

Robotronics®

The Leader In Safety Education Products

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Stand-up Robot Operating Manual

Version 6.3

Stand-up Operating Manual

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

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

Sincerely,

ROBOTRONICS, Inc.



ROBOTRONICS INC.
Springville, Utah 84663
www.Robotronics.com
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Contents

Warranty Information	1
PART 1 General Operating Instructions	3
Chapter 1 Getting Started	3
Operating Hints	3
Setup and How To Operate The Robot.....	4
Transporting The Robot	6
PART 2 Subsystems of the Robot	7
Audio System	7
Chapter 2 Radio Control System	8
Radio Control Operating Instructions	8
Radio Control Transmitter (Diagram)	9
Radio Control Transmitter Controls.....	10
NI-MH R.C. Transmitter Battery	11
Charging of the NI-MH R.C. Transmitter Battery (Diagram).....	11
Adapter for Charging and 110 V Power Supply	12
Chapter 3 Voice System Overview	13
Location of Voice Units	13
Belt Transmitter	14
Robot Receiver	15
151 System (Robot TX and Belt 151 Receiver)	16
Voice System Troubleshooting	17
Mouth Operation.....	19
Operator’s Voice Headset, Transmitter, and Receiver.....	20
Chapter 4 Cassette Tape and Radio System	21
Cassette Tape and Radio (Diagram)	22
Chapter 5 Siren	24
Chapter 6 Robot Battery Systems	25
Robot Battery	25
Robot Battery Charger	26
Chapter 7 Drive Motor System	28
Chapter 8 Head and Arms Motor System	30
Chapter 9 Eyelids and Eyes Left and Right	33
Chapter 10 Optional Accessories	

Pitch Shifter (Voice Modifier).....	34
PART 3 Assembly & Disassembly.....	36
PART 4 Maintenance.....	38
Chapter 11 Maintenance	38
Regular Maintenance Checklist	38
Recommended Tool Kit.....	39
Care of Character Fur	40
Painting of the Body	41
Repair of the Body	42
Storage.....	43

Appendixes

Appendix A.....	44
QUICK REFERENCE TROUBLESHOOTING	45
Robot Circuit Block Diagram	48
Appendix B Robot Parts Identification	49
Upper Robot Bottom View.....	50
Upper to Lower Body Latching.....	51
Lower Robot Inside View	52
Electronics Main Box-Inside View	53
Main Electronics Box Only	54
Robot Main Electronics	55
Main Board Led Functions	56
Fuse Block Detail	57
Upper Body Front View	58
Head Tip and Turn Mechanics	59
Head and Arm Electronics	60
Upper Chest Board	61
Freckles & McGruff Head Inside View (with servo mouth).....	62
Freckles & McGruff Head Inside View (with DC motor mouth.....	63
Safety Sam Head Inside View.....	64
Eyes and Mouth Servo Board	65
Drive Base Bottom View	66
Notes Section*	67
Technical Tips Section*	68

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

Limited Warranty

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

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

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

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

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

If You Have A Problem

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

Important: Have the robot serial number and model number ready. This will help our technician identify the model of robot you have. The serial and model number sticker is located on the robot frame on the right side. In the Appendix, the Lower Robot - Top View shows the location of the serial number sticker.

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

Contact your customs agency on how to document the shipment correctly to avoid unnecessary customs charges.

After The Warranty Repair and Help

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

Service Department phone number: 801-489-4466.

Part 1 General Operating Instructions

CHAPTER 1 Getting Started

OPERATING HINTS

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



- **The operator must have the radio control in their hands when the robot is on. If you need to set the radio control down, turn the robot off first.**



- **Always have a trained person (escort) near the robot for safety purposes**, 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.



- **When using the robot on a stage, the area just in front of the stage should be clear of children for at least 10 feet.**

- Keep the robot indoors with the cover on when not in use. This will keep the robot clean and the color at its best. Direct sunlight/UV light can fade the plastic over time.
- Operate the robot with charged batteries in the transmitter and robot.
- Never operate the robot out of line-of-sight.
- Make sure trims (sliders) on the RC are centered prior to turning on the RC and 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. 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.
- If there are other radio controlled robots at the same event, confirm that they are not on the same frequencies. See the diagrams showing your RC and wireless voices to locate these frequencies.
- When attempting to operate the robot for the first time, do so in a large flat area without obstacles. The operation of the controls should be done in a smooth, fluid manner. Avoid jerking starts and stops or overreacting to the controls. When first practicing movement, it is sometimes helpful to follow behind the robot, as robot movement will match stick movement. (Controls respond opposite when the robot is facing the operator.)

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

SETUP AND HOW TO OPERATE THE ROBOT

Step # 1

Read and study this manual completely before operating the robot.

Step # 2 Charge the batteries

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

Location of the robot battery

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

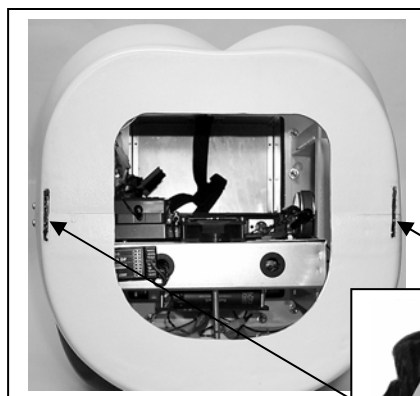


CAUTION

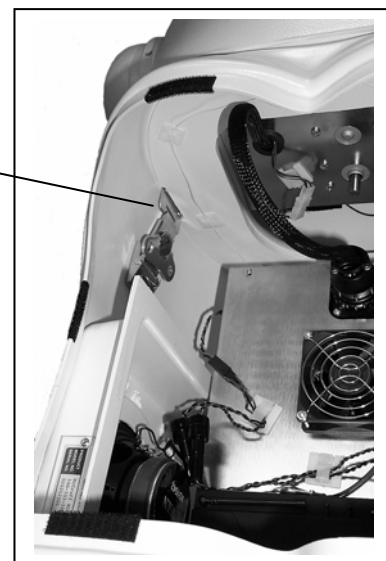
The robot battery posts should never contact the metal of the main electronics box or the metal of the drive base. This will result in damage to electronic components especially inside the main electronics box.

