

# Robotronics®

*The Leader In Safety Education Products*

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## Patches & Pumper™ Robot Operating Manual

Version 6C

# Patches & Pumper™ Robot

**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 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 and information sent from Robotronics; such as the technical tips section of the newsletter.

## **LIMITED WARRANTY**

All robots and accessories have a limited 180 day 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.

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. 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.

### **If You Have A Problem**

1. 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.

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**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.

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2. 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.
3. Parts of the robot are best sent by a carrier such as UPS, 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 Yellow Freight , ABF or Consolidated Freight way should be used only for the complete robot , because their shipping charges are based on 100 pound minimums.
4. 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. If you do need replacement parts, 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.

The staff of ROBOTRONICS has taken due care in preparing this manual. Because of parts availability, robots may vary slightly from unit to unit. If you have any questions, please contact our service department. **The service department phone number is: (801) 489-4466.**

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.

# 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. Much of the excitement the robot conveys is provided by the operator. 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.

When operating the robot, always maintain charged batteries and never operate the robot out of line-of-sight.

When operating in crowds, 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. The robot should not be operated near stairs. When operating on a stage you should leave plenty of distance between the robot and the edge of the stage and should keep the area below the stage clear of anyone.

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.

Never operate the robot with low batteries in the transmitter, the voice system, or in the robot itself.

The robot can be a highly successful tool for humor 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 most effective with children. They are light in weight and just the right size to communicate with children. Their light weight plastic construction makes them extremely safe even around the smallest child.

The most important ingredient to the use and effective operation of the robot is common sense. The following instructions will help you set up the robot and start using it.

## SETUP AND HOW TO OPERATE THE ROBOT

### Step # 1 Read the manual

Read and study this manual completely before operating the robot.

### Step # 2 Charge and install the batteries

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

#### Installing the robot battery:

1. Position the battery so that the posts face the rear of the robot. In this position, the battery wire will naturally run to the robot battery connector.
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. Secure the battery in place with the battery strap. Adjust the clip on the strap if necessary so that when you put the two clips together, the strap is holding the battery in place 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 # 3 Install the upper robot on the lower

1. Set the upper robot on the lower robot body.
2. Locate the four body latches and push the pins into the body to secure the upper robot to the lower. Two of the latches are located in the compartment where Patches sits. The pins are to the left and right of Patches. The other two are at the back of the robot. To latch these you will need to reach in through the back hatch/trunk.
3. Connect the 37 pin connector which is a round connector and wire bundle running from the upper robot to the lower robot. When connecting this rotate it until it sits down into its mate connection and turn the ring until it is secure.



### **CAUTION**

**Before operating the robot or transporting the robot on the cart or in a vehicle; the upper robot must be properly latched to the lower by pushing the latch pins in. Failure to do this could cause damage to the upper robot if it fell off.**

### Step # 4 Voice System Set Up

Put 9-Volt batteries in the voice units (Eveready Alkaline fit tighter). Make sure you follow the polarity sticker. Put the units on opposite sides of your waist. Plug the headset into the units. On the 151 Receiver the plug goes into the headphones jack. Adjust the voice system volume control to the level you want. The voice speaking volume adjustment is inside the trunk on the voice receiver. The hearing volume level is adjusted on the 151 Receiver that you wear. The Nady 331 Receiver in the robot should have the antenna extended all the way out.



### Step # 5 Tape Player Set Up

Put a cassette tape in and press play. The tape player volume can be changed on the tape player itself, which can be accessed through the rear hatch/trunk.

### Step # 6 Powering up

Turn the Radio Control (RC) "ON" first and then turn the robot "ON". Check that the RC battery level meter reads to the right. Extend the RC antenna about halfway out. The "ON/OFF" switch for the robot is located inside the trunk on the main electronics panel. Push the switch left to turn the robot on (On/Off positions are labeled).

### Step # 7 Test all the functions

Test all of the robot's functions: The voice both ways, head turning, mouth, steering wheel, eyelids, eyes, tape, siren, lights, and drive movement for proper operation.

**The robot is now ready to operate.**

### Step # 8 Powering Down

1. Turn off the voice equipment on your belt.
2. Turn the robot power switch to the "OFF" position.
3. Turn off the RC unit.

### Step # 9 Charge the batteries again

Connect the Pumper 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.

**NOTE:** The smooth and efficient operation of the robot will come with just a few short hours of practice. 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.)

## 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 four latches that must be latched to secure the upper robot to the lower robot (See the diagram below). These pins must be pushed in to secure the upper robot.

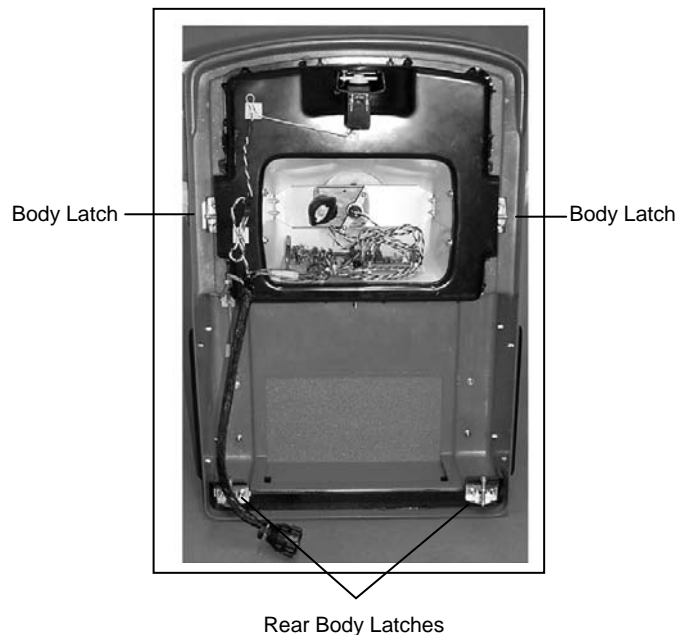
To strap the robot on the cart, roll the robot on to the cart with the back wheels first. The back wheels will drop in to the recesses. Pull the S-hooks on the cart up to each of the four eye hooks under the front and back bumpers of the robot.

You can leave the robot on the transport cart while the robot is in transit, to keep the robot from rolling around. Have the robot cover on the robot to keep the body from getting scratched.



### **CAUTION**

**If the upper robot is not properly latched before transport, it could come off while moving the robot with the transport cart or in a vehicle, causing damage to the upper robot.**



## Part 2 Subsystems of the Robot

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

- A. Radio Control System (Control)
- B. Voice System and Moving Mouth (Audio)
- C. Cassette Tape Player (Audio)
- D. Siren (Audio)
- E. Robot Battery Systems
- F. Drive Motors
- G. Eyelids and Eyes Left and Right
- H. Head Turning

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 microcontroller which is on the main circuit board. The micro-controller controls functions based on what was sent from the radio control transmitter.

Refer to the diagram showing the radio control transmitter for the location of controls. 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. Turn on the robot. 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.

## 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 and then turn on the main robot power switch. It is okay to turn off the RC with the robot on if the RC battery goes low or if the robot starts moving. This will put the robot in neutral while your going to the robot to turn it off.

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 adjusted if the robot creeps on its own, otherwise they should be left in the center.

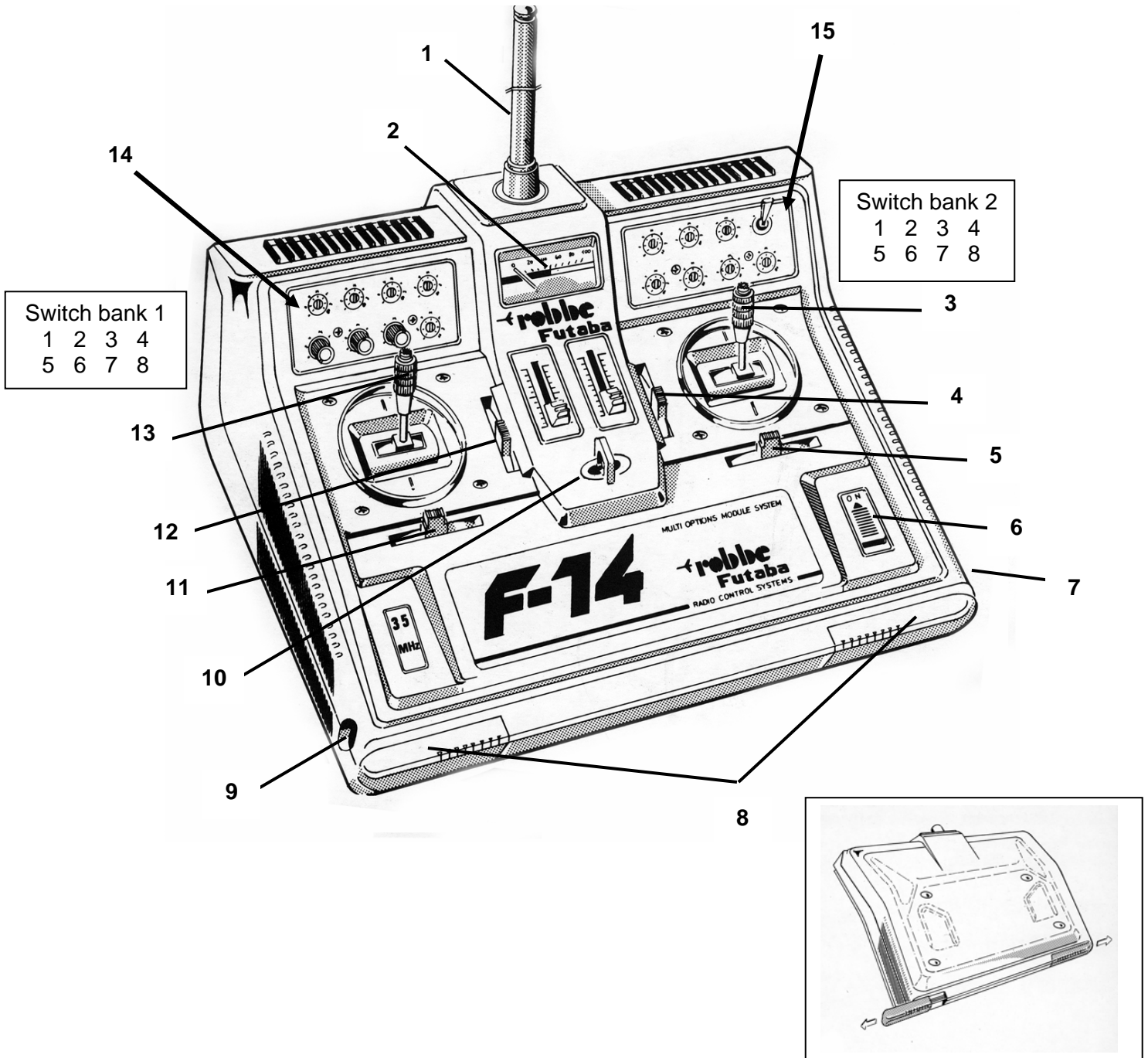
The left joystick left and right moves the eye pupils and the head. The eyes will look in the direction that you move the head automatically. The slider control below the stick should be left in the center so that the eyes and head stay in the center. Forward and back movement of the joystick does not control a function.

