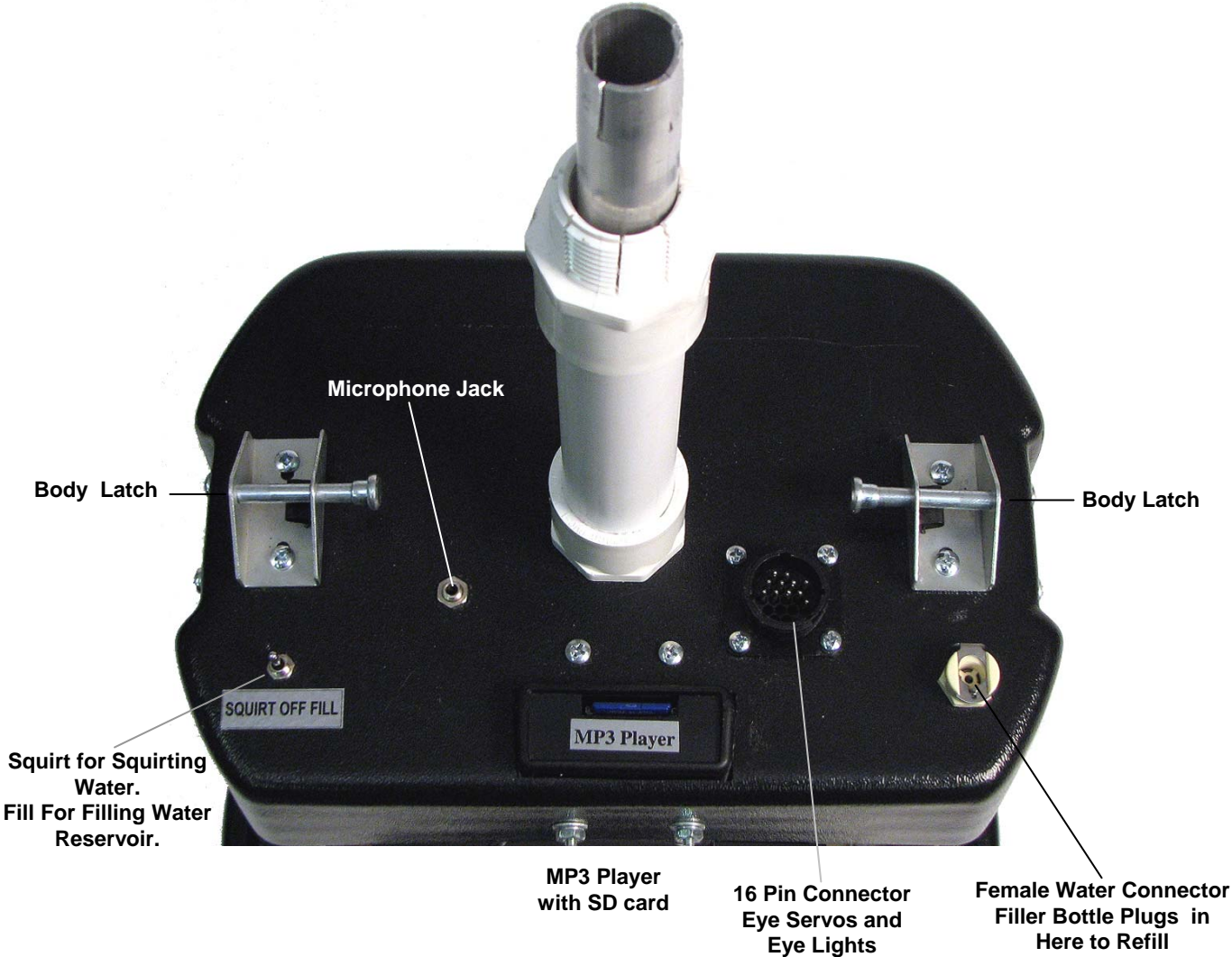


Audio - (Fuse 0) Robot voice transmitter (151), Robot voice receiver (101), audio booster, active filter, cassette player, siren.

Switching - (Fuse 4) Cassette player, siren. This applies to the switching on and off of these functions.