Step # 3 Attaching the upper robot to the lower

Install the upper body on the lower robot. Remove the rear hatch and locate the upper to lower body-latching mechanism (see the diagram in the Appendix). Swivel the Link Lock Latch up until it sets into the slot of the mounting plate. Turn the rotating handle making sure that the Link Latch is securely catching in the slot of the mounting plate. Keep turning the rotating handle clockwise until it stops, then fold down the handle, locking the mechanism in place. Try to move the upper body to make sure that it is secure. Plug in the round 37-pin waist connector by turning the outer ring clockwise until you feel it sit down into the socket; and then twist until it is tight.



Link Lock Latch
In slot and secured

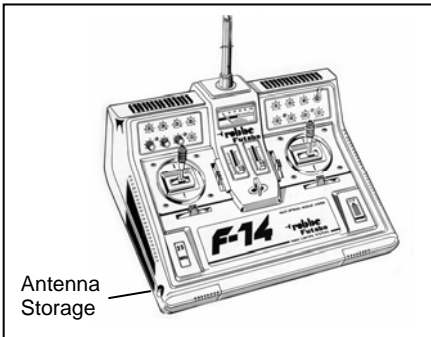


**CAUTION**

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 securing the link lock latches. Failure to do this could cause damage to the upper robot if it fell off.

Step # 4 Put on the clothing or uniform

When putting on the pants, there is a dowel in the front of pants that needs to be pushed in the slot in the plastic. When putting on the sleeves, you may need to rotate the arms back slightly.

**Step # 4 Powering up**

The **radio control transmitter** will be referred to as “RC” in this manual. Locate the RC antenna on the lower left side of the RC itself. This is where the antenna is stored. Remove it and screw it on the top of the RC unit. Turn the RC "ON" first and then turn the robot "ON". Check that the RC battery level meter reads to the right. The "ON/OFF" switch for the robot is located on the lower right leg in a hole in the plastic. Push the switch up to turn the robot on.

Step # 5 Set the Volumes

The tape player volume can be changed on the tape player itself located on the back of the robot. The volume for the voice is on the back of the voice receiver also accessible through the rear door. On some models it is also found on the operator's wireless transmitter. The hearing volume is on the 151 wireless receiver. There is an amplifier (Road Rage) on the main panel inside the back. This level adjustment acts as a master volume. The filter switch should be off.

Step # 6 Test all the functions

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

Step # 7 Optional Accessories Setup

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

Step # 8 Powering Down

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

Step # 9 Charge the batteries again

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

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

TRANSPORTING THE ROBOT

Before transporting the robot, remove the robot battery from the robot. This is especially important if the robot is going to be laid down. 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. Remember the two Link Lock Latches that must be latched to secure the upper robot to the lower robot

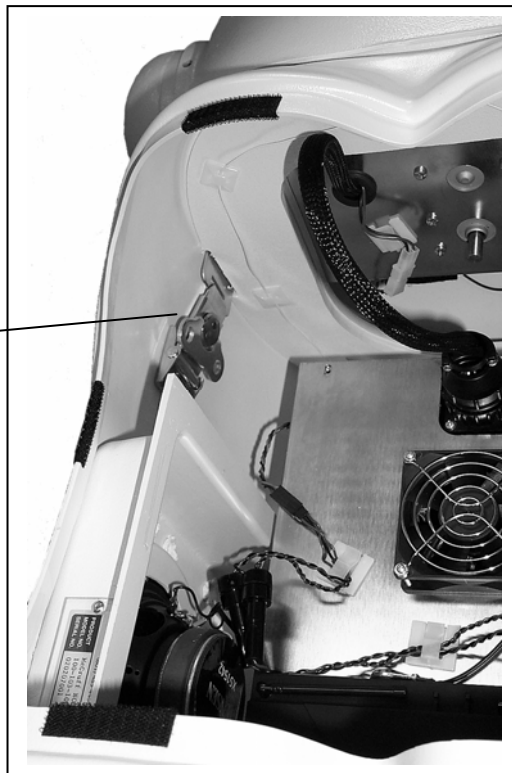
To strap the robot on the cart, roll the robot on to the cart with the back first. The wheels will drop in to the recesses. Put the bunji cord tight around the robot. If you have a robot cover, put this on before the cord.



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.

Both left and right Link Lock Latches must be secure before transporting the robot on the cart.



Part 2 Subsystems of the Robot

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

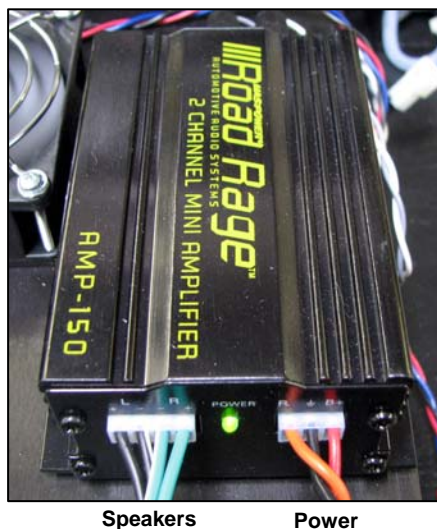
1. Radio Control System
2. Audio and Voice System
3. Cassette Tape Player
4. Siren
5. Robot Battery Systems
6. Drive Motors
7. Head & Arms Motor System
8. Eyelids and Eyes Left and Right

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

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

Audio System

The audio amplifier boosts the all audio from the main circuit board and drives the speakers. The level adjustment adjusts the volume for any audio projected from the speakers. There are individual volumes for the voice, tape player, and siren. It is located on the main electronics box. Keep the Filter switch in the off position.



