

# Robotronics®

*The Leader In Safety Education Products*

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## Toby Tire Robot™ Operating Manual

Version 6.5

# Toby Tire 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.**



**Robotronics**

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Springville, Utah 84663  
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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 6-month 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, this manual or any procedures herein.

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.

### 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 on the robot frame on the right side. In the Appendix, the Lower Robot - Top View shows the location of the serial number sticker.

Record the vital information from your robot here for future access

Date Received: \_\_\_\_\_  
 Customer Number: \_\_\_\_\_  
 Robot Model Number: \_\_\_\_\_  
 Robot Serial Number: \_\_\_\_\_  
 Brand of Radio Control: \_\_\_\_\_  
 Frequency of Radio Control: \_\_\_\_\_  
Voice Frequencies  
 Operator Transmitter: \_\_\_\_\_  
 Operator Receiver: \_\_\_\_\_

- Upon the receipt of your product, save all packing materials to return the product if needed.
- 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 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 phone number: 801-489-4466.**

# Part 1 General Operating Instructions

## CHAPTER 1 Getting Started

### OPERATING HINTS

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. The following points will help in your operation of the robot.

- 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 about 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 Charge the batteries**

Be certain that the robot battery and radio control transmitter battery are fully charged before operating the robot.

Install the robot battery. Open the rear door or trunk to gain access.

1. Put the robot battery in the compartment in the back.
2. Connect the robot battery connector to the robot connector. Red will go to red and black to black. This connection is polarity protected and can be connected only the correct way.
3. The battery is secured in place with a battery strap. Tighten the strap very tight.



### **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.**



### **Step # 4 Powering up**

The **radio control transmitter** will be referred to as “RC” in this manual. Turn the RC "ON" first and then turn the robot "ON". Check that the RC battery level meter reads to the right. The "ON/OFF" switch for the robot is located inside the rear door or trunk on the main electronics panel. Push the switch up to turn the robot on.

### **Step # 5 Set the Volumes**

Check that the volume of the voice and tape player are at the level that your want. The tape player volume can be changed on the tape player itself, which can be accessed through the rear trunk or door. The volume for the Character voice is on the back of the voice receiver also accessible through the rear door.

### **Step # 6 Test all the functions**

Test all of the robot's functions: Character' voice both ways, eyelids, eyes, tape, siren, lights, and drive movement for proper operation. The robot is now ready to operate.

### **Step # 7 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 # 8 Powering Down**

To turn off the system, turn the main switch to the “OFF” position. Finally turn off the Voice Transmitter, 151 Voice Receiver and the Radio Control Transmitter.



**Step # 9 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

Before transporting the robot, remove the robot battery from 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 upper robot is latched and secure. There are two latches. Secure the robot in transport so that it does not roll around inside your vehicle.



### **CAUTION**

**If the upper robot is not properly secured before transport, it could move around or tip over in your vehicle causing damage to the robot.**

## 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.

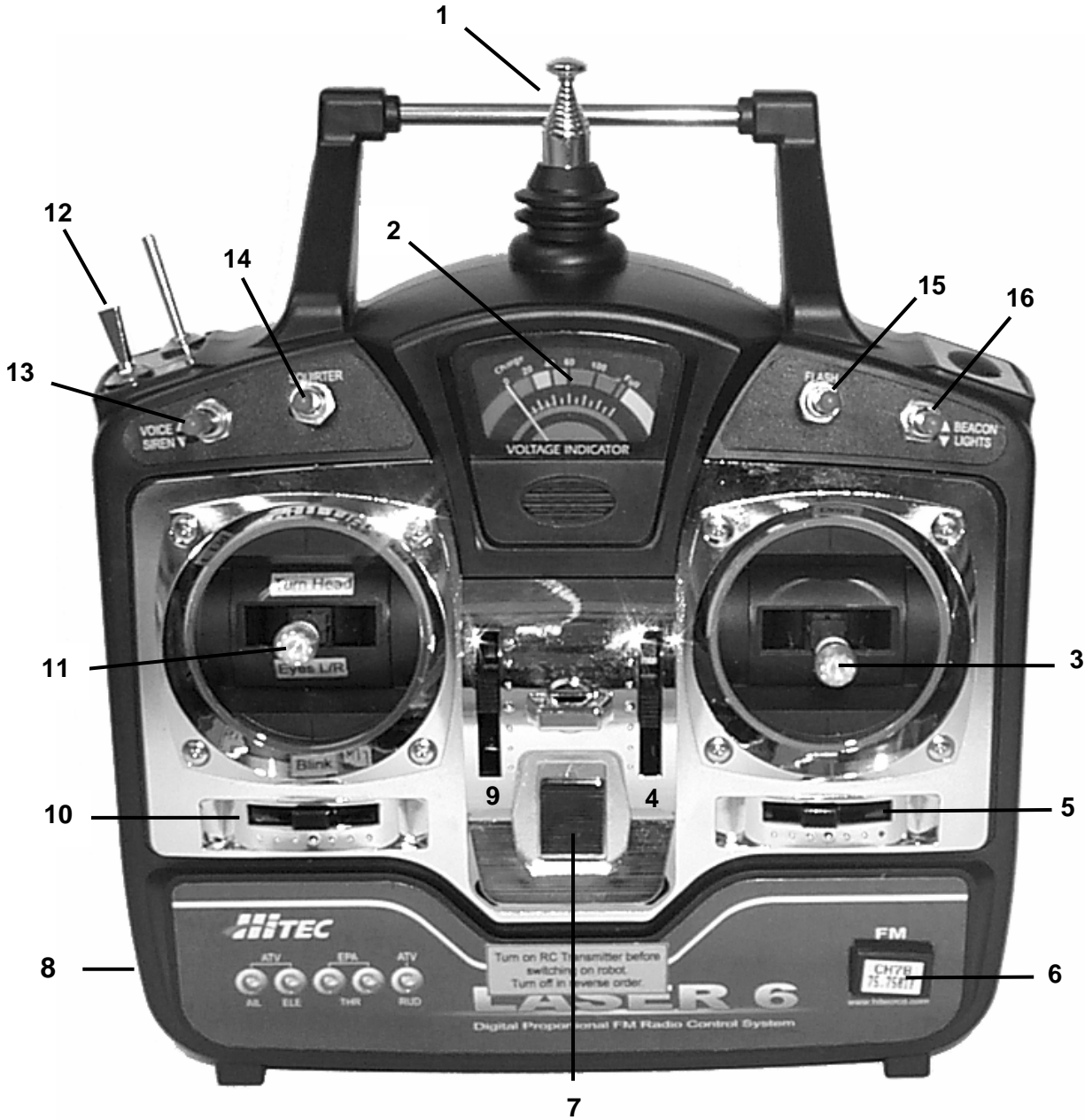
Control of the left arms is on the left joystick. The left and right arms are controlled in the corners forward and back. There is also arm movement on one of the switches. The eyelids, the tape, and the siren are all on a switch.

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

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**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- not used  
Up – Left arm and Right arm up and down

**Top Switch Functions**

- 12. Tape player
- 13. Blink eyes
- 14. Dance and Handshake
- 15. Unused
- 16. Siren

## 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 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.

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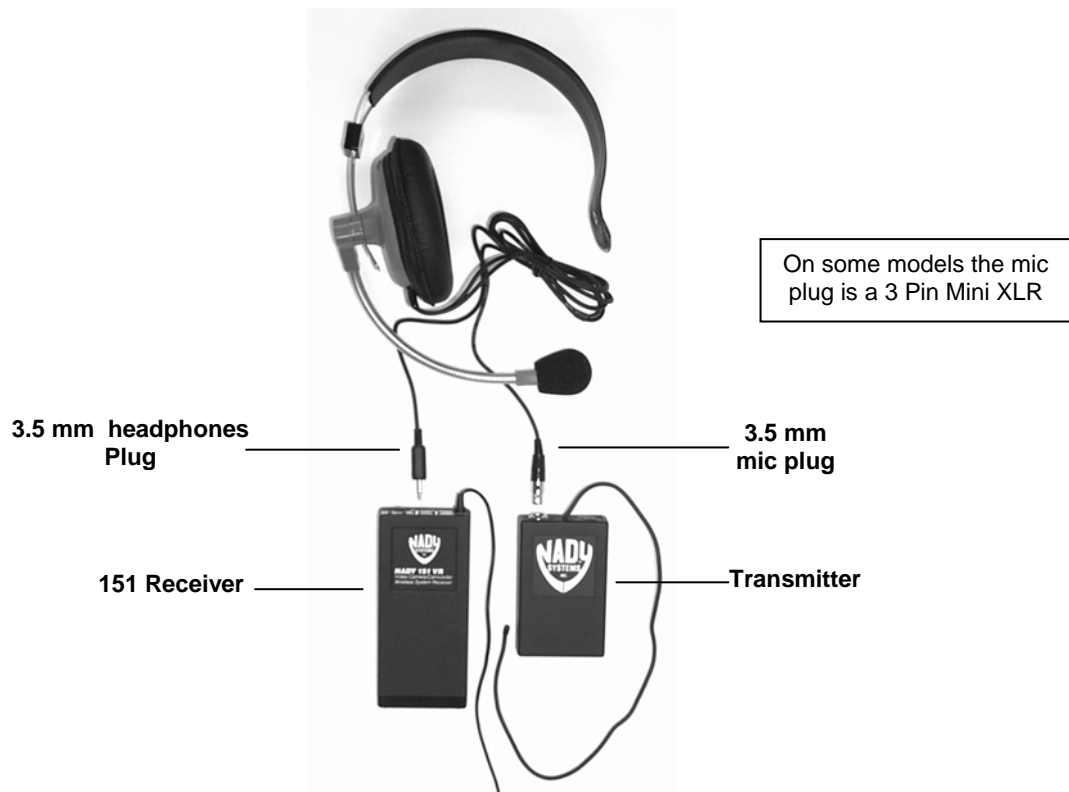
**Important:** The operator's transmitter and receiver should be kept as far separate as possible, such as on opposite sides of the operator's waist. Do not attach the units together, this may cause interference effects. The antennas should not be wrapped around each other or around the headset wire but should hang freely.