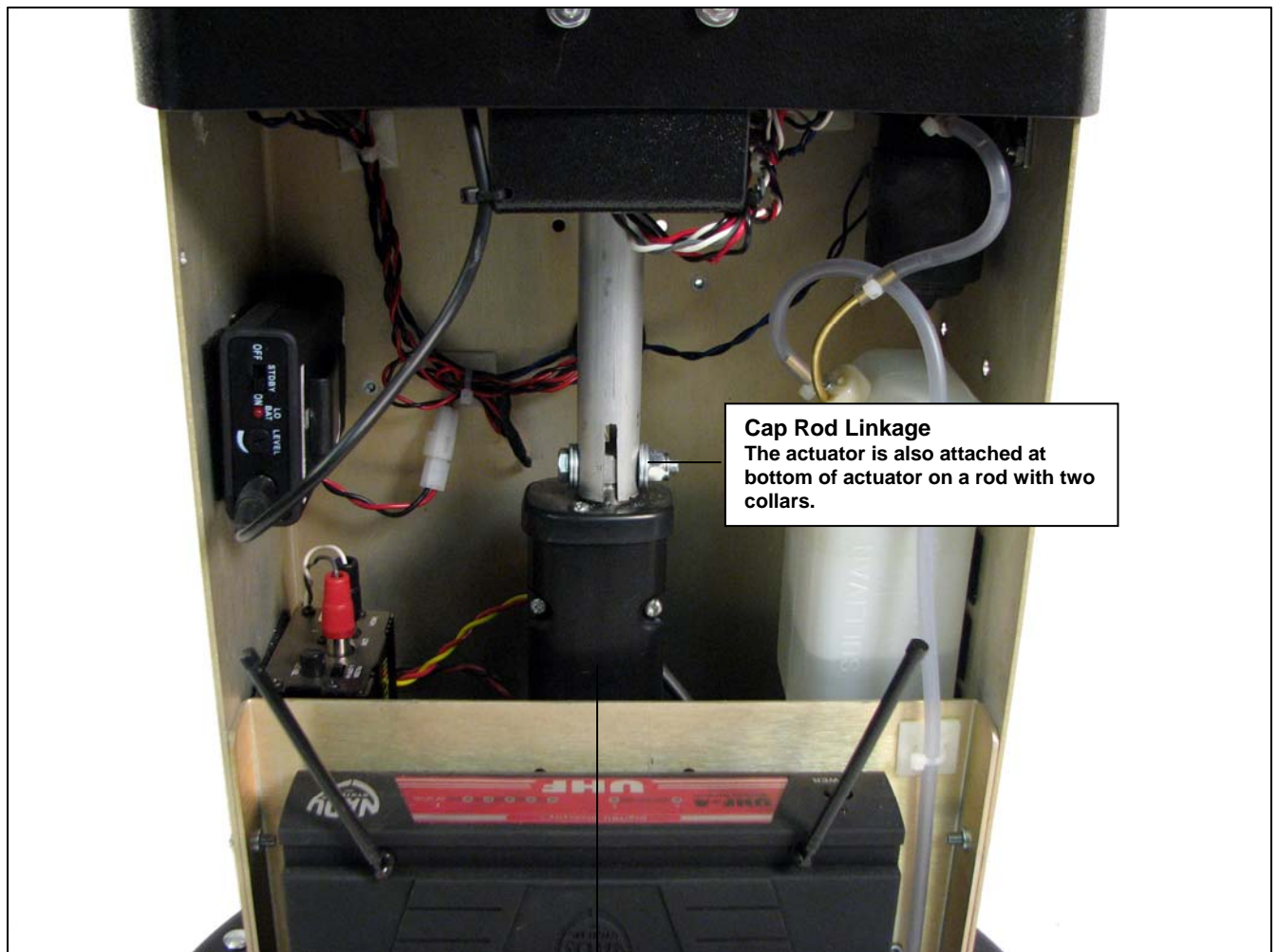
Switched Outputs – Switched outputs include the cap and water squirter.