CHAPTER 2 Radio Control System

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

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

RADIO CONTROL OPERATING INSTRUCTIONS

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

The right hand joystick controls movement of the robot's drive wheels. Pushing the stick forward will cause the robot to move forward. Pulling the stick back will cause the robot to move backward. Moving the stick to the right or left will cause the robot to turn to the right or left respectively. Movement is fully proportional so any variation or combination of movement is possible. The horizontal and vertical trim tabs to the left and below the joystick are for centering and should be adjusted periodically.

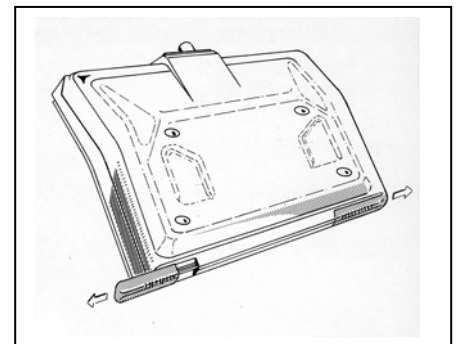
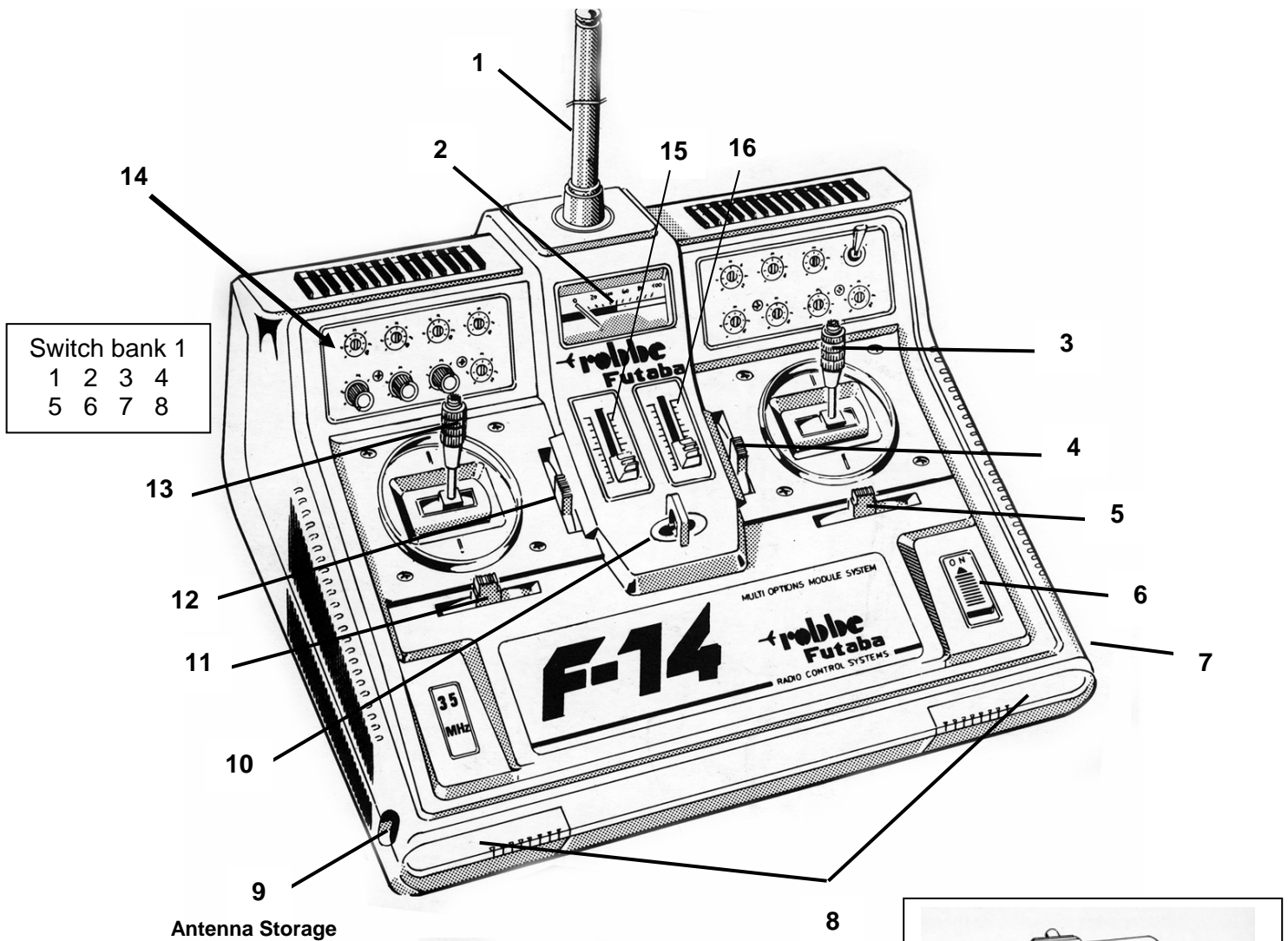
Control of the left and right eyelids is on Switch bank 1, switches #6 and #7 (See the radio control diagram) found on the upper left hand of the Radio Control Transmitter. Pushing it closes the eyelids. The eyelids can be operated together with switch #8. Pushing this switch closes the eyelids for blinking of the eyelids. The eyes left and right move when you turn the head. The eyes will look in the direction that you are turning, adding animation to the robot.