---

### 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



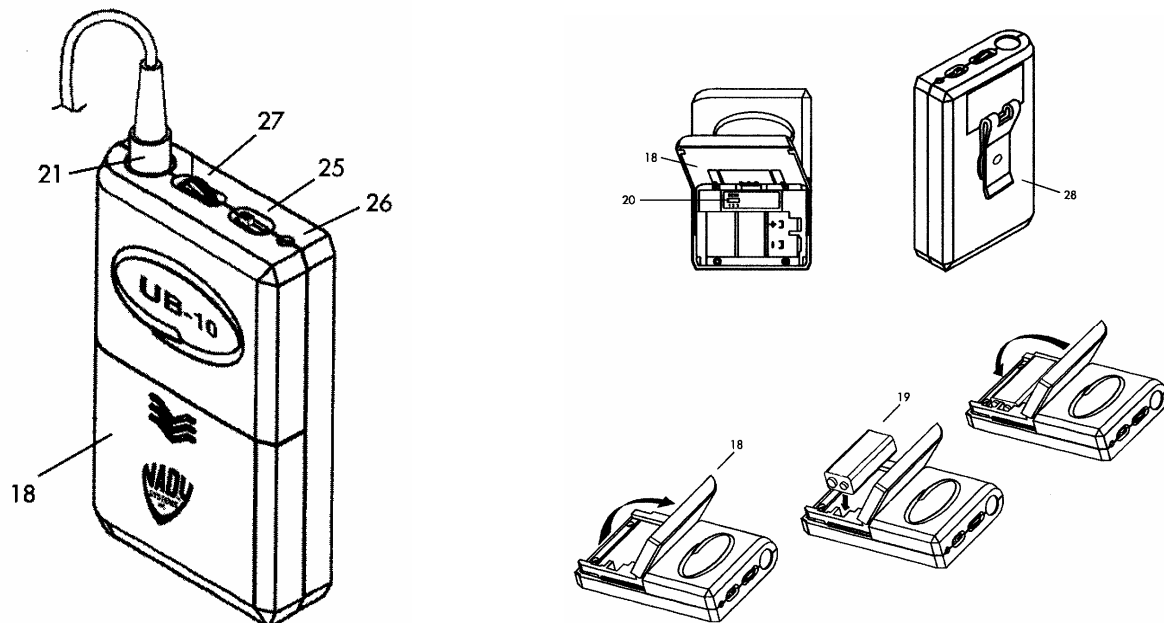
## How to Operate the Operator's Transmitter

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.
4. Plug the round connector from the headset into the top of the transmitter.
5. Move slide switches to the "ON" position.
6. On the UB-10 there is a volume adjust on the unit.

### Function of the LED

When turning on the power switch, with a fresh alkaline 9-Volt, the battery light will blink 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.



- 18. Battery Compartment
- 19. 9 V Alkaline Battery
- 20. Input Selector Switch ( Leave On 3 Lavalier)
- 21. 3.5 mm jack
- 25. Off/Standby/On switch
- 26. Battery Indicator LED
- 27. Volume- Input Level Control
- 28. Belt Clip

## How to Operate the Receiver (in Robot)

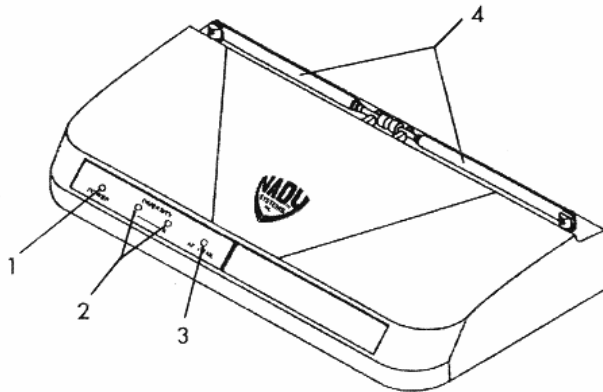
There are two adjustments on the receiver. The **volume** is on the back of the receiver, which you may set to the desired volume. On the UHF UB-10 you can change the volume on your belt transmitter *on the fly*. The other adjustment is the **sensitivity**. This is factory preset to maximum sensitivity. 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.

### Function of the LEDs

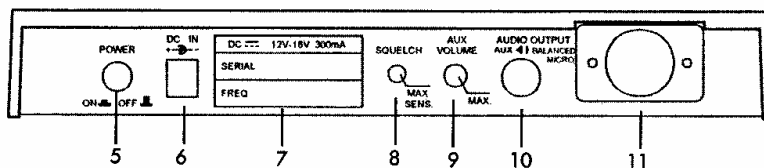
**TX LED-** This indicates that you are receiving a signal from the transmitter. On some units it is a single TX light. On other units it may have an A or B that it will alternate between.

**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. DC Input Jack
7. Frequency Label
8. Squelch Control
9. Aux. Volume Control
10. Audio Output
11. Balanced Mic. Audio Output XI R



## 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.

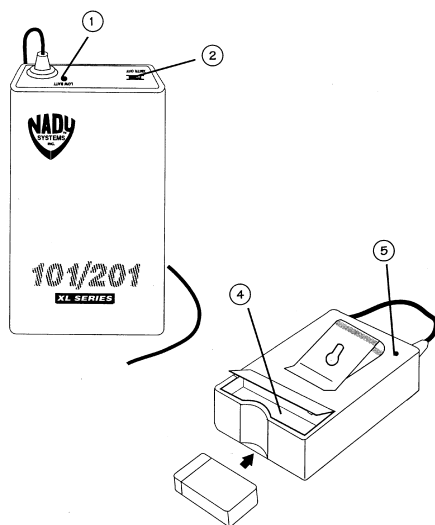
## How to Operate the 151 Receiver (Operator)

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.

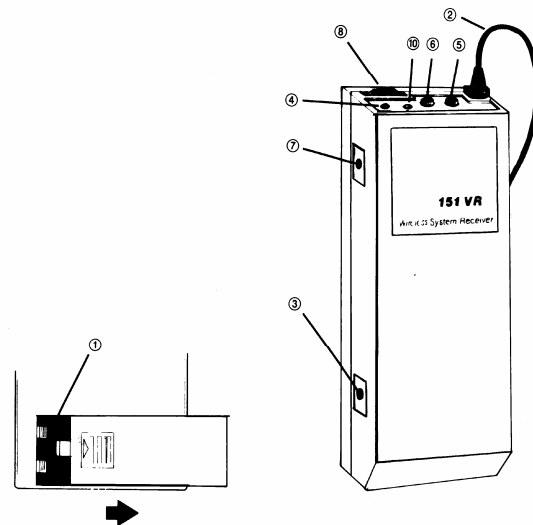
### Function of LEDs

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. Low Battery Indicator
  2. Off/Mute/On Switch
  3. Antenna
  4. Battery Compartment (Not used)
  5. Audio Level Trim
- USE ALKALINE 9 VOLT BATTERIES**



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
<p><b>Voice System</b>  <u>Always do the following first:</u>                      1. Replace the 9 Volt batteries with new ones. USE ALKALINE!                      2. Bend the battery contact out for better contact with the post of the 9 Volt battery.                      3. Check power and audio switches, and lights on all voice units.                      4. Check plug to and from the voices for proper connection.                      5. Check if the transmit (TX) lights are coming on.</p>		
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.

## MOVING MOUTH

Function- The moving mouth is a feature where the mouth moves as the operator speaks through the robot. The amount of the movement is effected by the level of volume of the voice. This level is effected 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 Moving Mouth sensitivity. When this pot is adjusted clockwise this makes the mouth more sensitive to your voice and turning it counter-clockwise makes it less sensitive.

### Location of the Adjustment

Main Electronics Box in Vehicle.



# Operator's Voice Transmitter and Receiver



## CHAPTER 4 Cassette Tape System

The cassette tape system is located inside the robot on the metal electronics box. The system is activated by remote control from the remote control box. (Additional instructions are on the next page.)

### How to Play A Cassette Tape

1. Insert a regular type cassette tape into the player.
2. Depress the play button on the cassette player.
3. Move the radio tape select switch to the tape position.
4. Activate the tape from the control box.
5. Adjust the volume to desired level.

The tape head of the cassette player should be cleaned after every 25 to 30 hours of use. Always remove the cassette tape when not in use. This will prevent flat spots on the capstan roller.

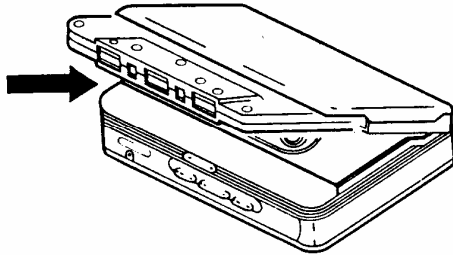
### Troubleshooting - Cassette Player

Problem/Cause	Action
<b>Cassette Player</b>	
<b><u>No tape operation</u></b>	
1. Tape player not on tape mode or volume not turned up.	1. Put mode select to tape and turn volume up.
2. Play button not pushed	2. Must push play button before hitting the switch on the radio control.
3. Bad Tape.	3. Check tape in other tape player.
4. Tape is too tight.	4. Loosen with a pencil by spinning tape.
5. Player is not getting power because power wire or plug is broken.	5. Check for 3 Volts at power plug. Replace plug or repair the wire.
6. Power or audio wire has come disconnected from the main board.	6. Open the main box and re-connect to board.
7. Radio control or tape circuit not working	7. Contact Robotronics for help.
<b><u>No siren, or voice either.</u></b>	
1. Audio fuse blown.	1. Replace the fuse. See fuse block diagram.
<b><u>Poor quality sound or slow.</u></b>	
1. Belts worn out and slipping.	1. Replace cassette player or belts.