# Robot Frame – Top View





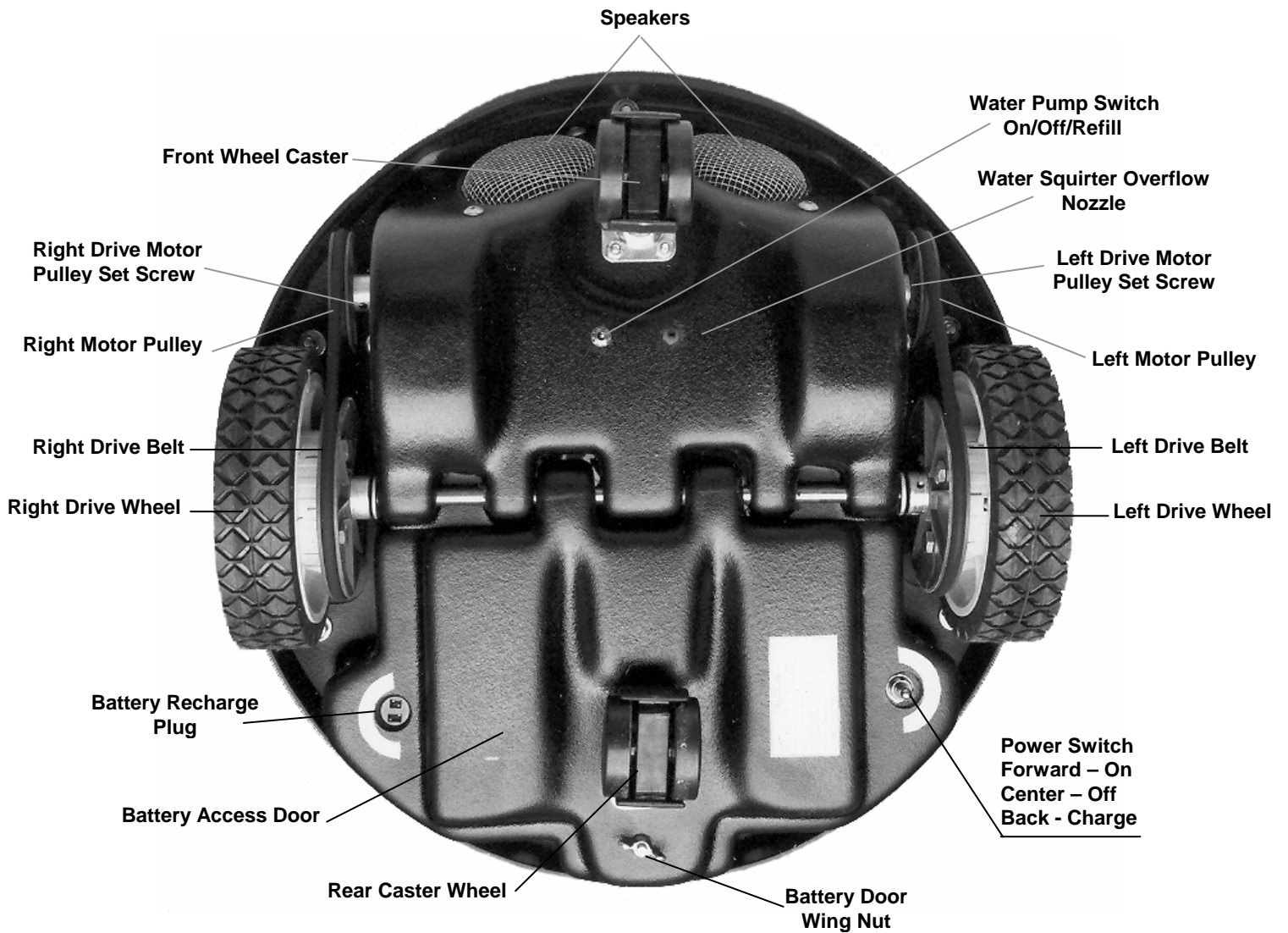
# Cap Linear Actuator



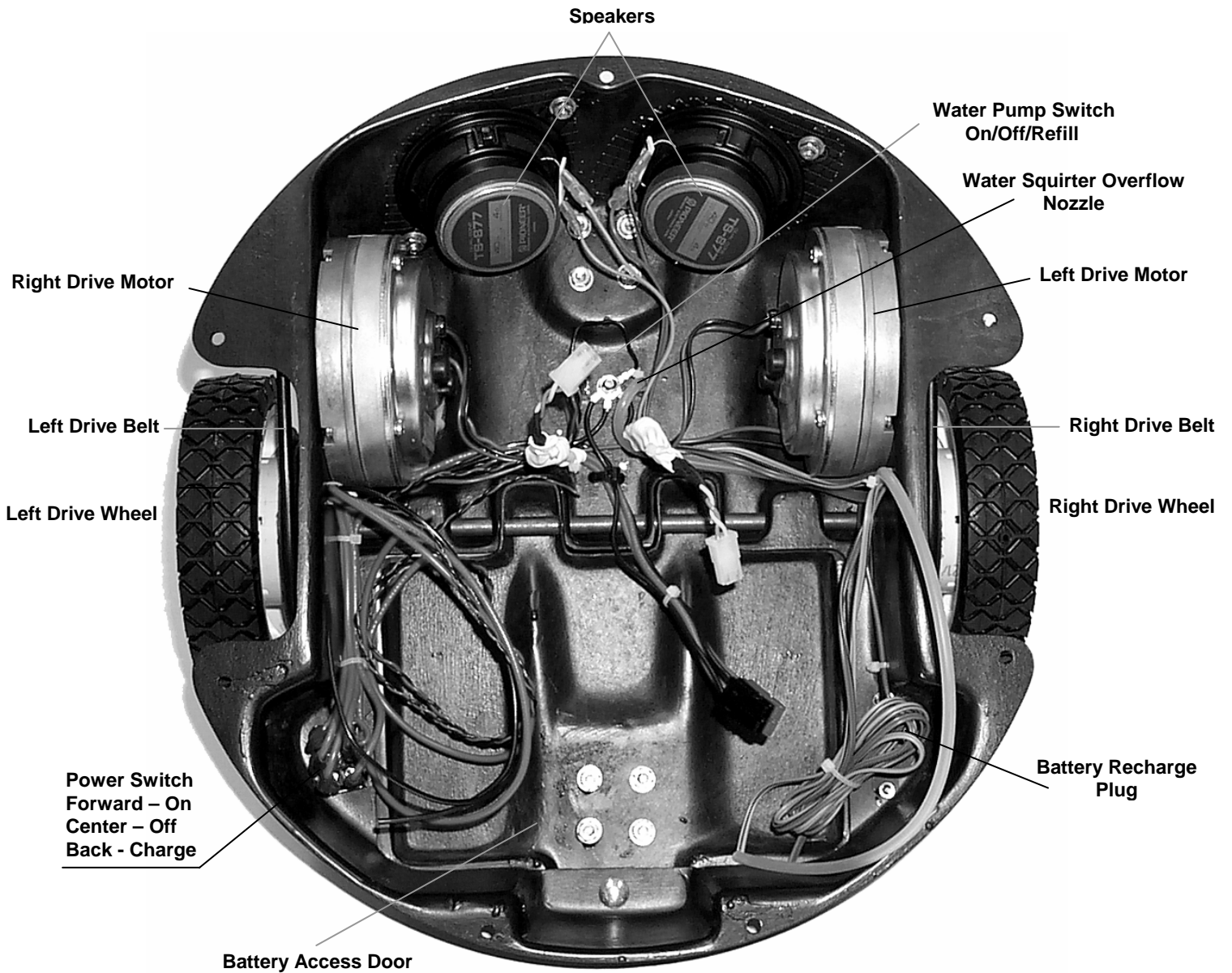
**Cap Rod Linkage**  
The actuator is also attached at bottom of actuator on a rod with two collars.