The left joystick left and right moves Character' head. The slider control below the stick should be left in the center so that the head stays in the center. Forward and back movement of the joystick tips the head up and down. By moving the stick all around you get fully proportional movement.

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

A charge plug is provided on the transmitter for recharging its internal battery (#7 on the diagram). The transmitter power switch must be in the off position before charging the batteries. A charge light on the charger will come on while charging.

RADIO CONTROL TRANSMITTER (Robbe-Futaba F-14)



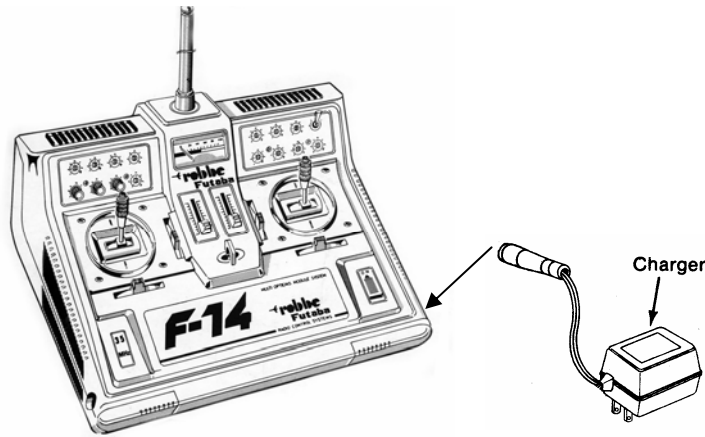
To remove back cover,
slide the tabs as shown.

RC TRANSMITTER CONTROLS

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 charge light will come on, on the charger.
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 head and eyes on robots with head movement.
12. Forward and reverse trim lever for the left control stick. Normal = Center. Unused.
13. Left Control Stick
Left and right movement - Turning of the head left and right.
Up and Down – Tipping of the head up and down.
- 14. Switch bank 1**
 5. Back- Siren/ Forward- Tape
 6. Back- close left eyelid momentary / Forward- Left Hand
 7. Back- close right eyelid momentary / Forward- Right Hand
 8. Back- Blink
Forward – Voice Modifier on/off
15. Left Arm slider
16. Right Arm slider

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

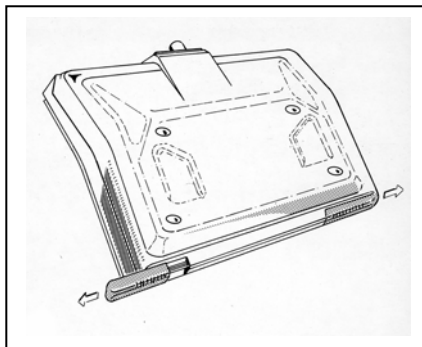
The NI-MH RC transmitter battery will last about 5-6 hours on a full charge. Charge the battery for about **14 hours**. A charge jack is provided on the transmitter for recharging its internal batteries. This round jack is located on the right side of the radio control. (See the radio control diagram) 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.



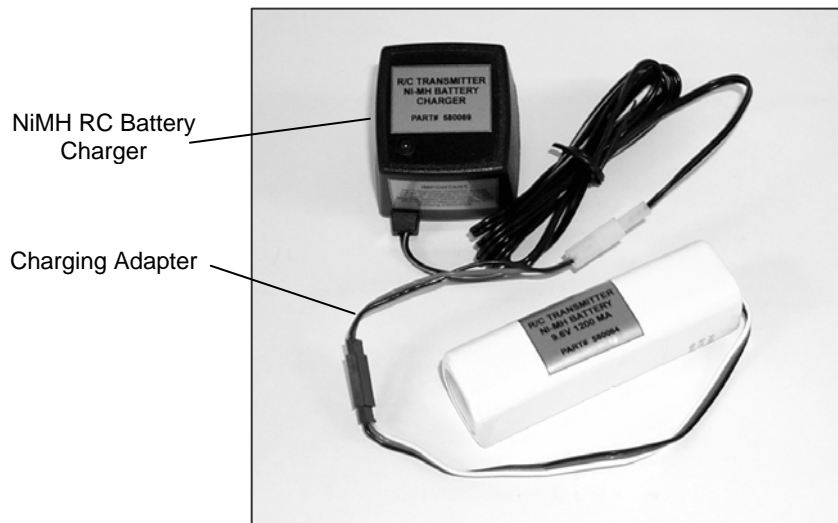
To remove back cover,
slide the tabs as shown.

NI-MH RC Battery and Charger Specifications

NI-MH RC transmitter battery	9.6 Volts	1500mAH
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 need 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. If the barrel adapter is currently on the charger, disconnect it and connect the other adapter. The charging time is still about 14 hours.