# Cassette Tape Player

## INSERTING A TAPE

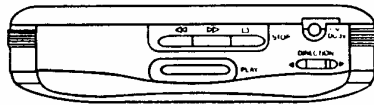
The MRX-225 can play any pre-recorded cassette tape (mono or stereo). Simply insert the cassette as shown below. Then, proceed to "Playing a Tape" in this manual.



1. Lift the cassette compartment lid as shown.
2. Insert the cassette with its open edge facing you and with the full reel to the left.
3. Close the compartment lid.

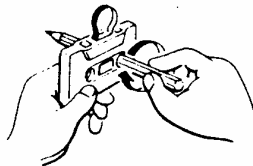
## FAST FORWARD/REWIND

Press **F FWD** or **REW** to quickly move the tape in the desired direction.



**Note:** Be sure to press **STOP** when the fast forward or rewind is finished, to avoid damaging the player.

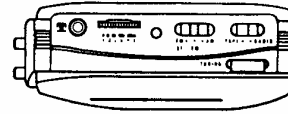
**Tighten Tape Slack**—Before loading a cassette, take up any slack in the tape by turning the tab hub with a six-sided pencil. Avoid touching the tape.



**Reduce Tape Tension**—If you repeatedly play both sides of a tape without using fast forward or rewind, the tape can become tightly wound. Before playing the tape, fast-forward the entire tape. Then, completely rewind it.

## PLAYING A TAPE

To play a cassette tape, begin by inserting the cassette as described in "Inserting a Cassette" and then follow these steps:



1. Move **TAPE/RADIO** to **TAPE**.
2. Connect your headphone to the **HEADPHONE** jack.
3. Press **PLAY**.
4. To stop the tape, press **STOP**.

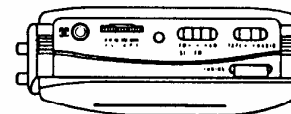
## TAPE TIPS

The following tips can help you get the best performance and the longest life from your cassette player and radio.

**Use Long Cassettes**—The use of tapes longer than 90 minutes is not recommended due to possible stretching of the actual tape material.

## RADIO OPERATION

1. Set **VOLUME** to its lowest setting.
2. Set **TAPE/RADIO** to **RADIO**.
3. Connect the headphones to the player's headphone jack.
4. Move **AM/FM** to select **FM** or **AM**.



5. Move the tuner dial to select the desired station.
6. In order to listen to **FM stereo**, set the **FM STEREO/FM/AM** switch to **FM STEREO**.
7. Adjust **VOLUME** for the desired sound.
8. To turn off the radio, set **TAPE/RADIO** to **TAPE**.

### Graphic Equalizer



Adjust the three equalizer settings for the best bass, midrange, and treble sounds.

### Radio Reception Hints

- The headphone's wire is also the FM antenna. For best reception, be sure it is completely uncoiled.
- If you are receiving a weak FM stereo station, you can improve reception by setting **BAND** to **FM**. The sound will no longer be stereo, but reception should be improved.
- The AM antenna is built in. If you are having difficulty receiving a particular station, changing the position of the radio might improve reception.

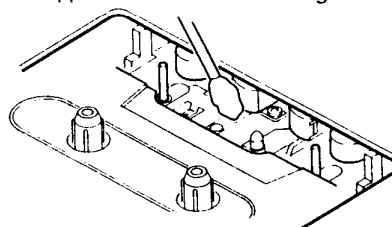
**Warning:** Do not use benzene, thinners, or other solvents to clean the cabinet, since they may warp or deform the plastic.

### Be Careful of High Temperatures!

Use and store the MRX-225 only in normal temperature environments. Temperature extremes can shorten the life of electronic devices, damage batteries, and distort or melt plastic parts.

### CARE AND MAINTENANCE

Routine maintenance of the playback head and pinch roller will increase the life of the player. Your Memorex dealer can provide you with different types of cleaners, such as a cleaner cassette you insert in the unit or a cleaning solution applied with a head cleaning stick.



**Caution:** If you are manually cleaning the playback head and pinch roller, take care not to damage the surface of the head.

To clean the cabinet, use a soft dry cotton cloth to remove the dirt. If the cabinet is very dirty, use a damp cotton cloth, and be sure you dry the cabinet afterwards.

### SPECIFICATIONS

Tape System	4 Track
	2 Channel Stereo
Tape Speed	1 7/8 Inches/sec.
Frequency Response	63Hz—10,000Hz
Frequency Coverage	AM530—1710 KHz
	FM88—108 MHz
Aerials	Built-in (Ferrite Bar/Coil AM Aerial)
	Headphone Cord As FM Aerial
Power Output	20mW + 20mW
Output Jack	3.5mm Stereo
Power Source	DC 3V—two AA
	External Power
	3V Source Jack,
	Centered Pin (—) Negative
Dimension	5 Inches x 3 3/8 Inches
	x 1 1/4 Inches (HWD)
Weight	12 ozs. (Without Batteries)

As a continuing effort to improve our products, specifications are subject to change without notice.

## 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

Problem/Cause	Action
<b>Siren</b>	
<b><u>No siren</u></b> 1. Audio fuse blown	1. Replace fuse. See fuse block diagram.
<b><u>Siren volume not loud enough</u></b> 1. Booster problem if tape and voice vol. also are not loud enough. 2. Adjust siren volume if tape and voice okay.	1. Replace or have booster repaired. 2. See siren volume adjust on main board.

## CHAPTER 6 Robot Battery System

### ROBOT BATTERY

The battery in the robot is a rechargeable sealed lead-acid Gel type battery **12 Volt 33AH**. This type of battery is very dependable and safe. It can be repeatedly charged and discharged.

### How to Recharge

1. Connect the charger to the white connector which is next to the on/off switch. It is labeled charge. Put the power switch in the charge position. The charger light will come on.
2. To charge out of the robot, connect the charger wires to the battery, red to the red (POSITIVE +) post and black to the black (NEGATIVE -) post.
3. Plug the line cord of the charger into a 110-volt AC outlet. Leave the trunk cover off or open during charging for ventilation. Keep the AC power connection as short as possible especially when using an extension cord.
4. The red LED will come on during charging and the green when the battery is charged and ready to use. Both red and green on indicates that you are in the middle stage of charging.

The robot is supplied with an automatic type battery charger. It will go to a float charge when it reaches a full charge on the battery.

### Taking Care of the Robot Battery

- The number one rule for battery care is to keep the batteries fully charged at all times.
- Like all batteries, there is some discharge that occurs every day. Because of this you should charge up the battery **monthly** during periods when the robot is not being used.
- Also, the automatic battery charger can be left connected for extended periods of time to keep the batteries at full.
- It is a good practice to rotate the batteries if you have two or more.
- For a battery that is outside the robot, store the battery on a wood or rubber surface not concrete floors.

### Caution



If the wires to the battery have been removed, observe properly polarity when re-connecting. The red wire goes to the positive terminal and black wire to the negative terminal. Damage to electronics could result if the polarity is wrong.

### Important

**Charge the battery to a full charge right after each use of the robot and monthly when not in constant use.**

## ROBOT BATTERY CHARGER

The charger supplied with the robot is designed to both recharge your battery, and extend your battery's life. It produces 12 Volts DC at a full 6 Amps. It will charge the battery in about 8 hours depending on how long you have used the robot. After the battery is charged, the green LED will come on and the battery is ready to use. At this point the charger is charging at a FLOAT or maintenance rate. At this rate you can leave the charger connected for extended periods of time.

### Charge Pro Model 2606A 6 Amp Battery Charger

#### Status Indicating Lights

**Red on**-The battery is discharged and is being recharged at the maximum 6 Amp rate of the charger (stage 1).

**Red and green both on**-The battery is charging at the stage 2 rate of 1.5 to 5 Amps.

**Green on**-Your battery is charged and ready to use. It is now on float charge (stage 3).

### Personal Safety Precautions

## Warnings

#### HAZARD OF EXPLOSIVE GAS MIXTURE

When charging, a lead acid battery gives off hydrogen gas. The Gel type battery 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. Charge the battery in a dry, well ventilated area. This is why it is important that you leave the trunk or door open. You can also remove the battery from the robot.
2. Do not position your face over the battery, at any time while making connections.
3. Do not smoke, strike a match, or cause a spark in the vicinity of the battery during charging.
4. Always unplug the AC supply cord before connecting or disconnecting the charger leads from the battery.
5. Do not drop a metal tool onto the battery.
6. Do not expose the charger to rain.
7. Replace defective cords and wires immediately.
8. Do not operate this charger with a two bladed adapter plug or extension cord. Doing so can result in serious personal injury.
9. To reduce the risk of shock, connect only to a properly grounded outlet.

## **If the Battery is not taking a Charge**

Make sure that the charger is working by connecting it to a battery that is known to be good.

Leave the charger on for a few days and see if the battery starts taking a charge. Turn the robot on and try to operate it. Connect to the charger again. If it still will not take a charge, it's time to replace the battery.



## 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.

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**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)

**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 Arms

The main components of this system consist of the arm motors, motor control circuit, and the feedback pot. When you move the joystick on the radio control, a signal is sent to the receiver in the Robot. The receiver sends this signal to the microcontroller on the robot. The motor control circuit is on the Character board. The motor control circuit is directed by the signal to send 12 Volts to the motor and in what polarity. What polarity is sent to the motor will cause the motor to move up or down.

The job of the feedback pot is to track the position of the head and continually relay information to the motor control circuit and micro-controller so that when you release the joystick and it goes back to center, the head also goes back to center.