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.

There is a **recharge jack** on the side of the transmitter. The recharge jack is used to charge the internal Nickel Metal Hydride RC transmitter battery. Connect the NI-MH RC battery charger to it and charge for 16 hours or overnight. This battery pack will give you 5-6 hours of operation on a full charge.

Take care not to overcharge the batteries as this will shorten their life span. You can charge the batteries whenever you want but you should not exceed the 16 hours charge time especially if the battery level does not show in the red yet.

# RADIO CONTROL TRANSMITTER (Robbe-Futaba F-14)



# RC TRANSMITTER CONTROLS

## (Robbe F-14)

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. On/Off switch
7. Recharge jack. Plug the RC battery charger in here to recharge the internal battery. The charger light will come on when it is connected.
8. Sliding tabs to remove the back cover. Slide both tabs off and take the back cover off.
9. Antenna storage.
10. Neck strap connecting hook.
11. Left and right Trim lever for left control stick. Normal = Center. Centers the eye pupils position.
12. Forward and Reverse Trim lever for the left control stick. Normal = Center. Unused.
13. Left Control Stick  
Left and right movement - Head turn and turning of the Eyes left and right  
Up and Down – Unused
14. **Switch bank 1**
  5. Back-close Left eyelid momentary / Forward- Water Squirter Option
  6. Back- Blink. Close both eyelids momentary / Forward- Beacon momentary (On and Off)
  7. Back-close right eyelid momentary / Forward- Siren momentary
  8. Back – Sleep(push switch to sleep and push again to wake up).

Special note: The eyelids will also open if you hit any one of the eye switches.

## 15. Switch bank 2

7. Headlights - Forward On / Back Off
8. Cassette Tape Player - Forward On / Back Off

When the battery level goes in the red, the robot should be turned off and the other battery connected.

The trim adjustments for the drive joystick can be adjusted if the drive centering comes off slightly such as if the robot starts moving on its own. If the robot does start moving slowly on its own, move the slider to the left of the stick or below the stick, slightly until it stops.

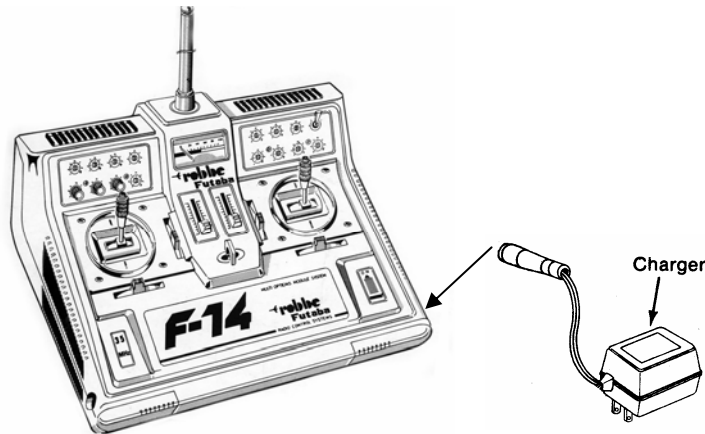
The trim adjustments for the left joystick will effect the position of the eye pupils. The one below the left of the stick effects the position of the pupil (Typically leave in the center).

### To remove the back cover of the transmitter

Remove the sliding locks at the bottom of the transmitter. This is all that is necessary to release the back cover. This will give you access to the RC transmitter battery inside if you need to replace it.

## THE Nickel Metal Hydride (NI-MH) RC TRANSMITTER BATTERY

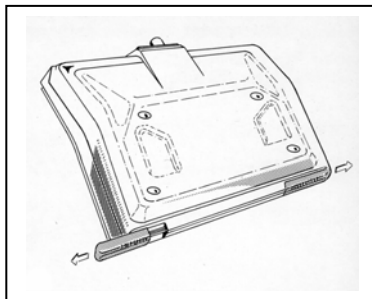
The NI-MH RC transmitter battery will last about 5-6 hours on a full charge. Charge the battery for **16 hours**. A charge jack is provided on the transmitter for recharging its internal batteries. This round jack is located on the right side of the radio control. (See the radio control diagram) The 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 back cover off the RC.



To remove back cover,  
slide the tabs as shown.

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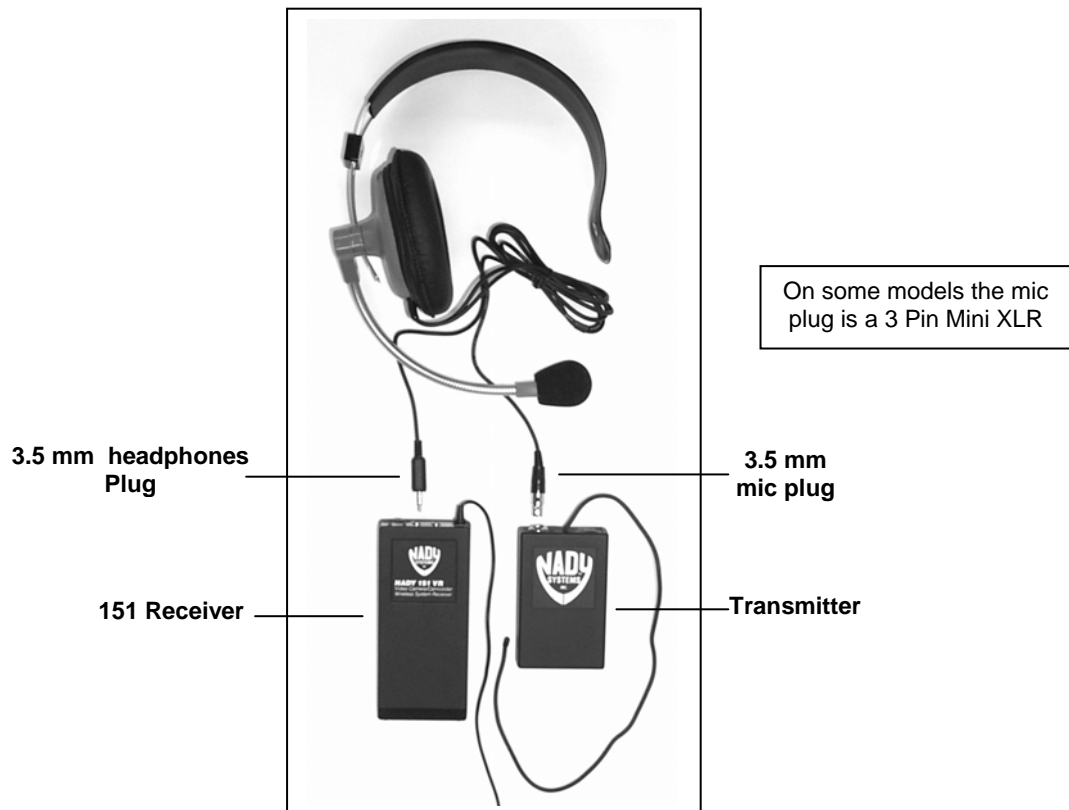
**Important:** The operator's transmitter and receiver should be kept as far separate as possible, such as on opposite sides of the operator's waist. Do not attach the units together, this may cause interference effects. The antennas should not be wrapped around each other or around the headset wire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

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### Location of Voice Units

Voice Transmitter-	Operator wears
Voice Receiver-	On the frame 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



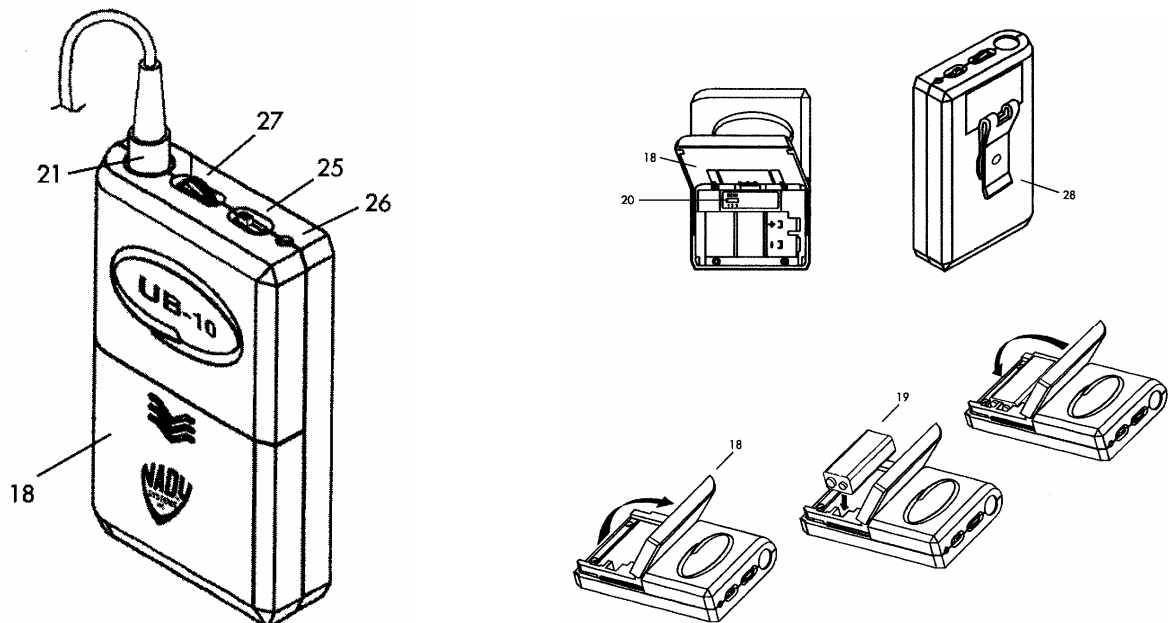
## How to Operate the Operator's Transmitter

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 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.