CHAPTER 3 Wireless Voice System

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

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

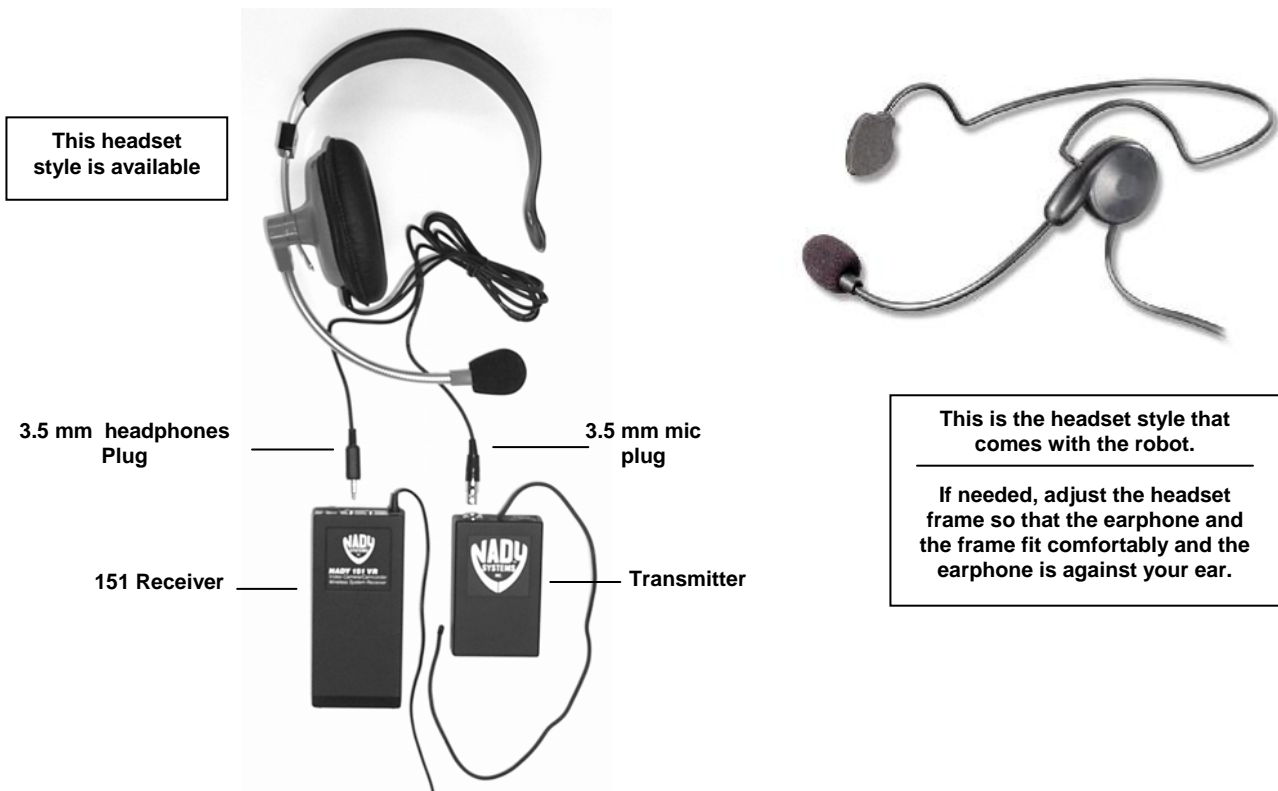
Note: The operator's transmitter and receiver can be worn next to each other. If you want you can use a belt pack. The 151 Receiver antenna can be put in your pocket.

Location of Voice Units

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

Note: For the location of the transmitter and receiver in the robot, see the **robot top view** diagram in the appendix.

Operator's Voice Transmitter, Receiver, and Headset



How to Operate the Operator's Transmitter

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

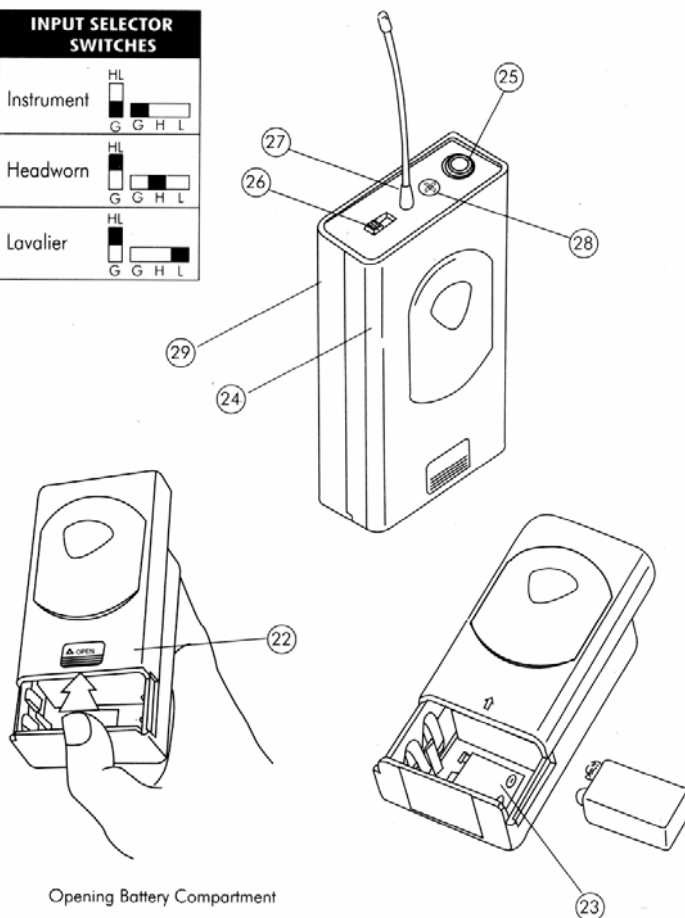
Frequency channel- Located on the back of the transmitter.

Function of the LED

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

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

INPUT SELECTOR SWITCHES	
Instrument	HL G G H L
Headworn	HL G G H L
Lavalier	HL G G H L



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

Frequency is listed on the back.