### **Location of Parts**

Motor control circuit-On the Character Board mounted on the inside of the main box.

Feedback pot- directly below the motor.

Set screw- on the motor hub.

### **Troubleshooting - Arms**

#### **The arm is out of position but operates:**

This is not likely because the arm is kept in position on a keyway. Check the set screws for tightness.

#### **The arm motor is keeping the head position to the extreme left or right:**

1. The in line connector to the feedback pot has come disconnected.
2. The feedback pot shaft could have slipped out of position. The feedback pot which is a blue pot just below the arm motor will need to be adjusted. Loosen the pot slightly, move it until the arm is in the right position and then tighten the pot again.

#### **The arm motor is not operating:**

1. Check the in fuse in the main fuse block.
2. Check the motor wire to see if it came disconnected at its in line connection.
3. The Character board is not getting power- if this is the case you would not be getting eyelid movement. Check the fuse inside the main electronics box. See the main electronics box diagram for location of the fuse.

Look at the red and black wire bringing power to the Character board. If you have a Voltmeter, check for 12 Volts going to the board. Is there 12 Volts; a broken wire?

## CHAPTER 9 Eyelids

The eyelids movement is accomplished by one servo motor just behind the eyes. 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 behind the eyes. 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 with a servo arm and then an eyelid rod.

### Troubleshooting - Eyes

#### An eyelid 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.

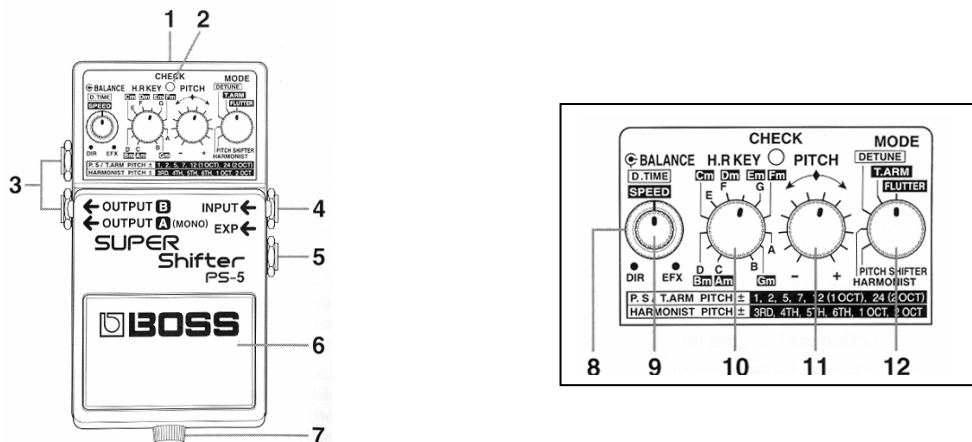
#### There is no operation of any of the eye functions:

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 10 OPTIONAL ACCESSORIES

### 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 operators 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 us.
4. Input Jack.
5. EXP Jack. No 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.

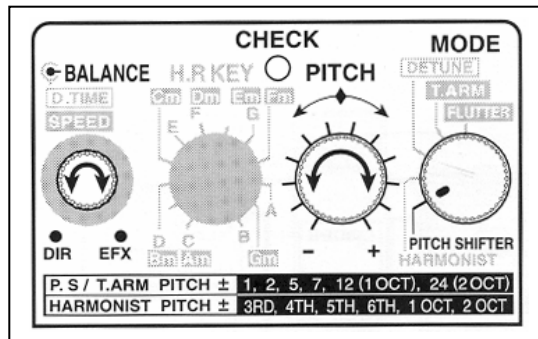
The pedal on the pitch shifter is used to turn it on and off. When the pitch shifter is on, the power light labeled 'check' will be lit. The shifter will take a few seconds to power up. To turn it off, push the pedal again. If the pitch shifter is not turned on, your unmodified voice will come through the Smoke Alarm.

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. If the cover of the main electronics box ever needs to be removed, do not allow the shifter power wire plug, to contact the metal box. The metal box surface has a ground connection. 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 shifted cartoon character or robot type voice.

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



## PART 3

### CHAPTER 11 Assembly & Disassembly

#### Removing the body:

1. Remove the tread to access the battery.
2. Twist the latches.
3. Disconnect any wires that are connected.
4. Lift the body off the frame.

#### Removing the hubcaps

1. Remove the four bolts.
2. Disconnect the wires to the arm motor while removing the hubcap.

Reverse order for installing.

#### Removing the main electronics box from the robot:

1. Disconnect the battery connector before working with or removing the main electronics box. There are two fasteners holding the main box bracket it. You do not need to remove the bracket from the main box. There are some wires to disconnect also. These include the speaker wires, headlights, drive motor wires (blue and yellow), power wire to the 151-voice transmitter, and the receiver antenna wire.
2. Remove the box by lifting up and out.

#### Removing the drive base from the body: (This would be necessary only if you needed to get to the drive pulleys, belts or remove a drive motor.)

1. On some models, the main electronics box and bracket have to be removed first.
2. Remove the 6 nuts holding the drive base to the plastic frame.
3. Disconnect the drive motor wires at the in line connection. These wires are blue and yellow wires going to each drive motor.
4. Lift the back of the robot up and roll the drive base out from under it.

#### Installing the drive base back into the body:

1. Lift the back of the robot up enough to roll the drive base under and into position.
2. Line up the 6 aligning threads with their holes and lower the robot onto them.
3. You may need to put the electronics panel on now.
4. Put the nuts back on which hold the metal drive base on to the frame.

Reverse steps for disassembly or assembly.

# PART 4

## CHAPTER 12 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 upper robot. 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 and Radio System 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 windows or pupils.)
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.



## 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 silicone-based product such as Armor-All put on it. Clean the plastic with a plastic cleaner designed to clean before painting. Use a 600-grit sandpaper to smooth the scratches before painting. You can use a body filler, like Bondo to fill the scratches then sand them out again after it's dry. You may also rough up the surface with 600-grit sandpaper or a Scotch-Brite 7448 pad for better adhesion.

### Painting the surface:

#### Method 1

Enamel spray paints such as Krylon Interior/Exterior enamel does adhere to the body. This method can be touched up easily if the paint ever gets scratched. This is typically a method 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. Use a very narrow masking tape to tape the line and then much larger tape beyond that.

#### Method 2

If your robot has been pre-painted, an automotive type paint was used. You should contact a professional painter that has had experience painting on various types of surfaces. These paints typically include a primer and base coat. For a glossy look you can use a glossy base coat or a clear coat. Painters can typically color match the painted areas to match the existing paint.

#### ***Brand-Dupont***

Primer: Acrylic Urethane Flexible Primer Surfacer. Use a Dupont Primer.

Paint: Acrylic Enamel. Dupont ChromaBase Basecoat. ChromaBase requires a clear coat for a glossy look. Dupont also has some single stage paints where a clear coat is not required.

For future reference, keep the information on file about who painted the robot and ask them for the paint brand and mix information. This will help you to get touch up paint and a new paint job when needed.

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	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 the robot.