- 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)

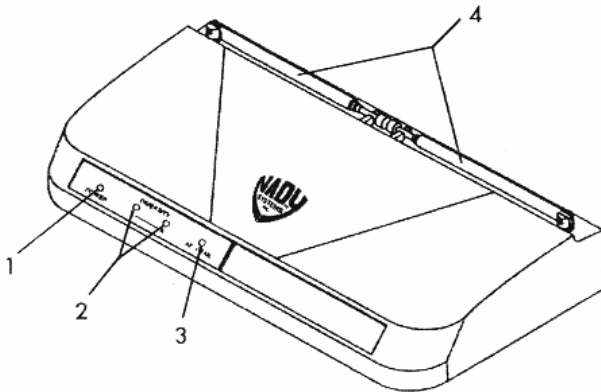
There are two adjustments on the receiver. The **volume** is on the back of the receiver, which you may set to the desired volume. On the UHF UB-10 you can change the volume on your belt transmitter *on the fly*. The other adjustment is the **sensitivity**. This is factory preset to maximum sensitivity.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

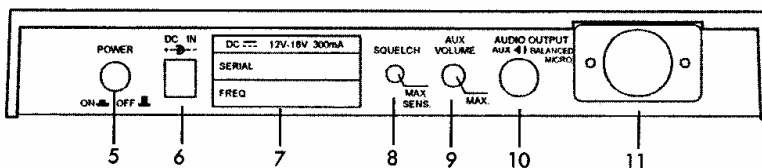
**TX LED-** This indicates that you are receiving a signal from the transmitter. On some units it is a single TX light. On other units it may have an A or B that it will alternate between.

**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.

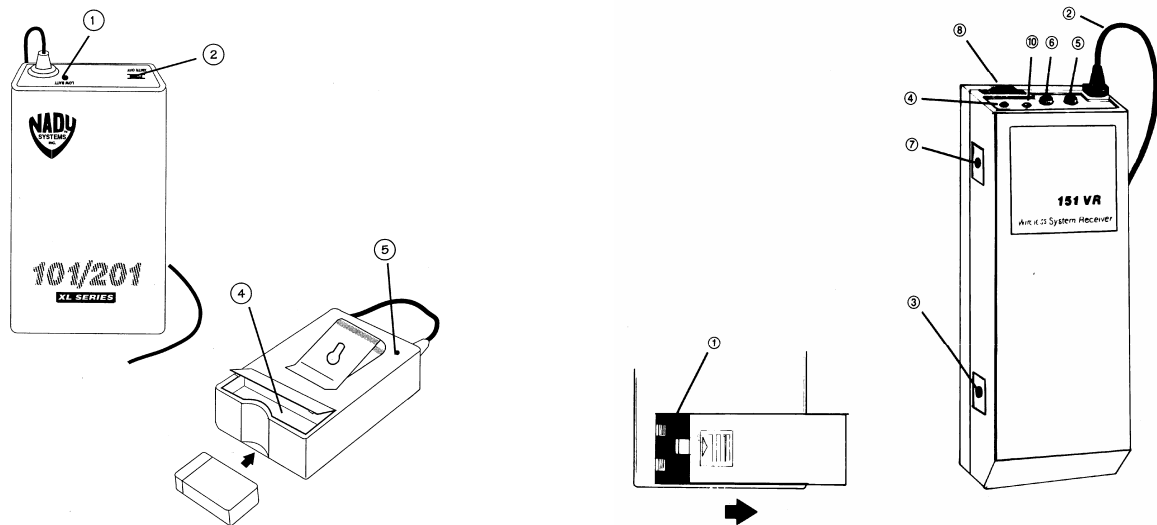
## How to Operate the 151 Receiver (Operator)

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.
5. Headphones jack
6. 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>		
<p>Operator cannot talk</p>	<ol style="list-style-type: none"> <li>1. Low Battery. LED on steady or no LED flash.</li> <li>2. Battery posts not touching the metal clips in the operator's transmitter.</li> <li>3. No power to the 101 Receiver. If yes, continue.</li> <li>4. No TX light on the Receiver. If yes, continue.</li> <li>5. Audio wires going through pitch shifter connected wrong.</li> <li>6. Headset plug to transmitter broken.</li> <li>7. Still not working. Call Robotronics.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace the 9 Volt battery. Is battery inserted in correct polarity?</li> <li>2. Bend out the metal clips. Put foam under clips.</li> <li>3. Check the in line fuse to the Receiver in robot and audio fuse on main fuse block.</li> <li>4. Check Sensitivity adjustment on back of Receiver. It should be on Max. Sens.</li> <li>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.</li> <li>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.</li> <li>Send transmitter, receiver, and headset in.</li> </ol>
<p>Operator cannot hear</p>	<ol style="list-style-type: none"> <li>1. Low Battery. LED on steady or no LED flash.</li> <li>2. Battery posts not touching the metal clips in the operator's receiver</li> <li>3. Headset plug to 151 RX has a broken wire.</li> <li>4. Robot 151 transmitter not turned on.</li> <li>5. Power plug to robot 151 transmitter unplugged.</li> <li>6. If you have no TX light on 151 RX mute could be out of adjustment</li> <li>7. Robot microphone in robot is bad.</li> <li>8. Still not working. Call Robotronics.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace the 9 Volt battery.</li> <li>2. Bend out the metal clips. Put foam under clips.</li> <li>3. Unscrew cover of plug and look for broken wire.</li> <li>4. Turn on audio and power.</li> <li>5. Find wire and plug it back in.</li> <li>6. Adjust the mute on the 151 RX to max. which is fully CCW.</li> <li>7. Order a replacement. TEST- Plug your headset into the robot transmitter in place of the robot microphone and test.</li> <li>8. Send robot mic, transmitter, receiver, and headset.</li> </ol>
<p>Voice Operates but cuts out. Should get 50 feet without any cutouts.</p>	<ol style="list-style-type: none"> <li>1. Low Battery.</li> <li>2. Sensitivity Adjustment down too far.</li> <li>3. Broken, loose or retracted antenna</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace the 9 Volt battery.</li> <li>2. Sensitivity adjustments should be at max. on the 151 Receiver and robot receiver.</li> <li>3. Extend robot receiver antenna or replace broken antenna.</li> </ol>
<p>Squelch coming from robot</p>	<ol style="list-style-type: none"> <li>1. No signal being sent to the robot</li> <li>2. Sensitivity is too sensitive.</li> </ol>	<ol style="list-style-type: none"> <li>1. Turn on the operator's transmitter.</li> <li>2. Very slightly adjust sensitivity down from max. (This will decrease your range)</li> </ol>
<p>Squelch in headset when turning robot off.</p>	<ol style="list-style-type: none"> <li>1. 151 Receiver slightly too sensitive.</li> <li>2. 151 RX picking up interference in your area.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust 151 RX mute slightly CW</li> <li>2. Always turn off 151 RX and remove headset before you turn off robot.</li> </ol>

## 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



3.5mm Headphones Plug

Mic Plug - 3.5mm or 3 Pin mini XLR

## CHAPTER 4 Cassette Tape Player System

The cassette tape player system is located inside the robot on the metal electronics box. The system is activated by remote control from the radio 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. Push the play button on the cassette player.
3. Move the radio tape select switch to the tape position.
4. Activate the switch on the radio control labeled tape.
5. Adjust the volume to desired level.
6. On some models there is a normal or Extra Bass switch.

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.

There are cassette tapes available from Robotronics with safety songs or you can customize your own tape to work with your program.

### Troubleshooting Cassette Player

#### **No operation when you activate the tape function:**

1. Is the cassette fully inserted ,play switch pushed, and the volume level up.
2. Is the cassette unit receiving power?  
If not, make sure that the mode switch on the cassette player is in tape mode.  
If it is still not working check the **wiring, plugs and the audio fuse** on the fuse block. (See the Fuse Block Detail)
3. Is the Radio Control Transmitter "ON" and working? Listen for the cassette motor and check to see if the power light or FM stereo light is on as the R.C. is activated.

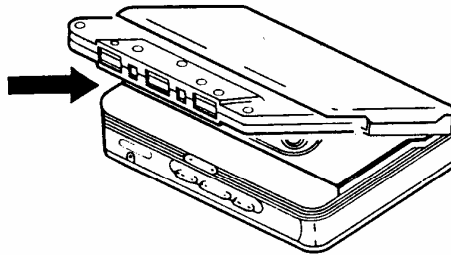
#### **Sound Quality is poor:**

1. Test the cassette tape on some other player. If the cassette tape is OK, clean player and try again.
2. If the tape is running slow, loosen the tape by spinning it with a pencil. Try a different tape. The tape running slow may be an indication of worn out belts that need to be replaced or the cassette player needs to be replaced.

# Cassette Tape Player

## INSERTING A TAPE

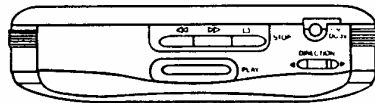
The MRX-225 can play any pre-recorded cassette tape (mono or stereo). Simply insert the cassette as shown below. Then, proceed to "Playing a Tape" in this manual.



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.

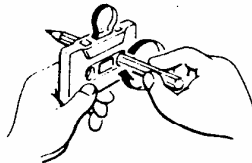
## FAST FORWARD/REWIND

Press **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.

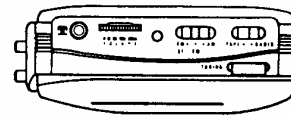
**Tighten Tape Slack**—Before loading a cassette, take up any slack in the tape by turning the tab hub with a six-sided pencil. Avoid touching the tape.



**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**.

## AUTO REVERSE



You can use Auto Reverse to have your player automatically reverse the cassette, or you can change the tape direction at a press of a switch.

To change the direction of the tape at any time, press **DIRECTION**.