Opening Battery Compartment

How to Operate the Receiver (in Robot)

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

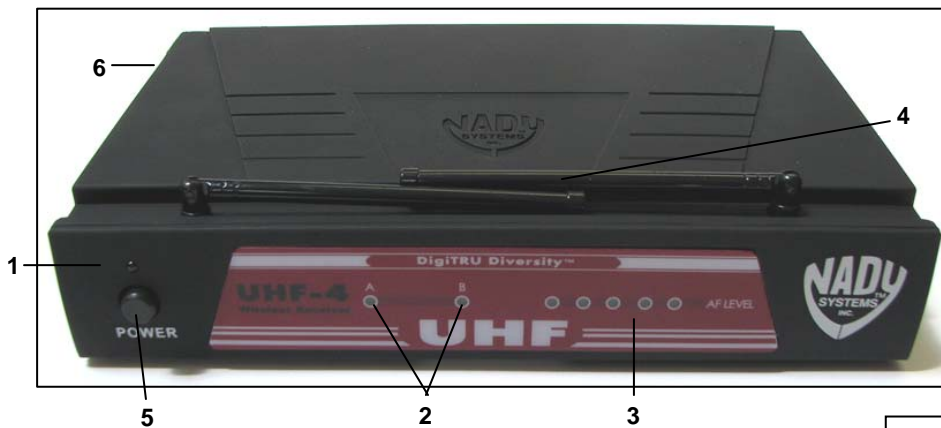
Frequency label- Located on the side of the receiver.

Function of the LEDs

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

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

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



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

How to Operate the 151 Transmitter (in Robot)

Located in the front left of the lower robot. The wire from the hood mic connects to it. 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. Use a 9-Volt alkaline battery and insert it according to the diagram in the battery compartment.
2. Plug the small round connector from the headset into the headphone jack on the top of the 151 receiver.
3. Turn the volume knob clockwise to the desired volume (if volume is too loud you will hear a loud high-pitched feedback noise. Turn the volume down until the feedback is gone.

Frequency label- Located on the back of the receiver.

Function of LEDs

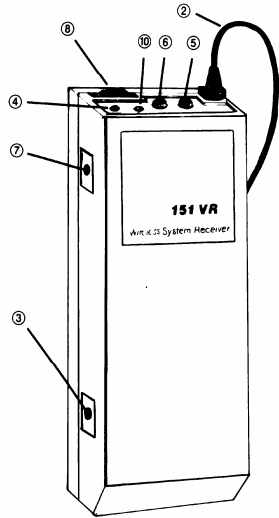
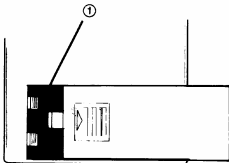
When turning the volume knob on with a fresh alkaline battery, the red light will blink on momentarily and go out. This indicates that it is powering up and that the battery has enough charge on it. As labeled, the light is a low battery indicator. When the light is on constant, this indicates that the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

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



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

Frequency listed on back



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



Warnings

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

Troubleshooting the Voice

For any voice problem, perform the following steps first:

1. Check to see that the batteries are good in the operator's transmitter and in the 151 receiver. Normally when you turn the 151 receiver on, the low battery light should blink on and go off. When turning on the power switch of the transmitter, the light should blink on and go off. If either of these lights stays on constant, the 9-volt battery is too low and must be replaced.
2. Check that the battery is in the correct polarity and confirm that the battery contacts are making a solid connection to the spring clips inside the compartment. Bend them out slightly if necessary. If the battery is making intermittent contact in the Transmitter, try a different brand battery. Certain brand batteries are bigger than others.
3. Check all switch positions both on the operator and robot voice units. This includes the audio and the power switches. See the Voice Unit Diagrams for details about the correct position of these switches.
4. Check all plugs to and from the voices for proper connection.
5. Check the LED lights. When operating normally, the Receiver in the robot has a red TX light on. The UHF10 or UHF4 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>Voice System <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 plugs to and from the voices for proper connection. Some plugs have covers that can be opened. Look for a broken wire. 5. Check if the transmit (TX) lights are coming on.</p>		
Operator cannot talk	1. Low Battery. LED on steady or no LED flash. 2. Battery posts not touching the metal clips in the operator's transmitter. 3. No power to the UHF10 or UHF4 Receiver. If yes, continue. 4. No TX light on the Receiver. If yes, continue. 5. Audio wires going through pitch shifter connected wrong. 6. Headset plug to transmitter broken. 7. Still not working. Call Robotronics.	1. Replace the 9 Volt battery. Is battery inserted in correct polarity? 2. Bend out the metal clips. Put foam under clips. 3. Check the in line fuse to the Receiver in robot and audio fuse on main fuse block. 4. Check Sensitivity adjustment on back of Receiver. It should be on Max. Sens. 5. The wire should go from audio out of receiver to input of pitch shifter, then from output A into the main box and plug on to the main board. 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. Send transmitter, receiver, and headset in.
Operator cannot hear	1. Low Battery. LED on steady or no LED flash. 2. Battery posts not touching the metal clips in the operator's receiver 3. Headset plug to 151 RX has a broken wire. 4. Robot 151 transmitter not turned on. 5. Power plug to robot 151 transmitter unplugged. 6. If you have no TX light on 151 RX mute could be out of adjustment 7. Robot microphone in robot is bad. 8. Still not working. Call Robotronics.	1. Replace the 9 Volt battery. 2. Bend out the metal clips. Put foam under clips. 3. Unscrew cover of plug and look for broken wire. 4. Turn on audio and power. 5. Find wire and plug it back in. 6. Adjust the mute on the 151 RX to max. which is fully CCW. 7. Order a replacement. TEST- Plug your headset into the robot transmitter in place of the robot microphone and test. 8. Send robot mic, transmitter, receiver, and headset.
Voice Operates but cuts out. Should get 50 feet without any cutouts.	1. Low Battery. 2. Sensitivity Adjustment down too far. 3. Broken, loose or retracted antenna	1. Replace the 9 Volt battery. 2. Sensitivity adjustments should be at max. on the 151 Receiver and robot receiver. 3. Extend robot receiver antenna or replace broken antenna.
Squelch coming from robot	1. No signal being sent to the robot 2. Sensitivity is too sensitive.	1. Turn on the operator's transmitter. 2. Very slightly adjust sensitivity down from max. (This will decrease your range)
Squelch in headset when turning robot off.	1. 151 Receiver slightly too sensitive. 2. 151 RX picking up interference in your area.	1. Adjust 151 RX mute slightly CW 2. Always turn off 151 RX and remove headset before you turn off robot.