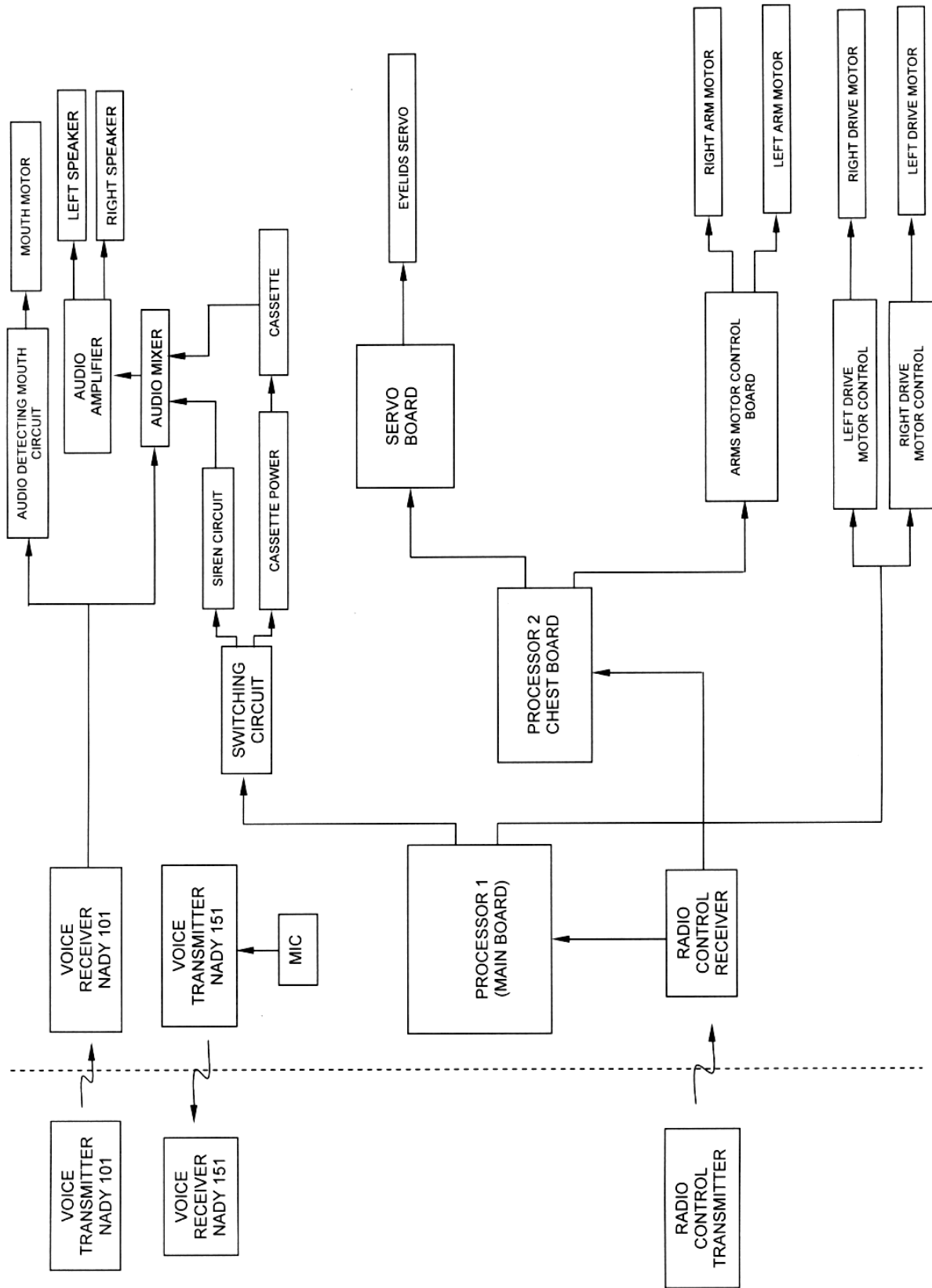
Problem	Cause	Solution
<b>Cassette Player</b> No tape operation	1. Tape player not on tape mode or volume not turned up.	1. Put mode select to tape and turn volume up.
	2. Play button not pushed	2. Must push play button before hitting the switch on the radio control.
	3. Bad Tape.	3. Check tape in other tape player.
	4. Tape is too tight.	4. Loosen with a pencil by spinning tape.
	5. Player is not getting power because power wire or plug is broken.	5. Check for 3 Volts at power plug. Replace plug or repair the wire.
	6. Power or audio wire has come disconnected from the main board.	6. Open the main box and re-connect to board.
	7. Radio control or tape circuit not working	7. Contact Robotronics for help.
No siren, or voice either.	1. Audio fuse blown.	1. Replace the fuse. See fuse block diagram.
Poor quality sound or slow.	1. Belts worn out and slipping.	1. Replace cassette player or belts.
<b>Siren</b> No siren	1. Audio fuse blown.	1. Replace fuse. See fuse block diagram.
	Siren volume not loud enough	1. Replace or have booster repaired.
<b>Robot Battery System</b> No functions will operate.	1. Booster problem if tape and voice vol. also are not loud enough	2. See siren volume adjust on main board.
	2. Adjust siren volume if tape and voice okay.	
Battery will not take a full charge. Needle on charger will not move.	1. Check wires and connector from battery to the robot.	1. Push battery connector pins in until it clicks in place. Pin could have slipped out of position.
	2. Battery is very low or bad.	2. Charge battery or replace if it will not charge. Also test charger.
<b>Drive Motors</b> Neither drive operates only. To correctly evaluate drive problems, look at wheels off the ground.	1. Battery has not been kept fully charged	1. Charge and discharge repeatedly. Replace battery if it does not start charging.
One drive only does not operate.	1. Both drive fuses blown.	1. Replace drive fuses on fuse block.
	2. Radio control drive section problem. Contact Robtronics for help.	
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.	1. Drive motor pulley loose.	1. Tighten motor pulley set screws.
	2. Broken connection at motor connector.	2. Check blue/yellow wires and in line motor connector at motor
	3. Drive circuit not getting power.	3. 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?
	4. Drive motor damaged.	4. Repair or replace motor.
	5. Drive Circuit on main board problem.	5. Send main electronics box back to Service Dept.
Drive motors moving on their own even when the stick is in the center.	1. Drive trim sliders not in center.	1. Move drive stick sliders to center or position to neutral the robot.
	2. Joystick potentiometer broken.	2. Send to Robotronics for repair.
Robot not driving straight.	1. One motor pulley set screw loose.	1. Tighten set screws.
	2. Straight drive adjustment needs to be adjusted.	2. Find adjustment on the main circuit board. See diagram of main board in Appendix.
<b>Character Head Turning System</b> Head is out of position but operates.	1. Loose head set screw or head was hit.	1. Re-position head and tighten set screw. Better to do this with the robot on.
	Head motor is keeping head in not centered position	1. 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.
Head motor is not operating	1. Character board is not getting power	1. Check fuse on main fuse block.
	2. Broken wire.	2. 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	1. Rod linkage came off.	1. Get to eyelid rods and ball links and re-attach.
	2. Servo wire broken or wire came out of eye servo board	2. Trace wires from servo motor of the eyelid or eyes and follow this wire to the eye servo board to find problem.

Problem	Cause	Solution
One of the eyelids is at a different level	1. Eyelid rod bent or eyelid out of adjustment	1. 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.	1. Connection at eye servo board has come off.	1. Vehicle- located on underside of upper robot. Robots with Character- located in character.
	2. Wire(s) bringing 5 Volts and signal to servo board are not making a connection. Broken out of 37 pin connector.	2. 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.
	3. No 5 Volts going to eye servo board.	3. Find broken wire on red/black or check fuse for eye servos on fuse block.
<b>Water Squirter</b> Cannot fill reservoir	1. In-line fuse blown.	1. Replace the 5 Amp fuse which is in-line on the wire. Follow wire from water squirter switch.
	2. Broken wire at water squirter switch or coming from main box	2. Repair break.
Cannot squirt: no pump sound.	1. Water squirter switch is not in on position. 2. Broken wire at pump or W.S. switch.	1. On position is not the center position. 2. Repair/re-solder broken wire.
Cannot squirt: pump sound yes	1. Reservoir empty	1. Fill Reservoir with filler bottle.
	2. Water line is not connected to water connector	2. Connect it.
	3. Overflow tube and squirt tube are switched at the reservoir.	3. 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	1. Modifier not turned on.	1. Push pedal on modifier. Light should come on.
	2. Audio wires not plugged in correctly	2. 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.