Cap Linear Actuator

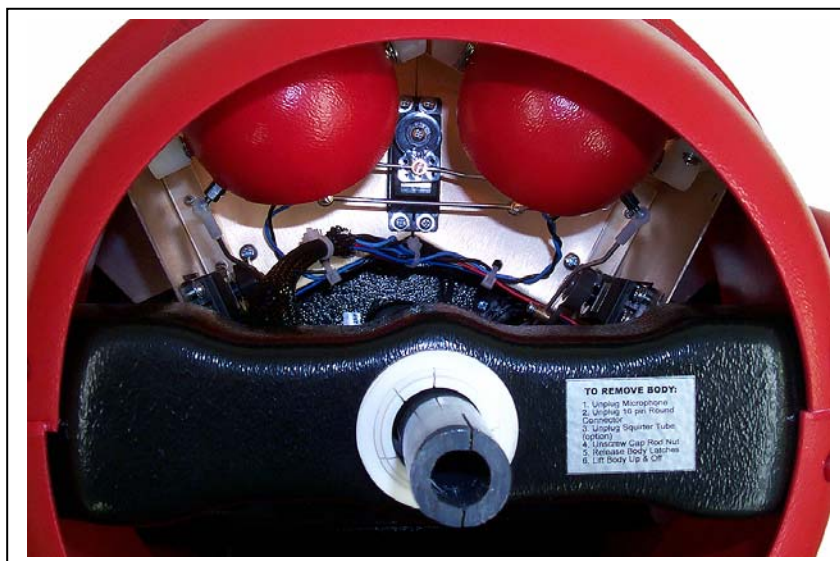
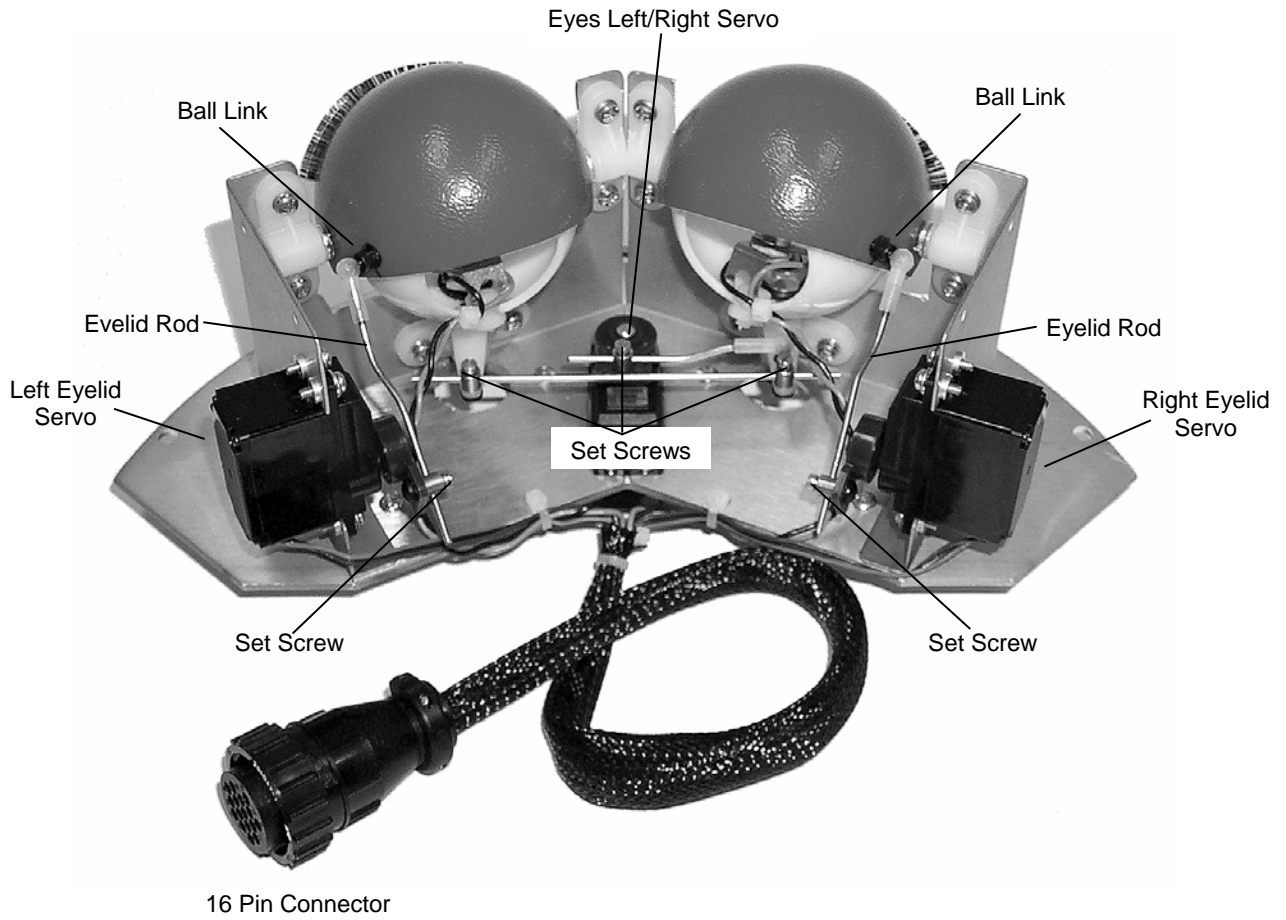
# Base Frame – Bottom View