Moving Mouth

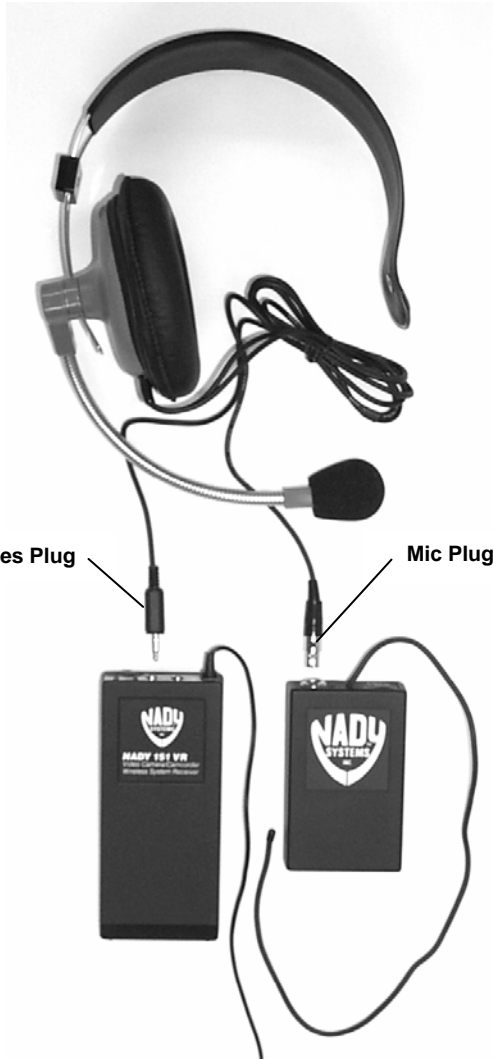
Function- The moving mouth is a feature where the mouth moves as the operator speaks through the robot. The amount of the movement is affected by the level of volume of the voice. This level is affected by the Receiver volume level and the position of the headset microphone to the operator's mouth. The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

Adjustment- The adjustment is preset at the factory and should not need any adjustment. If an adjustment is necessary, see the Main Circuit Board diagram in the Appendix for the location of it. It is labeled 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



Headset style that comes with the robot.

CHAPTER 4 Cassette Tape System

The cassette tape system is located on the robot's upper back in a recessed area. The system is activated by remote control from the remote control box. (Additional instructions are on the next page.)

How to Play A Cassette Tape

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

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

Troubleshooting - Cassette Player

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.

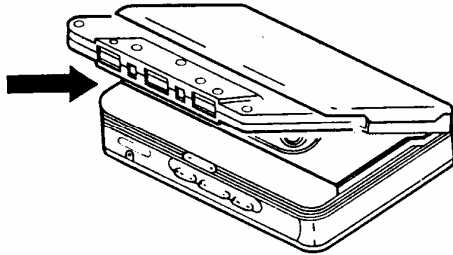
Sound Quality is poor:

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

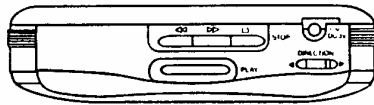
The MRX-225 can play any pre-recorded cassette tape (mono or stereo). Simply insert the cassette as shown below. Then, proceed to "Playing a Tape" in this manual.



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.

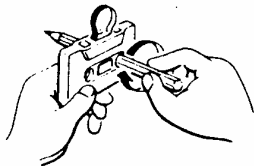
FAST FORWARD/REWIND

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.

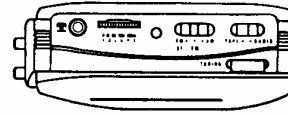
Tighten Tape Slack—Before loading a cassette, take up any slack in the tape by turning the tab hub with a six-sided pencil. Avoid touching the tape.



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**.

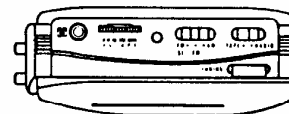
TAPE TIPS

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.

RADIO OPERATION

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



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

Graphic Equalizer



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

Radio Reception Hints

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

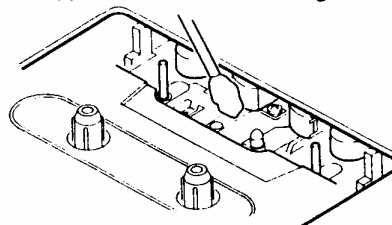
Warning: Do not use benzene, thinners, or other solvents to clean the cabinet, since they may warp or deform the plastic.

Be Careful of High Temperatures!

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

CARE AND MAINTENANCE

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



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

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

SPECIFICATIONS

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

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

CHAPTER 5 Siren

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

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

Troubleshooting – Siren

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

CHAPTER 6 Robot Battery System

ROBOT BATTERY

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

How to Recharge

1. To recharge the robot battery, first open the trunk or rear door and unplug the battery from the main component board. You could also remove the battery from the robot.
2. Connect the charger wires to the battery, red to the red (POSITIVE +) post and black to the black (NEGATIVE -) post.
3. Plug the line cord of the charger into a 110-volt AC outlet. Leave the trunk cover off or open during charging for ventilation. Keep the AC power connection as short as possible especially when using an extension cord.
4. The red LED will come on during charging and the green when the battery is charged and ready to use. Both red and green on indicates that you are in the middle stage of charging.