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



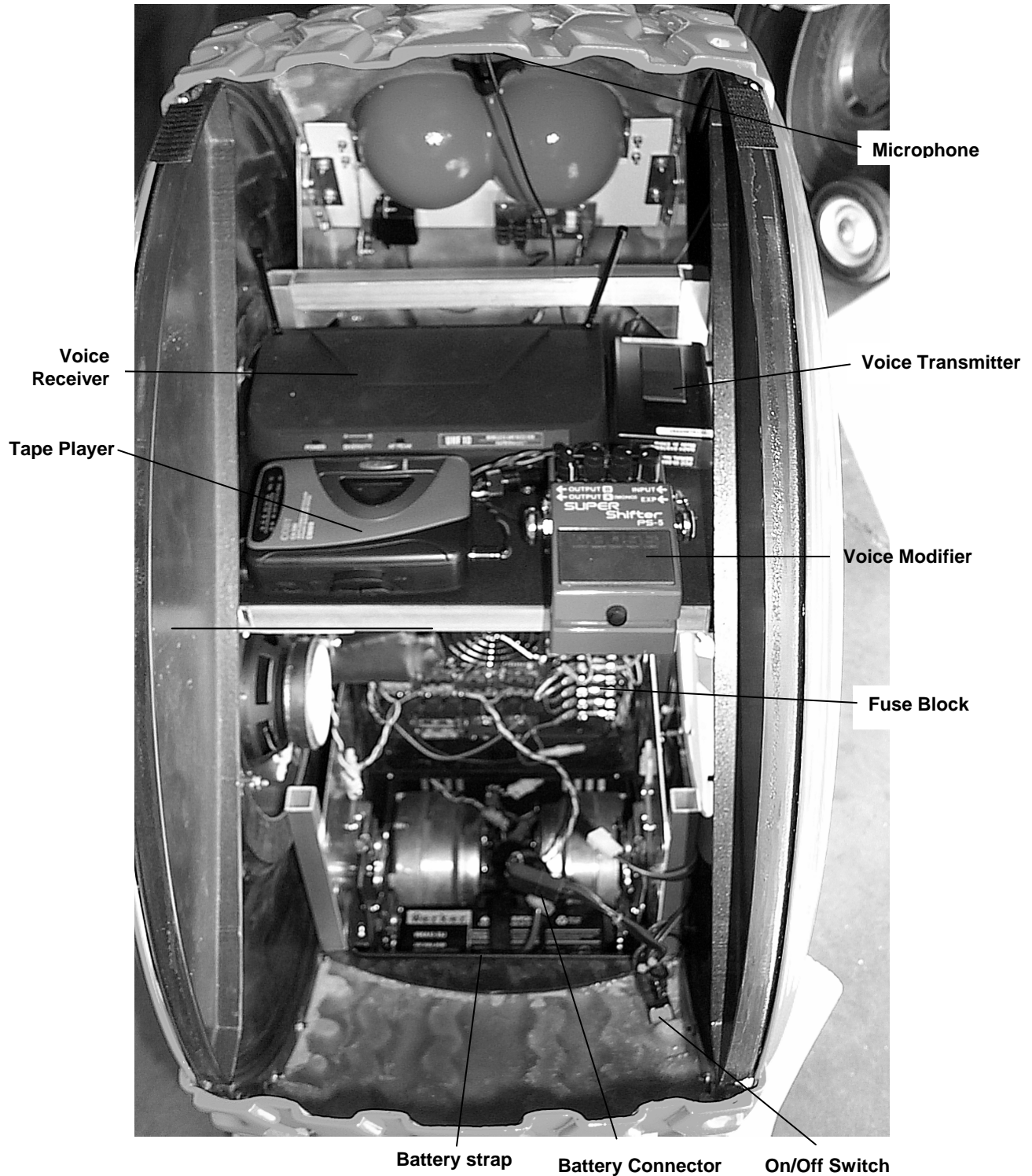
# Robot Block Diagram



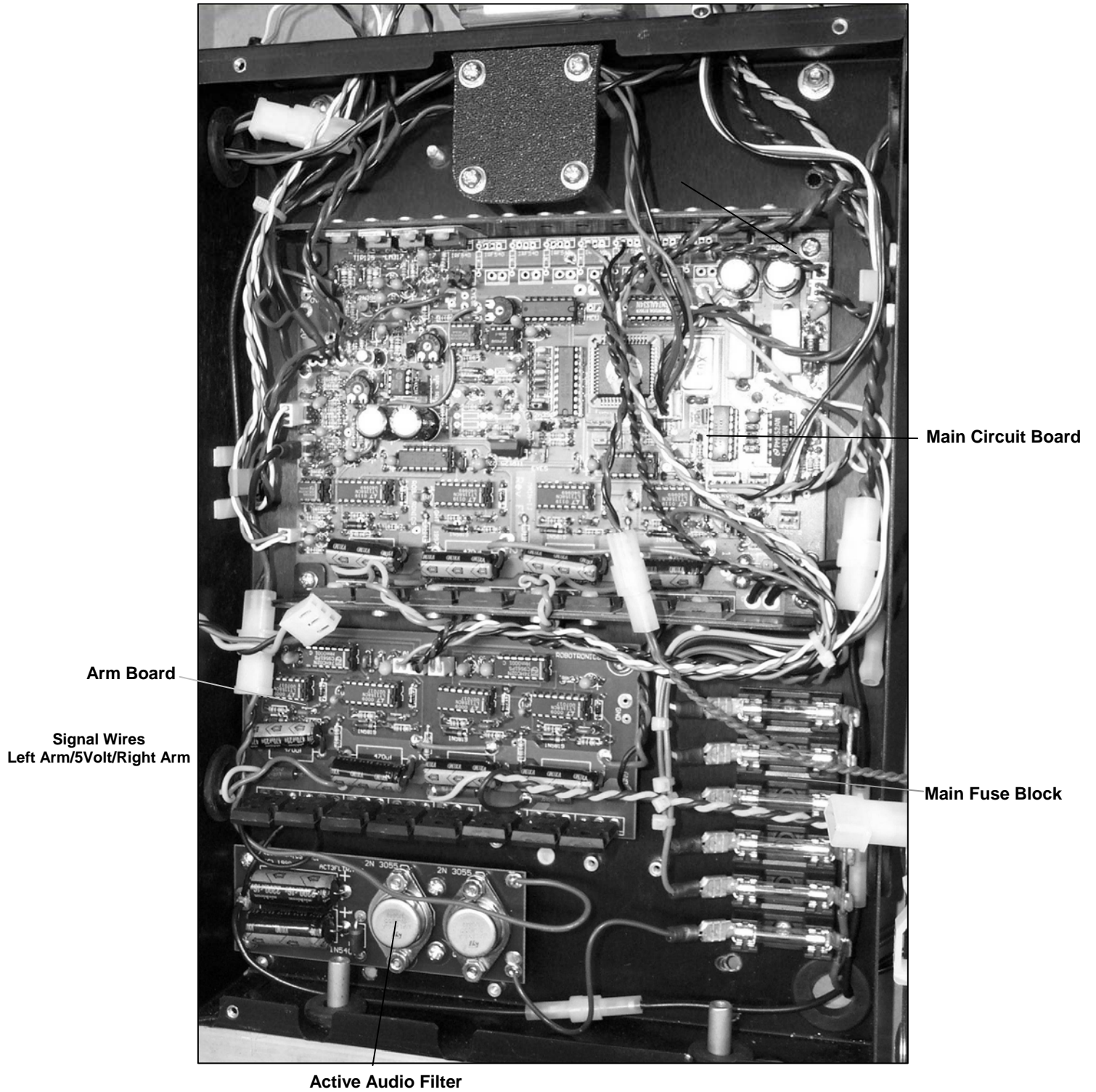
# **APPENDIX B**

## **ROBOT PARTS IDENTIFICATION**

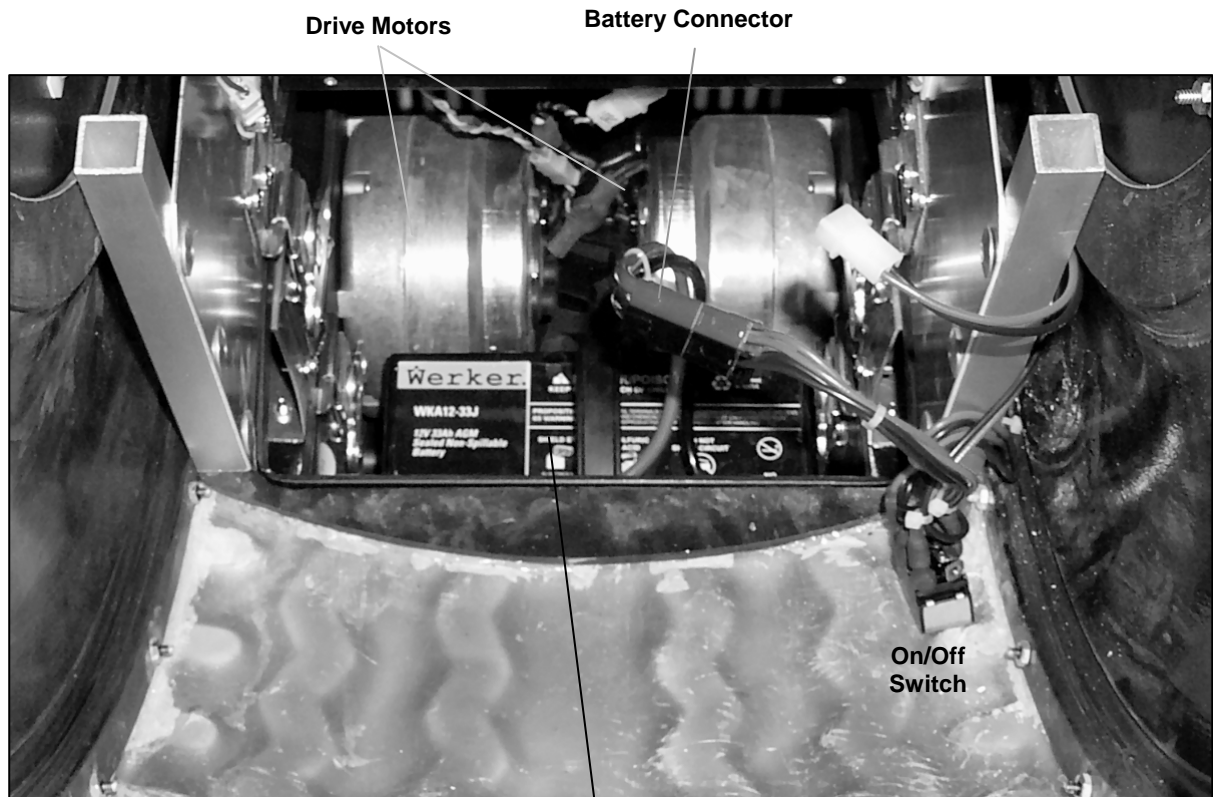
# Inside View



# Main Box Inside

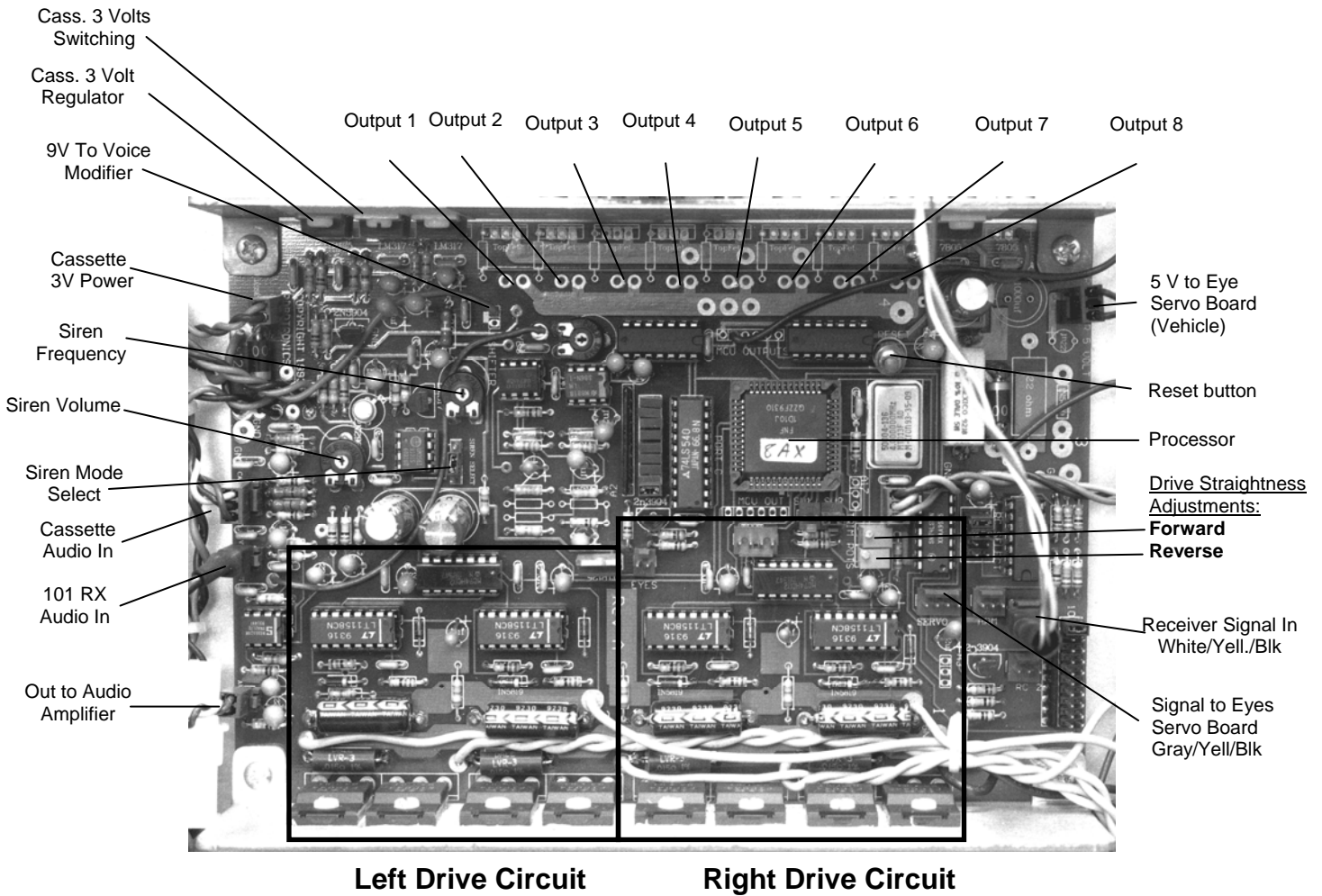