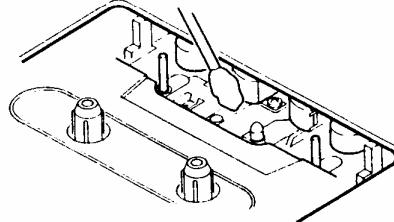
## TAPE TIPS

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.

## CARE AND MAINTENANCE

Routine maintenance of the playhead 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.

**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.

## 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

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

### PUMPER ROBOT BATTERY

The battery in the robot is a rechargeable sealed lead-acid Gel type battery **12 Volt 31AH**. This type of battery is very dependable and safe. It can be repeatedly charged and discharged.

### Installing and Removing

When removing and inserting the battery in the robot battery compartment, slide the battery in and out carefully. **Always fasten the battery down snug with the strap provided.** It is best to remove the robot battery when transporting the robot particularly if the body may be on its side or upside down during shipment.

### How to Recharge

To recharge the robot battery, first open the trunk hatch and unplug the battery from the main component board. Next connect the charger wire to the battery. Finally connect the line cord of the charger into a 110 volt AC outlet. Leave the trunk cover off or open during charging for ventilation. The robot is supplied with an automatic type battery charger. This 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.

More charging instructions are in the charger section

### Cautions



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 at the end of the connector of the battery.

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. **Fully charge the battery after each use.**

**Important:** Charge the battery to a full charge right after using the robot. Gel type batteries will be damaged if not kept fully charge at all times.

## 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 Globe 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.
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.
4. Always unplug the AC supply cord before connecting or disconnecting the charger leads from the battery.


As additional protection from the hazard of electrical shock:

5. Do not expose the charger to rain.
6. 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 ammeter reading is your best indication of the battery's state of charge. In most cases, if the battery has been discharged at all, the current meter will initially read close to 10 amperes. After 5 minutes or so, the meter will drop to some lower level. This reading can be used as a rough guide to determine the state of charge as shown on the front panel of the charger. Do not use the initial reading obtained just after starting the battery charge. Some charger models will have a battery fully charged light to indicate a full charge.

2. When fully charged, a new battery in good condition may cause the meter to "bounce" around the "0" mark. This is normal and, in fact, indicates a true "full" charge. As it ages or is wearing out, a battery may, in some cases, not drop below 1 ampere no matter how long it is left connected to the charger.

3.  If an audible click is heard when connecting the battery charger leads to the battery, or if the meter is seen to move abruptly to the right (off scale), disconnect the charger leads immediately. They have been connected in reverse polarity. **Always connect the red (+ or positive) clip to the positive terminal of the battery and the black (- or negative) clip to the negative battery terminal.**

4. In some cases, a severely discharged battery can cause the circuit breaker to open because the battery is drawing more current than the charger can safely provide. If such is

#### Chapter 6 Robot Battery Systems: Pumper Battery Charger

the case, it is permissible to let the charger run for as much as 10 minutes with the circuit breaker turning the charger on and off. The circuit breaker resets automatically. There is no reset button provided.

If the charger does not stay on after 10 minutes, disconnect the charger from the battery. The battery most likely has a shorted cell and needs replacement.

5. In some cases, a battery, which is discharged completely, will not draw any noticeable current when the charger is connected and the power cord plugged in. A battery that 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.

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

If this condition is encountered, leave the charger on the battery for, up to, one week and occasionally look at the meter to see if the battery is drawing any current. Connect and disconnect the power cord and watch the meter, at the same time, to see if the meter moves, indicating that the battery is drawing some current.

Try using the battery and see if it runs your equipment. If it does but not for a normal time, repeat the charge and discharge two or three times. The battery may recover. If the battery does not recover, it must be replaced.

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

7. This charger is not recommended for continuous charging of Gel type batteries. The charger should be disconnected from the battery once the ammeter shows the battery to be fully charged. Because of the automatic nature of this charger, no harm will be done if the charger is occasionally left on for a week or two 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.

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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.

#### Chapter 7 Drive Motor System

- **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.

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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 Patches Head Turning System

The main components of this system consist of the head turning motor, 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 Pumper. The receiver sends this signal to the microcontroller on the Patches board. The motor control circuit is on the Patches 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 right or left.

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 Patches Board mounted on the inside the chest of Patches.

Feedback pot- Directly below the motor.

Set screw- On the inside of the neck.

### **Troubleshooting Head**

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

The head could have been hit out of position or the set screw is loose. Try to move the head manually. If you can, move it back into the correct position and make sure the set screw is tight. The set screw can be accessed through the shoulder access hole. If you cannot manually move the head, you may need to loosen the set screw re-position it and then tighten the set screw.

#### **The head 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 head turning motor will need to be lowered clear of the tubing that joins its shaft to the shaft of the head turning motor. Now you will have access to be able turn the shaft of the feedback pot until the head comes back into center position. Bolt the pot back up into its correct position.

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

1. Check the motor wire to see if came disconnected at its in line connection.
2. The Patches board is not getting power- If this is the case you would not be getting eyelid movement. Check the fuse on the fuse block:  
Look at the red and black wire bringing power to the Patches board. If you have a Voltmeter, check for 12 Volts going to the board. Is there 12 Volts; a broken wire?

## CHAPTER 9 Eyelids and Eyes Left and Right

The eyelid and eyes left and right movement is accomplished by three servo motors in Patches. 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 are 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 Patches board.

## CHAPTER 10 OPTIONAL ACCESSORIES

### WATER SQUIRTER SYSTEM

#### WATER SQUIRTER PARTS AND WHERE TO FIND THEM

(The Lower Robot -Top View Diagram shows you where these parts are in the robot.)

**Refill bottle** - Comes with robot.

**Water squirter nozzle** - Typically located in the front grill.

**Water squirter switch** - Rear left side of the robot. Open rear hatch to access.

**Refill fuse** (5 Amp-AGC type) On the red wire between the switch and the main circuit board.

**Overflow nozzle** -On the bottom of the lower robot below the water squirter switch.

**Female water connector** - Next to the water squirter switch.

**Water pump and reservoir** - Located on the middle front in the lower robot.

A. How to fill your water squirter system:

1. Unplug the water line coming from the water squirter nozzle to the female water connector and plug in the filler bottle in its place.
2. Hold the water squirter switch in the momentary position until water comes out the overflow nozzle. You will fill the reservoir until water comes out. (You can stop sooner if you want.) Be sure that the water is filling in the reservoir.
3. Plug the water line back in and switch the water squirter switch to the "on" position.

B. 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 activate the water squirter system, move the switch on the radio control box to the momentary (spring loaded) position.



#### **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.

If you have any questions or need help in learning to operate your new water squirter option, please feel free to contact Robotronics' Customer Service Department at (801) 489-4466.

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

The pitch shifter (voice modifier) can change the operators 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 of the pitch shifter. It is modified and sent from the shifter output to the voice 'audio in' on the main circuit board

### **Location of Pitch Shifter(Voice Modifier):**

**PATCHES & PUMPER-** Attached to electronics panel. Remove the trunk and you will see it.

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 robot. The wire that goes in the input jack of the pitch shifter comes from the 331 voice receiver. The wire that connects to the output A jack of the pitch shifter goes into the main electronics box and connects to the main circuit board.

To set or change the pitch shifter settings, reach through the rear door or trunk. If needed, unlatch the top and lift the top slightly. Make sure to push the top latches back afterward to keep the top secure on the lower robot.

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 is a ground. The fuse related to the shifter is the audio fuse located on the fuse block.

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**One Common Setting for PS-5 Models:** If you have the PS-5 model, a common setting is to set the Balance fully clockwise to EFX, mode to pitch shifter setting and the pitch knob to about 2:00 position for a shifted up robot voice. Adjust the pitch to fine tune your voice clarity. One setting can be more clearly understood than another.

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## PART 3

### CHAPTER 11 Assembly & Disassembly

#### Installing the robot battery:

1. Position the robot battery so that the posts face the rear of the robot. In this position, the battery wire will naturally run to the robot battery connector.
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. Secure the battery in place with the battery strap. Adjust the clip on the strap if necessary so that when you put the two clips together, the strap is holding the battery in place 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.**

#### Installing the upper robot on the lower :

1. Set the upper robot on the lower robot body.
2. Locate the four body latches and push the pins into the body to secure the upper robot to the lower. Two of the latches are located in the compartment where Patches sits. The pins are to the left and right of Patches. The other two are at the back of the robot. To latch these you will need to reach in through the back hatch/trunk.
3. Connect the 37 pin connector that is a round connector and wire bundle running from the upper robot to the lower robot. When connecting this rotate it until it sits down into its mate connection and turn the ring until it is secure.



#### **CAUTION**

**If the upper robot is not properly latched before transport, it could come off while moving the robot with the transport cart or in a vehicle, causing damage to the upper robot.**

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

1. **Always remove the robot battery** from Pumper before working with or removing the main electronics box. This is important because the electronics in the box will be damaged if it contacts a post of the robot battery.
2. There are 4 nuts to remove at the base of the main box bracket. Two are at the front and two at the back. 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 green long antenna wire.

3. The box can now be removed. When removing, do it slowly, making sure that all wires are disconnected.

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. Remove the robot battery from Pumper before removing the drive base.
2. On some models, the main electronics box and bracket have to be removed first.
3. Disconnect the drive motor wires at the in line connection. These wires are blue and yellow wires going to each drive motor.
4. Rotate the handles of the Link Lock Latches in the drive base counter-clockwise. This will release the latch from the slot of the mounting plate.
5. 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 four aligning threads with their holes and lower the robot onto them.
3. Turn the handle of the Link Lock Latch clockwise and make sure that it pulls down into the slot of the mounting plate.
4. Keep turning the handle until it is turned as far clockwise as possible and then lay down the handle. This locks the mechanism.