# Base Frame – Inside View

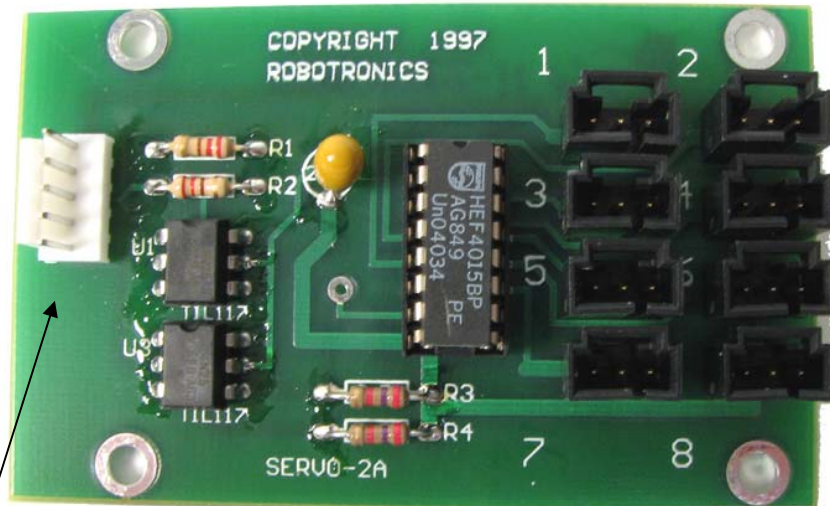


# Pluggie Eyes

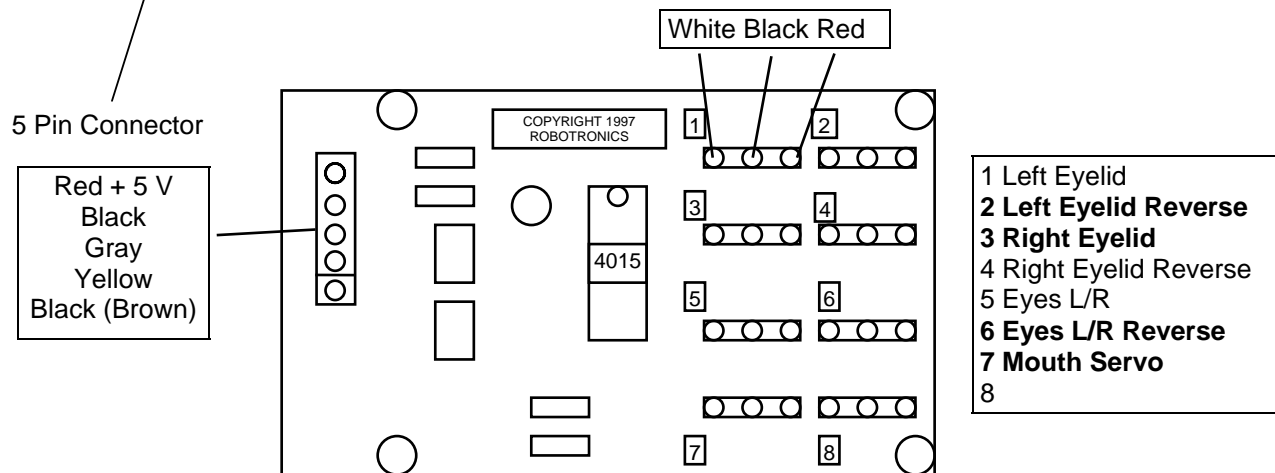


Top View of Eyes Inside Robot

# Eyes Servo Board (Opto-Shift Register Board)



### Version With One 5 Pin Connection



Robot	Typical Connection	Location of Board in Robot
Vehicle robot	2,3,6,7	In Upper robot



# Notes

# Technical Tips