# Battery Compartment-Inside View



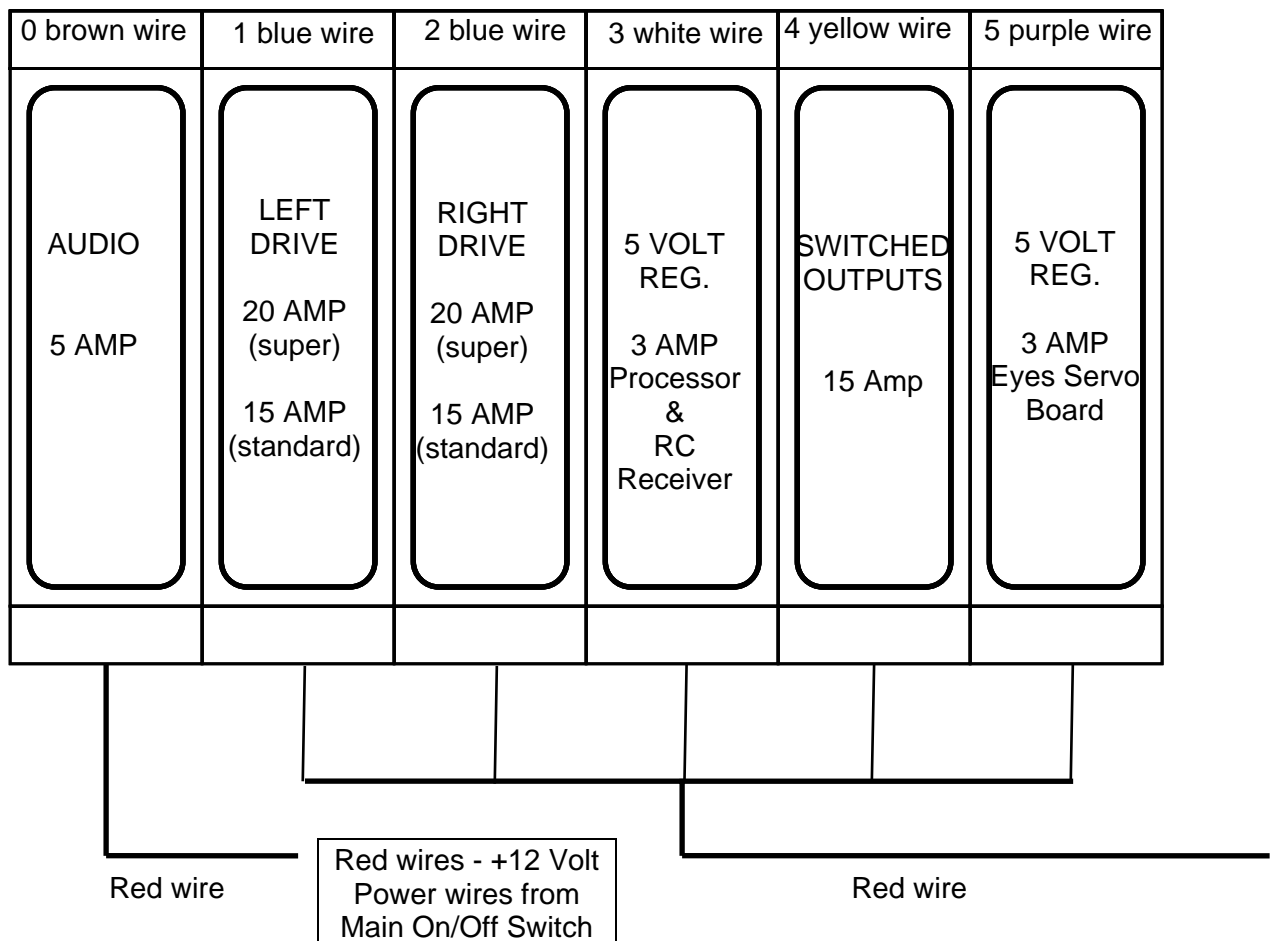
Robot Battery

# Main Electronics Board



# Fuse Block Detail

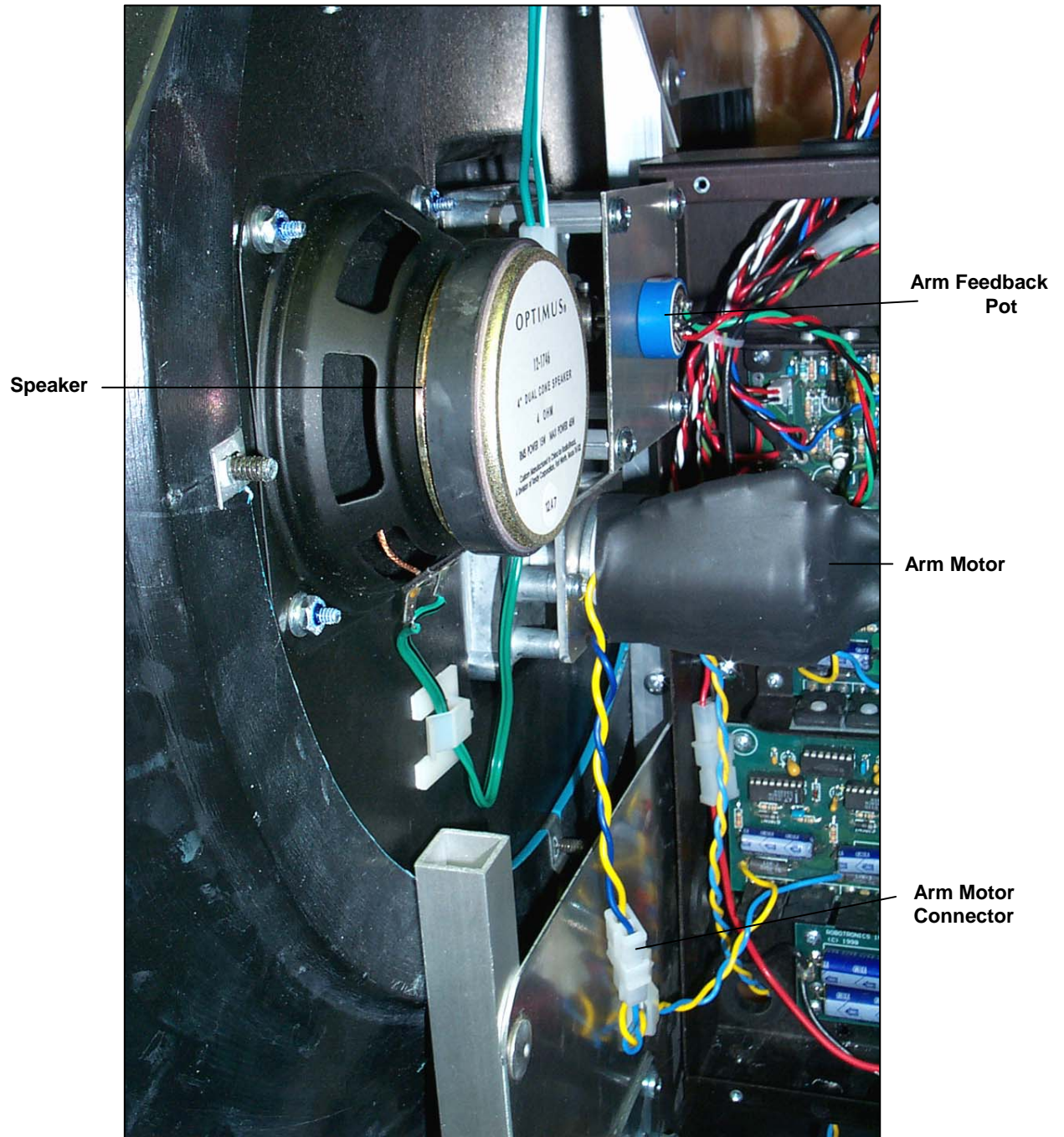
Use AGC Fast Acting Type Fuses



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

Switched Outputs - (Fuse 4) Switched outputs are 2 pin outputs.