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)

## FUR CARE

General maintenance of your robot should include caring for the robot's fur. After each use, clean and brush the robot's fur and clothing so the oils and dirt do not become permanent. This may be done with a cloth or brush. Keep the robot covered when not in use to keep dust and dirt off and to protect the fur and clothing. A good idea is to have two people operate the robot. One to operate it and the second to help people interface with the robot. This person can protect the robot from sticky fingers, dirty shoes, ball point pens, etc. This person can pass out stickers, flyers, and help give your safety presentation. The following is a list of specific ways to care for the fur:

1. Brush the fur regularly with a soft brush, or white terry cloth towel to avoid matting over time. This will help to keep it clean and looking fresh and new. Be careful to be gentle, excess friction may cause excess wear.
2. For regular cleaning maintenance use a damp soft cloth and warm water. A drop or two of mild liquid detergent in the warm water before applying it with a damp cloth should remove most skin oils and other dirt buildup. **Do not get the robot wet!** Brushing the fur gently with a damp cloth should remove most dirt buildup. Then rub gently with a soft dry towel and brush the fur dry.

## **PAINTING OF THE ROBOT BODY**

The following information are 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 400 grit sandpaper. Clean with alcohol again before painting.

### **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. 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. This method may not allow you to touch up the paint as easily but your painter could do the touch up when necessary.

### ***Brand- Sikkens***

Priming and Painting: You could use a Scotch-Brite pad 7448 or one recommended by the paint store to remove dust particle and lightly sand after primer coat and/or between coats of paint.

Primer: Plastoflex primer by Sikkens

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

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

Primer: Flexible Primer Surfacer. One brand that could be used is mar-hyde (Talsol Corporation).

Paint: Acrylic Enamel. A brand that could be used for the paint is Dupont Centari.

The information listed here are suggestions and general information. For detailed information refer to the store that you purchase it from. 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.  Remove robot battery and charge fully as per instructions in battery section. **(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 operators 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 effecting 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.	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.



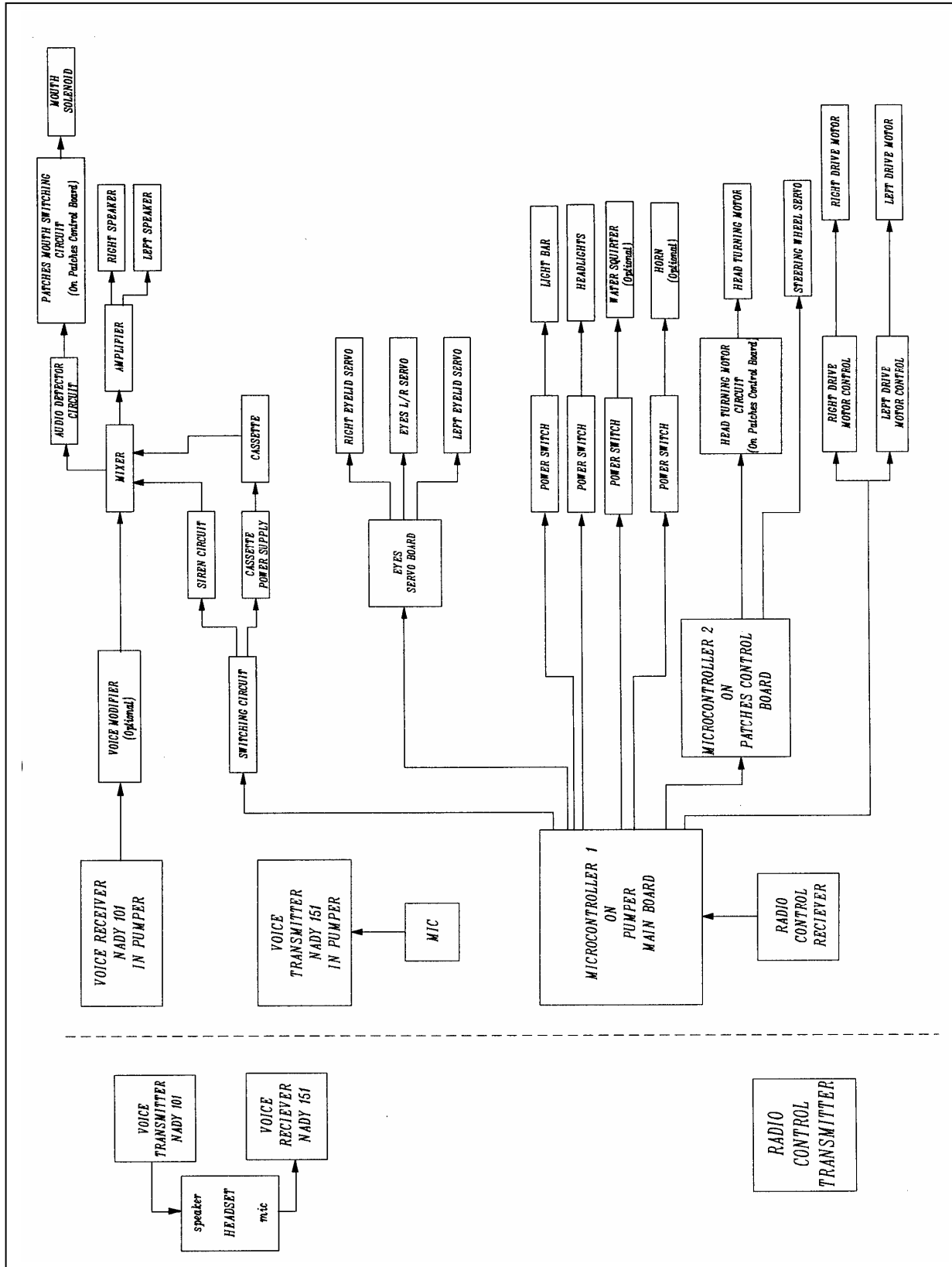
More detailed troubleshooting by system is included with each subsystem. For additional help or parts call our service dept. at 801-489-4466.

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.
	Straight drive adjustment needs to be adjusted.	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.	Loose head set screw or head was hit.	Re-position head and tighten set screw. Better to do this with the robot on.
	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.
Head motor is not operating	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.
Cannot squirt: pump sound yes	Broken wire at pump or W.S. switch.	Repair/re-solder broken wire.
	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.
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.