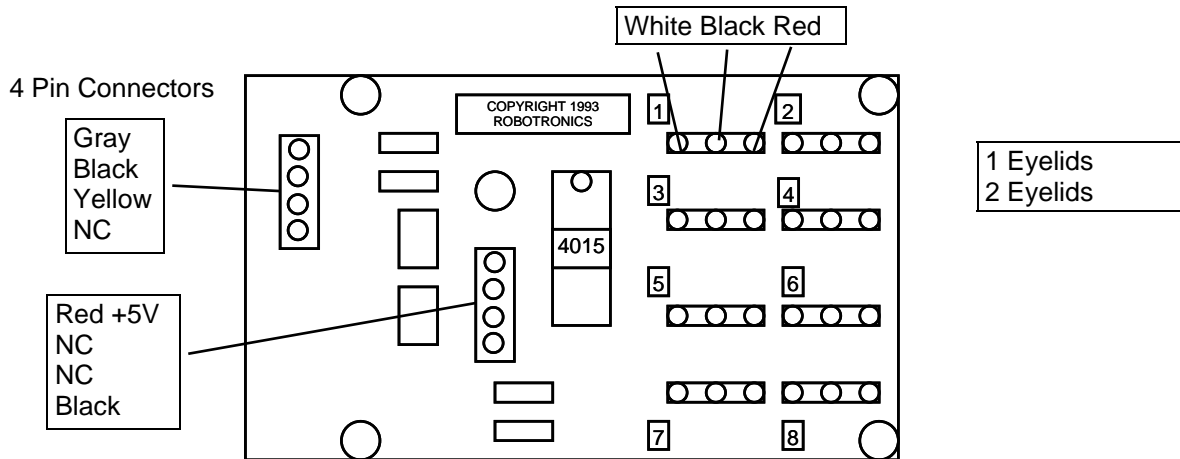
# Side Arm View



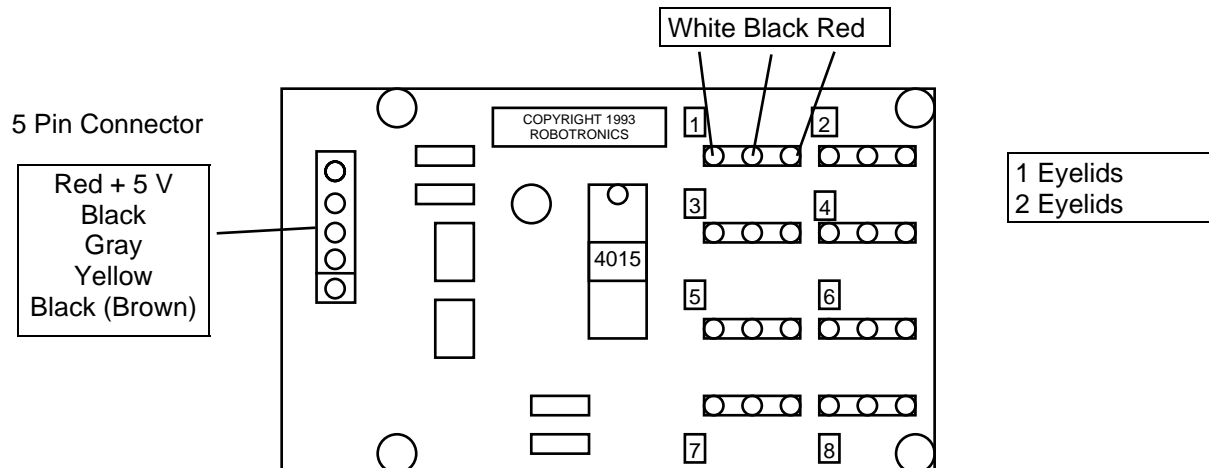


# Eyes Servo Board (Opto-Shift Register Board)

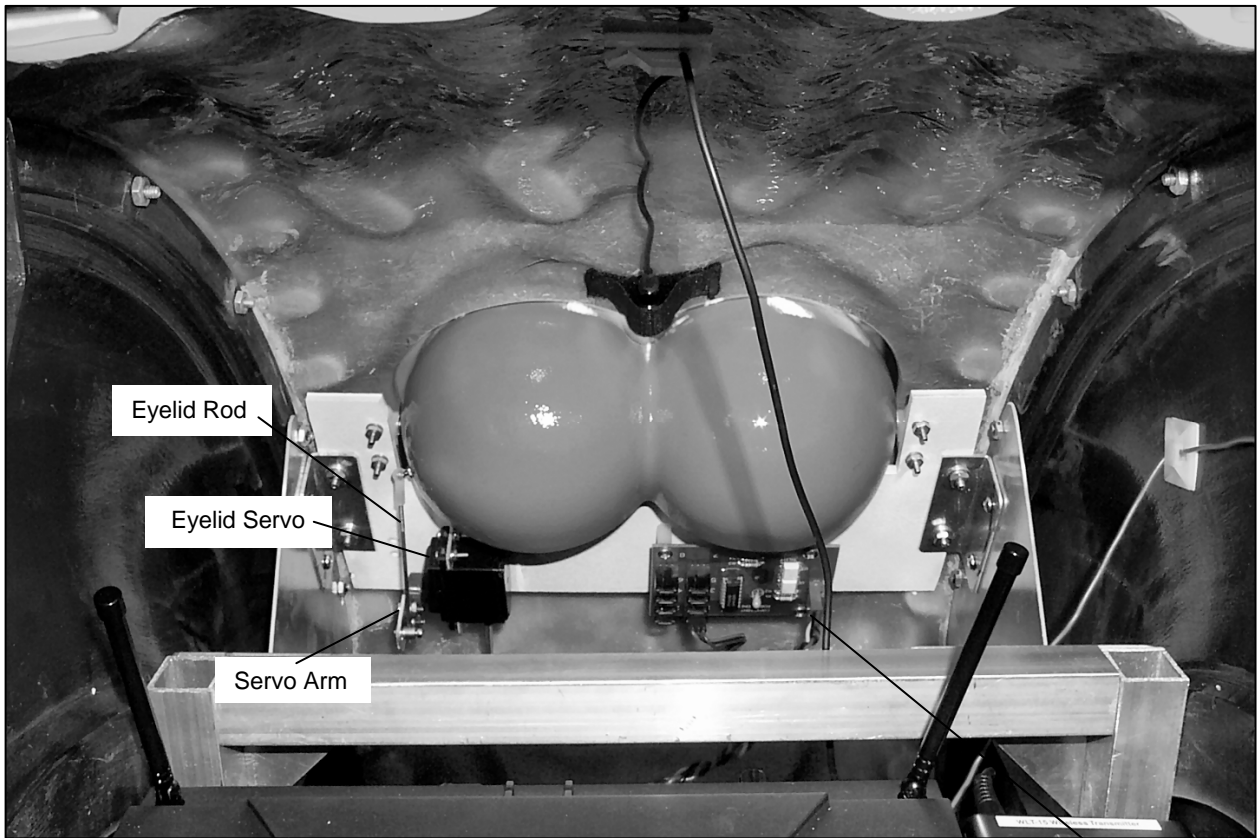
## Version With Two 4 Pin Connections



## Version With One 5 Pin Connection



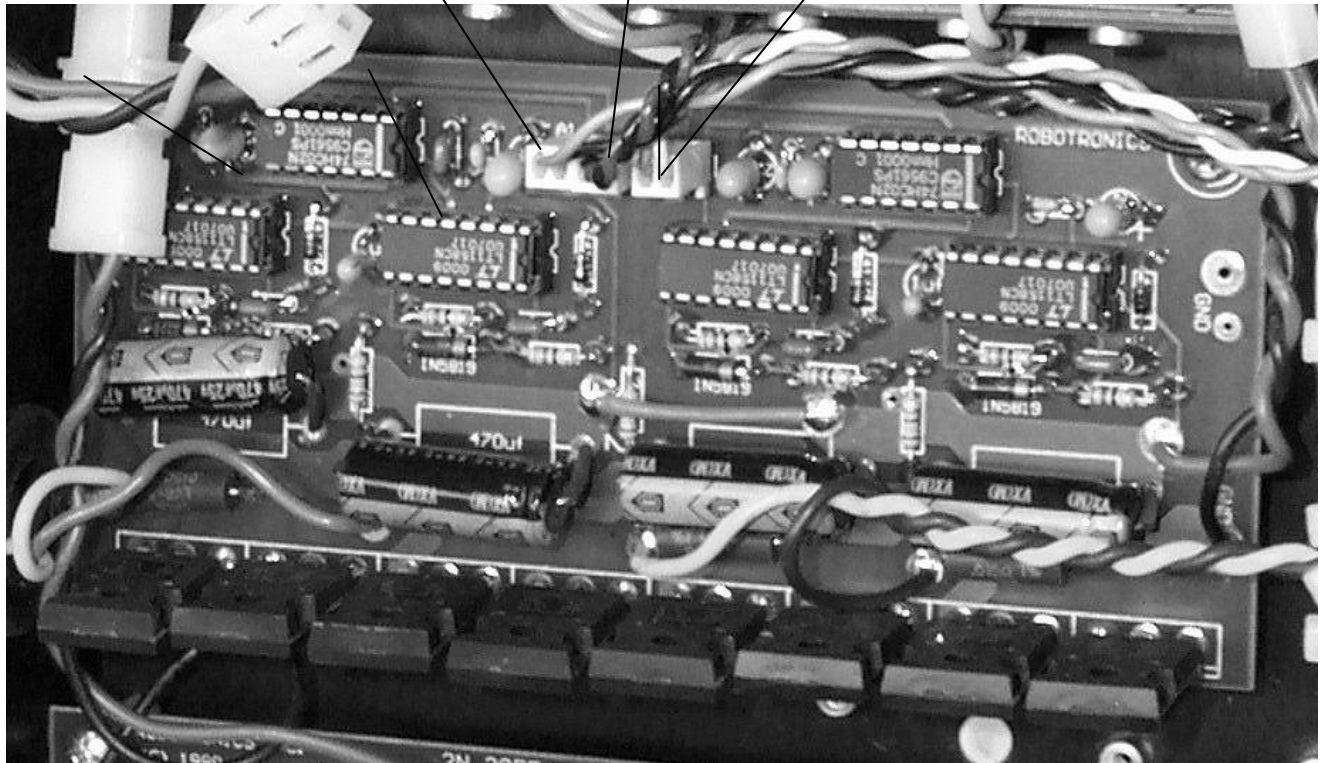
# Eyes



Servo Board

# Arm Control Board

Left Arm Signal      5 Volt Power      Right Arm Signal



Left Arm Circuit

Right Arm Circuit

# Notes

# Technical Tips