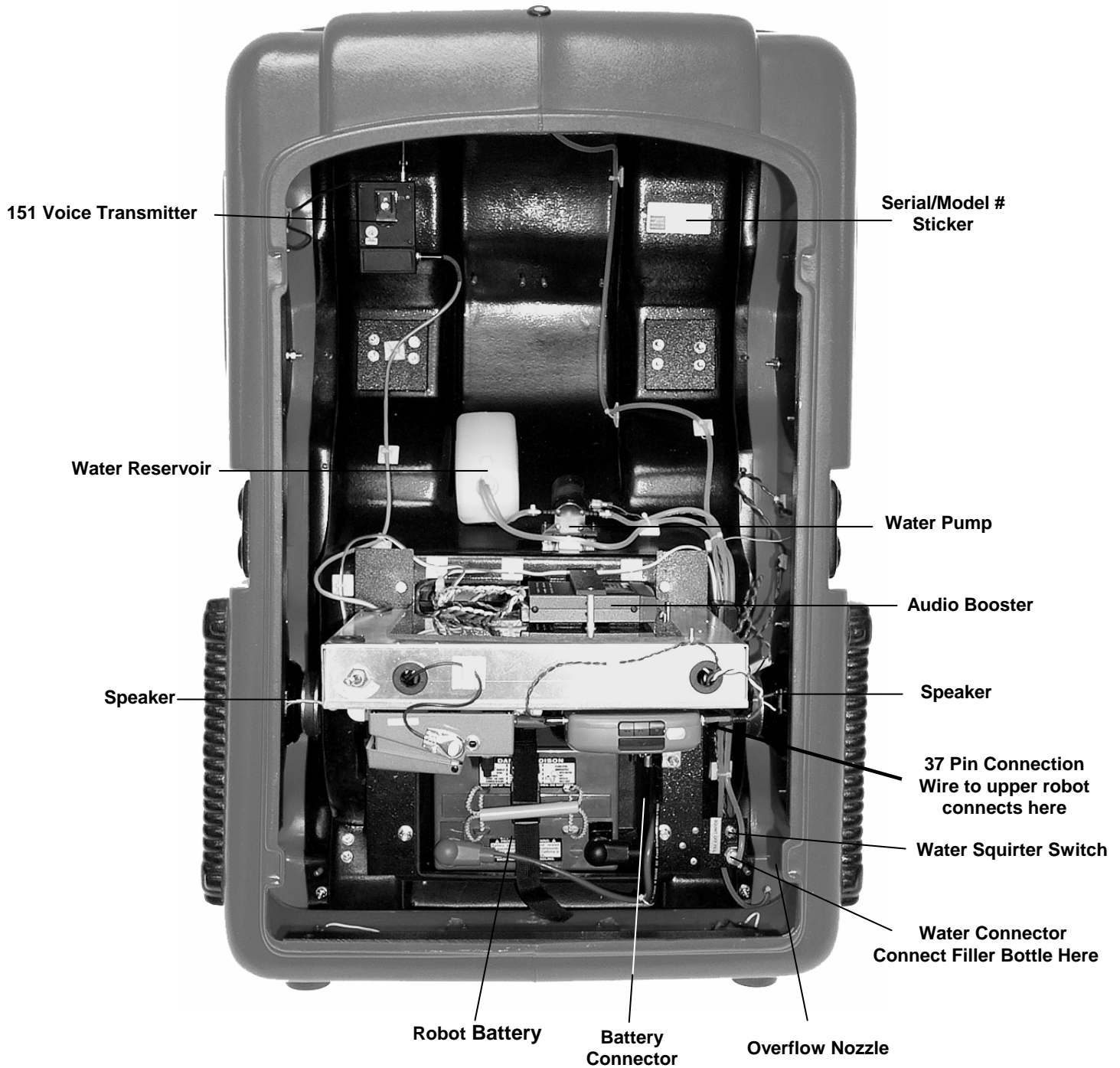
# Robot Functional Block Diagram



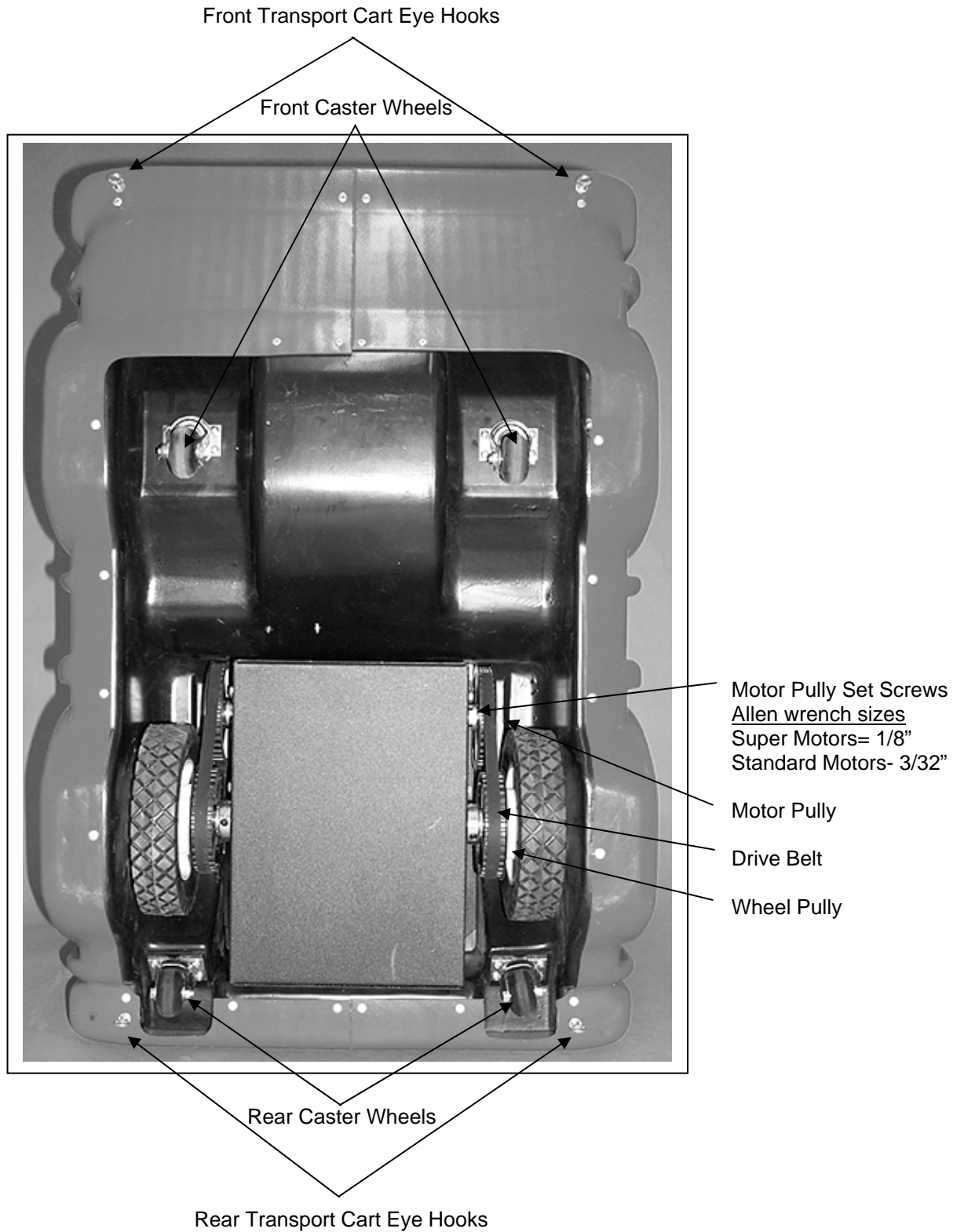
## **APPENDIX B**

# **ROBOT PARTS IDENTIFICATION**

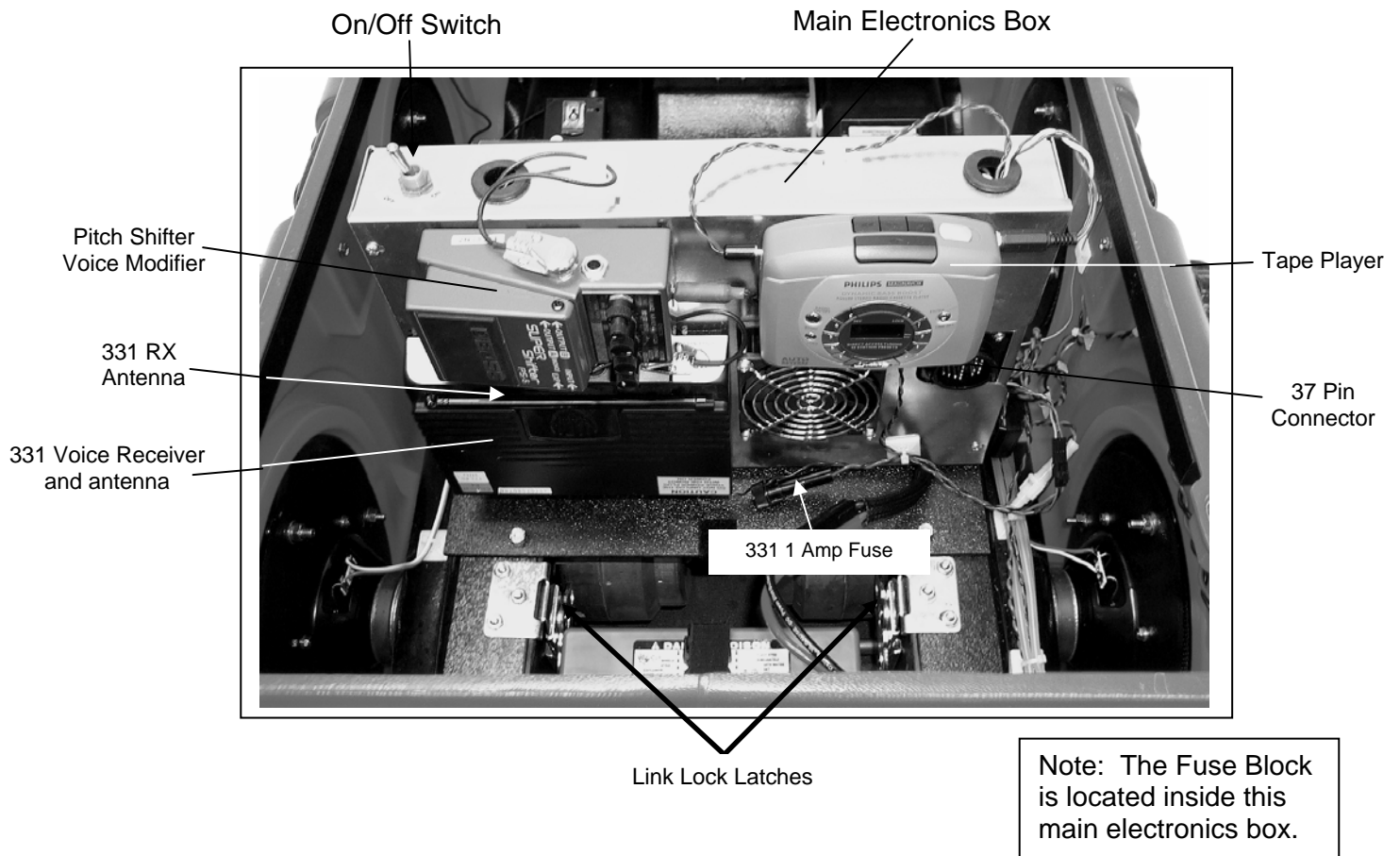
# Lower Robot - Top View



# Lower Robot - Bottom View



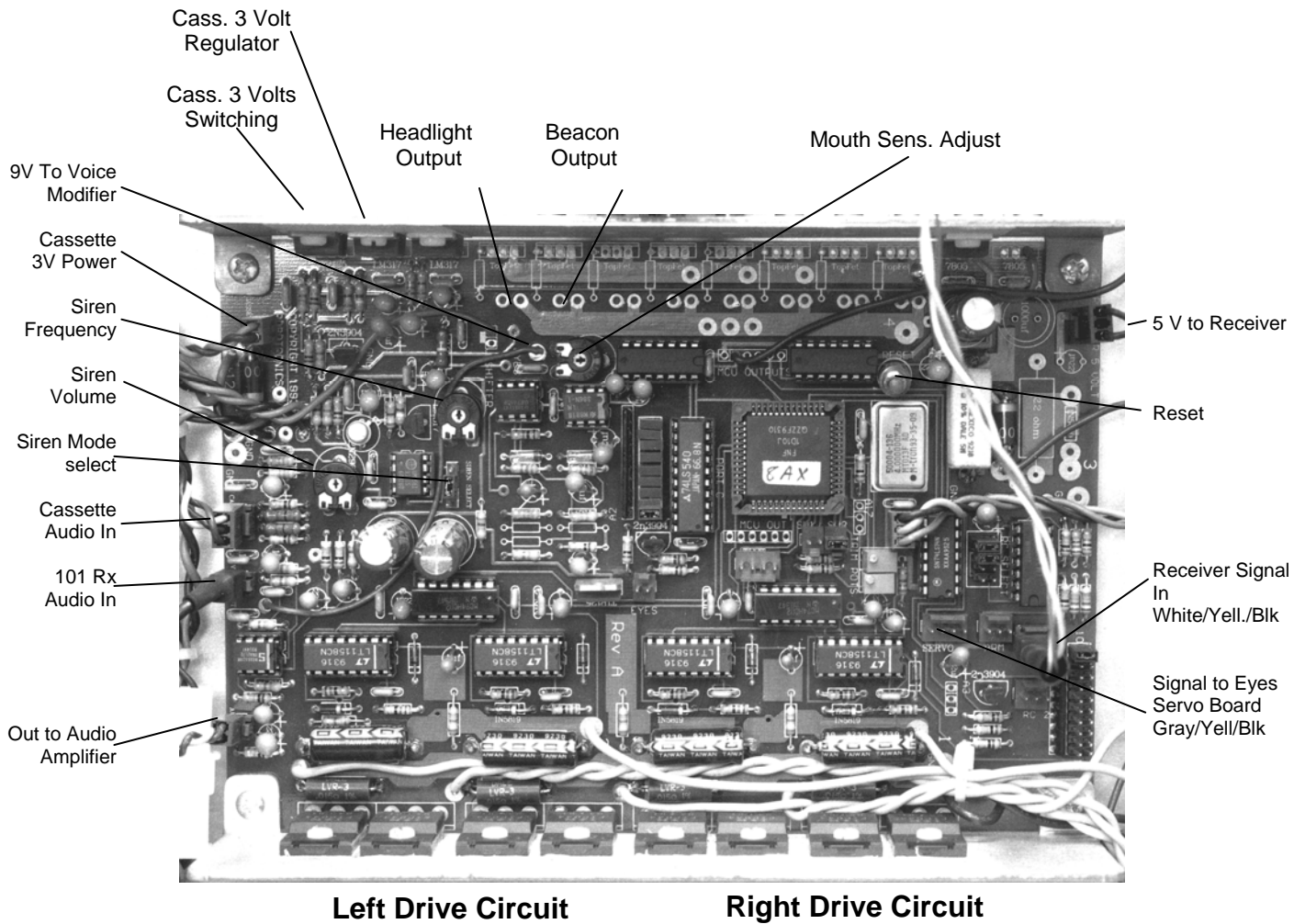
# Main Electronics Box



**Tip:** For best reception of the voice speaking, make sure the Nady 331 Receiver antenna is fully extended.

**Important:** Make sure that the robot battery strap is tight to secure the battery.

# Pumper Main Electronics Board



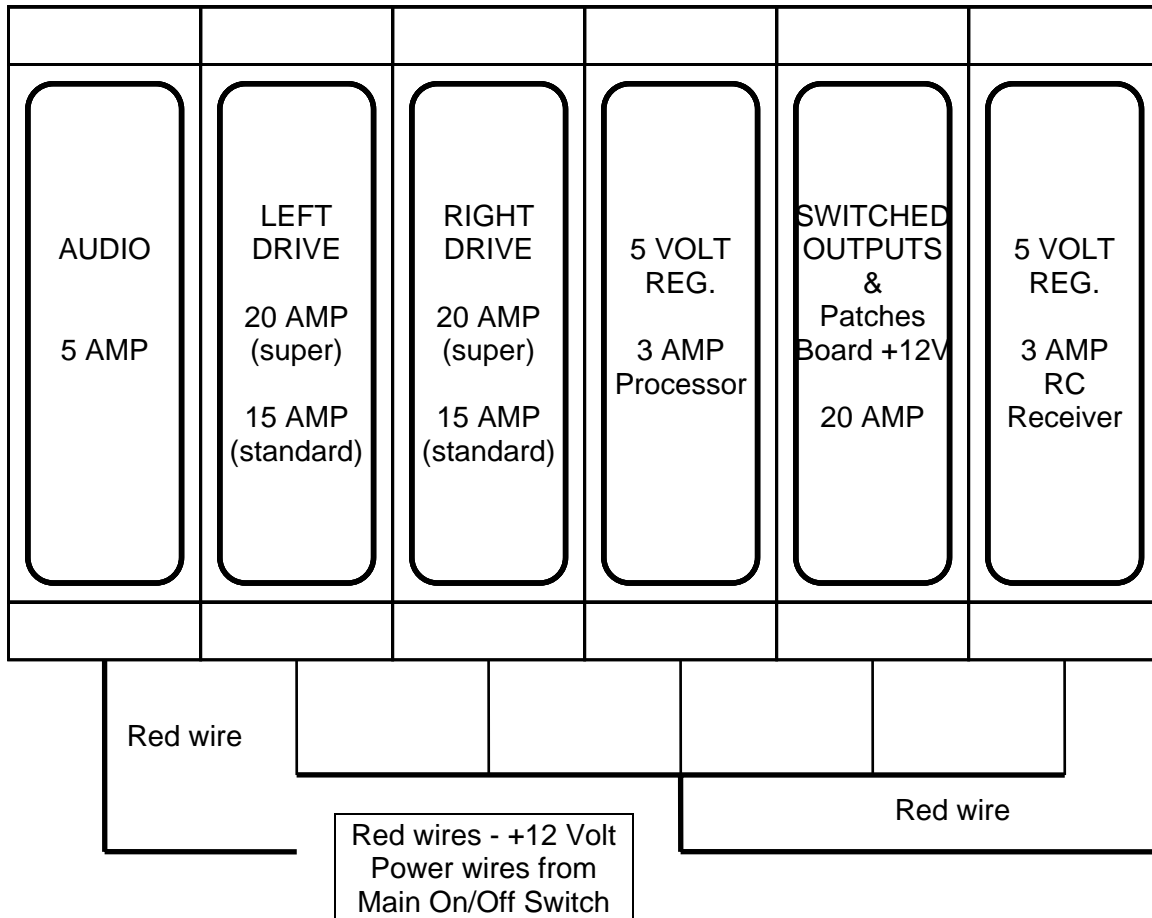
Patches- Head movement, tape player, siren, eyes operation, voice system, and mouth circuit.



# Pumper Fuse Block Detail

All Fuses are AGC type fuses.

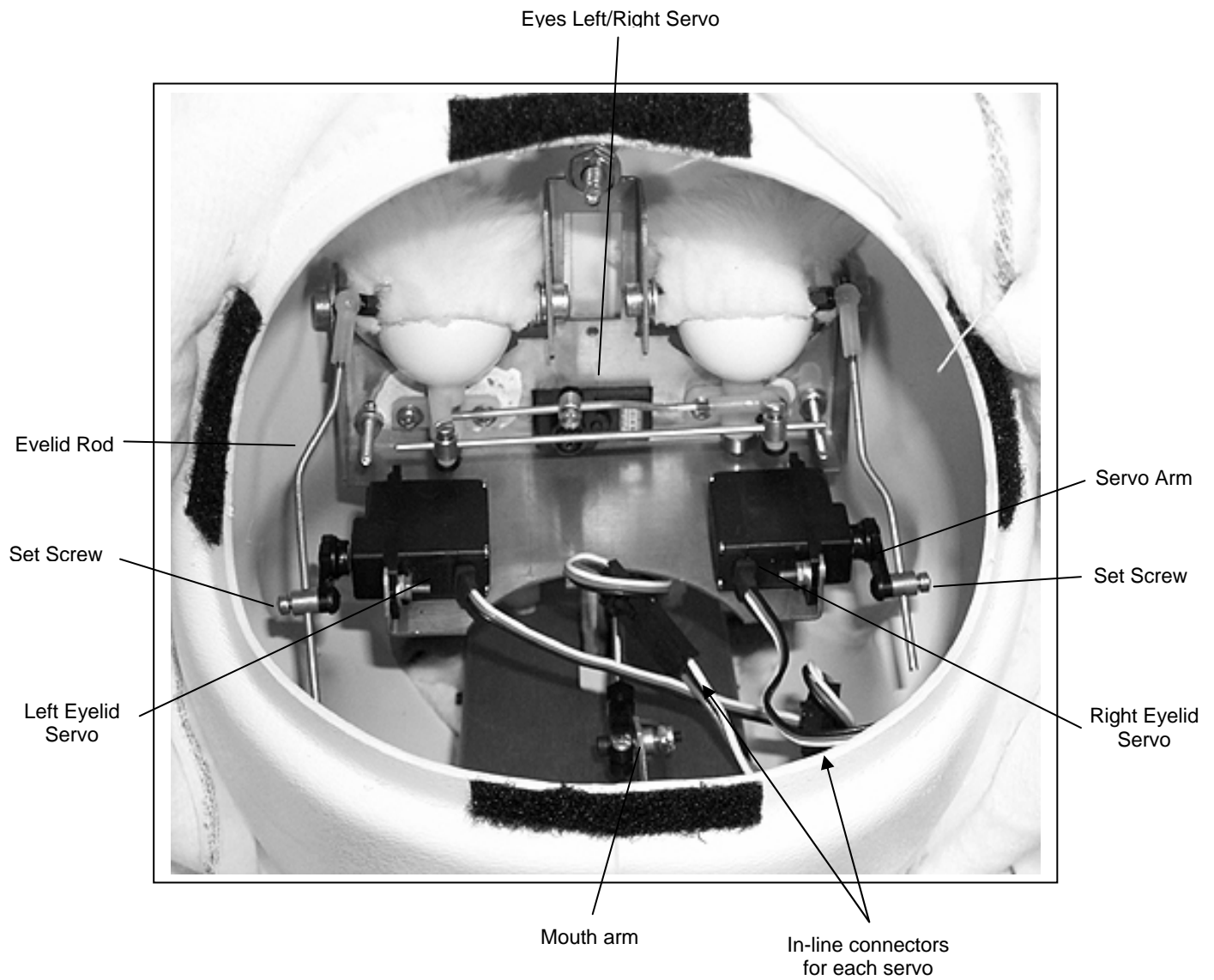
0 brown wire    1 blue wire    2 blue wire    3 white wire    4 yellow wire    5 purple wire



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

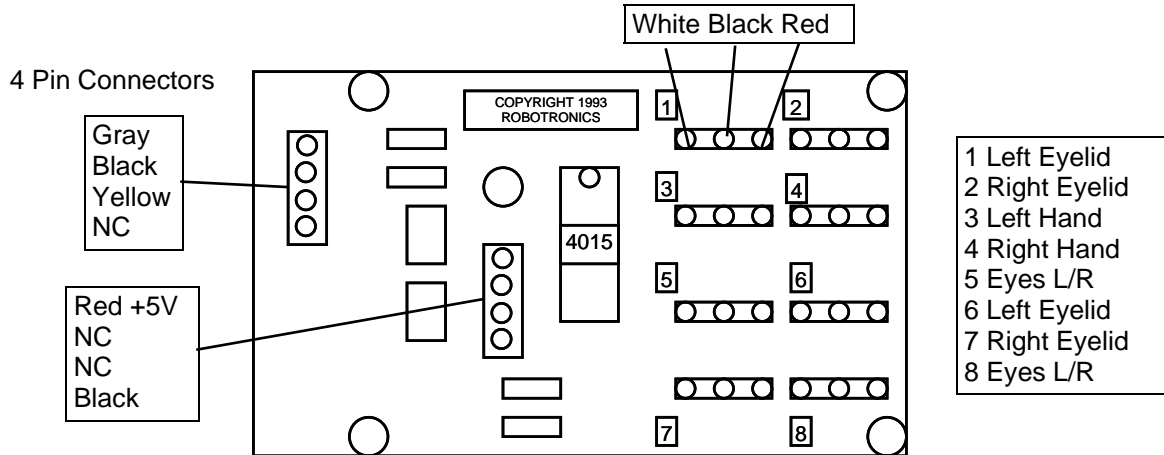
Switching - (Fuse 4) Cassette player, siren, headlights, beacon, and water squirter. This applies to the switching on and off of these functions. Power to Patches control board which includes head turning, mouth, steering servo, and eyes servos(eyes servo board).

# Patches Head - Inside View

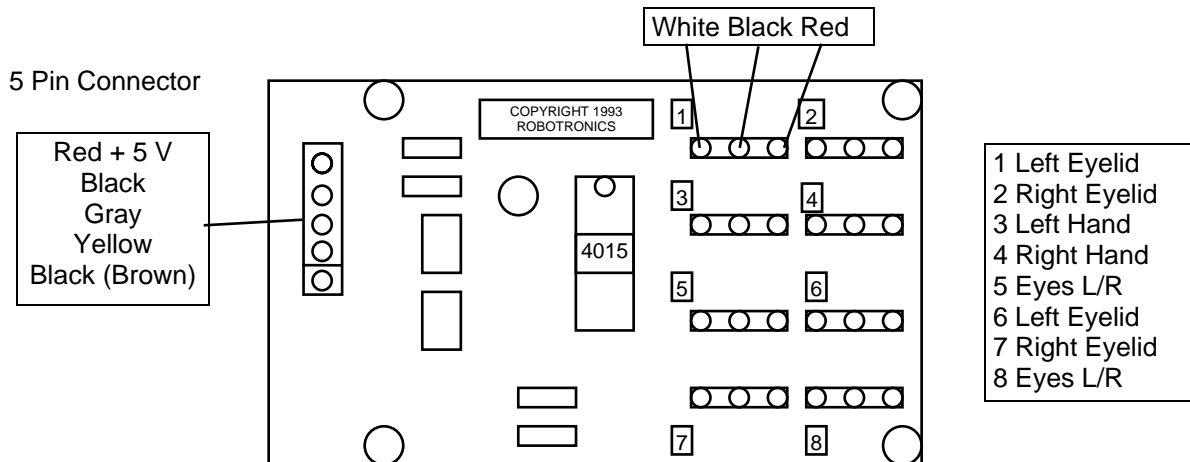


# Eyes Servo Board (Opto-Shift Register Board)

## Version With Two 4 Pin Connections

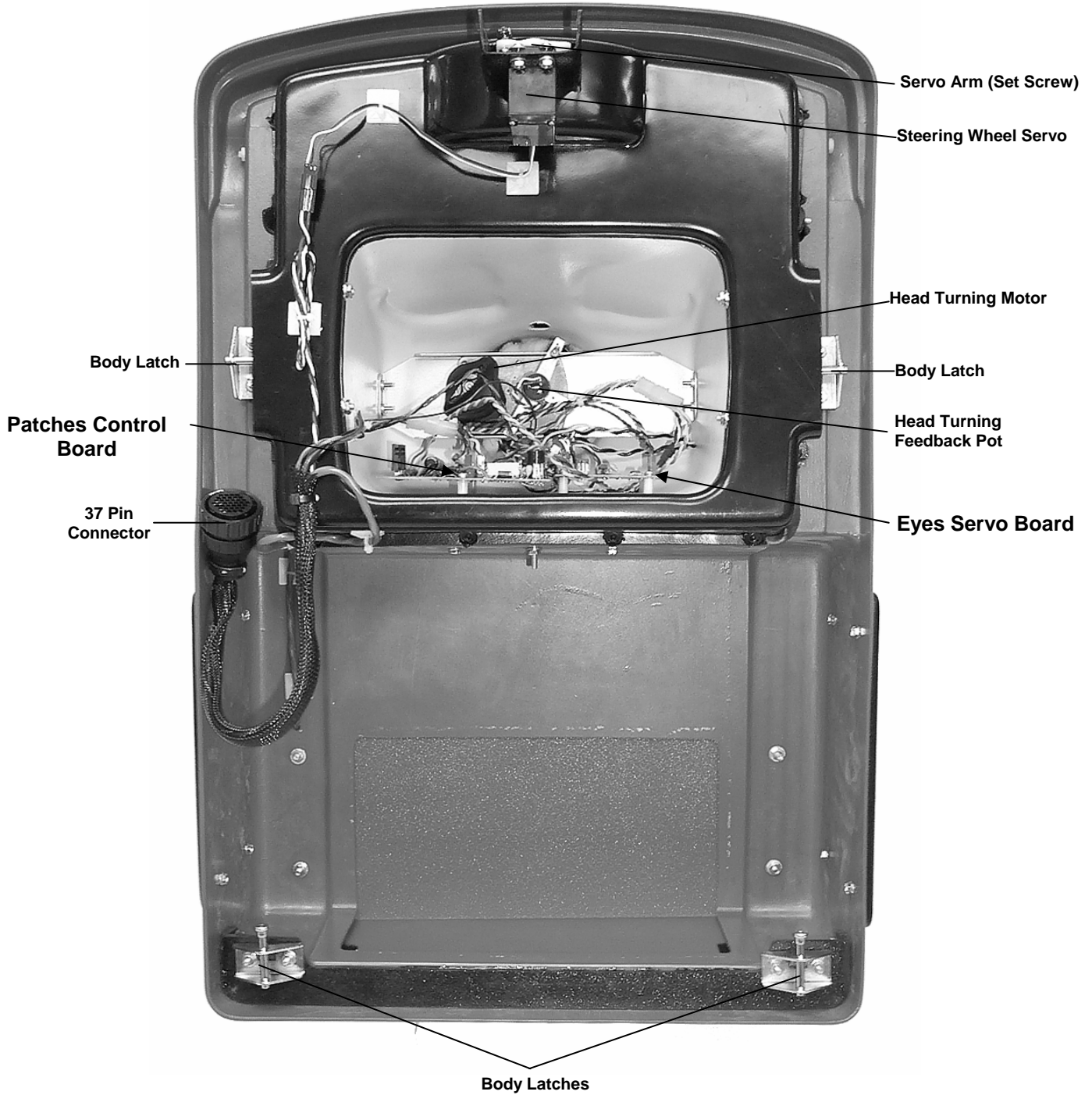


## Version With One 5 Pin Connection



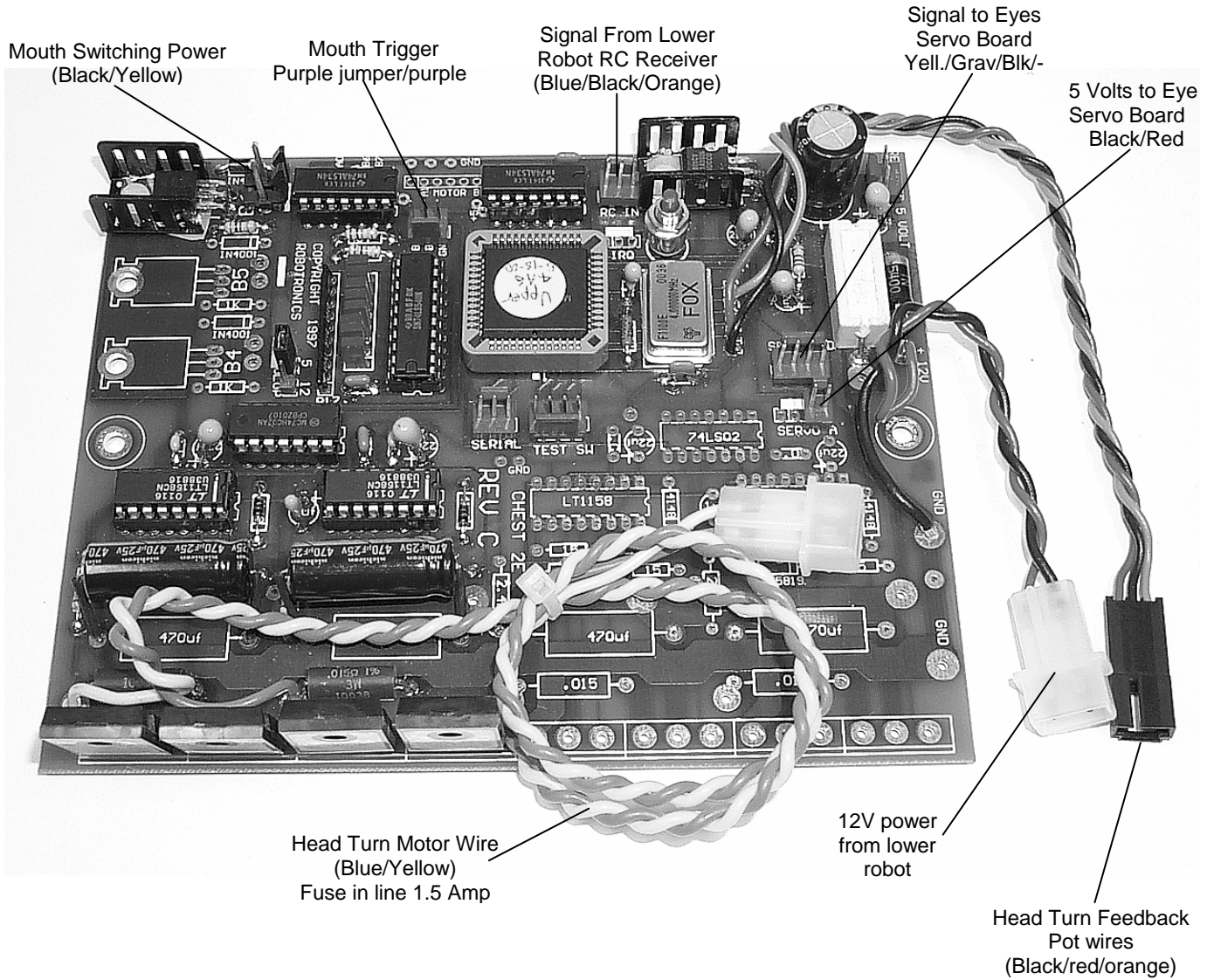
Robot	Typical Connection	Location of Board in Robot
Patches Robot	6,7, and 8	In Patches

# Upper Robot Bottom View



See Patches Control Board Diagram for detail of connections on the Patches board.

# Character Control Board



# Notes

# Technical Tips