The robot is supplied with an automatic type battery charger. This will recharge the battery full in about 8 hours depending on how long you have operated the robot. It will not overcharge the battery if left "ON" indefinitely. It goes to a float charge mode once the battery is fully charged.

Taking Care of the Robot Battery

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

Caution



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. Remember when connecting wiring the standard is red wire to red (positive) post and black wire to black (negative) post. Use a digital voltmeter, if necessary to verify polarity of the battery at the posts and at the end of the battery connector.

Important

Charge the battery to a full charge right after using the robot. Gel type batteries will be damaged if not kept fully charged at all times. You do not need to discharge them before charging. 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.

ROBOT BATTERY CHARGER

The charger supplied with the robot is designed to both recharge your battery, and extend your battery's life. It produces 12 Volts DC at a full 3 Amps. It will charge the battery in about 8-12 hours depending on how long you have used the robot. After the battery is charged, the green LED will come on and the battery is ready to use. At this point the charger is charging at a FLOAT or maintenance rate. At this rate you can leave the charger connected for extended periods of time.

Robots with recharge jack: Certain robots have a recharge jack on the body for recharging. If your robot does, then the on-off switch will have a recharge position also.

Schumacher 3 Amp Battery Charger

Status Indicating Lights

Amber- Charging

Green- Charged and is now in float charge.

Red- Check battery. The charge clips may be on wrong or the battery may be bad.



Personal Safety Precautions

Warnings

HAZARD OF EXPLOSIVE GAS MIXTURE

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

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

If the Battery is not taking a Charge

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

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

CHAPTER 7 Drive Motor System

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

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

Trouble-Shooting - Drive

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

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

Perform the following depending on the symptoms indicated:

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

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

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

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

down below the electronics box. You may have to remove the robot battery, to make the swap. If now the wheel/motor on the side in question operates and sounds fine then the motor is good.

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

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

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

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

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



CAUTION

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

Forward Drive Adjust Pot - Effects forward straightness of drive.

Robot veering left- Adjust it counter-clockwise

Robot veering right- Adjust it clockwise

Reverse Drive Adjust Pot- Effects reverse straightness of drive.

Robot veering left- Adjust it counter-clockwise

Robot veering right- Adjust it clockwise

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

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

CHAPTER 8 Head and Arms Motor System

The head and arms motor system consists of five motors and five servos, which control the head, arms, eyes and hands movement.

Three motors and three servos control the head. One motor is used to control movement of the head turning left and right. One motor is used to tip the head forward and back. One motor is used to operate the mouth by receiving a signal from the audio detector, which is activated when the operator speaks through the voice system. Two servos are used to operate the left and right eyelids. One servo is used to control the eyes turning left and right. Two motors are used to operate the arms and two servos are used to operate the hands.

Note: If the arms are forced to rotate by pulling on them or by bumping into something, the shoulder mechanism will slip to prevent damage to the motor assembly or the arm itself. The arm should not be rotated all the way around 360 degrees. This may damage the wiring going to the hand. This slip mechanism is designed to be slipped back into place. To realign the arm move the slide control on the radio control to the down position. Pull outward on the shoulder slightly and move the arm the opposite way it was forced, to slip it back to the normal position. You will feel it lock back into place. If you cannot get the arms to line up very well when in the set lock positions, the arm rotator cuff may be out of position. Follow the steps for removing the arm in the Disassembly-Assembly section. Use a 5/32" Allen wrench to loosen the set screws and change the position of the cuff which will change the position of the arm.

If the head is forced to tip or turn, it will automatically realign itself while the robot power is on. If the power is off when the head is forced to move out of position, then when the robot is turned on, it will automatically realign itself.

Trouble-shooting

Important: If you need to open the chest box to see the head and arms' electronics, make sure to open and close carefully. Be certain that wires keep their slack to avoid being disconnected.

Head tipping and turning

The head tipping or turning is loose: Tighten the head tipping clamp Allen screw (use a 5/32 " Allen wrench). There are two locations for tightening the head turning. One is a large Allen screw just below the head turning box (use a 1/4 " Allen wrench). The other is a bolt located in a hole on the front lower side of the chest box (use a 7/16 " socket.) See the upper body front view in the Appendix. **Be careful not to over tighten.** The head and chest plastic would need to be removed to access this.

The head tipping or turning do not operate: Do you hear the motor operate when you tip or turn the head with the joystick? Check the tightness as described above. If you do not hear the motor, check if the arms, eyes and hands operate.

- Arms, eyes and hands do operate: Check the motor wires that run from the head motor circuits to the head tip and head turn motors. The chest plastic would need to be removed and the chest metal box opened to get to the circuit boards that are in the chest.

- Arms, eyes and hands do not operate: Is the 37-pin waist connector connected to the lower robot?

If it is, the fuse in the main electronics box could have blown. This is the chest power fuse. To locate it see the Electronics Box - Inside View and the Fuse Block Detail.

If the fuse is not blown, check the **receiver signal in wire** that comes from the main electronics box to the upper robot. To locate this wire and connector see the Head and Arm Electronics Diagram in the Appendix. Check if the receiver signal in wire is connected or if a wire is broken.

The head tipping or turning motor are constantly running and you have no control from the radio control: Check if the head tipping or head turning rod have popped off their ball links. If they have, look for any damage, and put the rod back on the ball link. If the rods look good, check the wiring from the head tipping and turning pot to the head tip and turn motor circuits for a broken or disconnected wire. Also make sure that the head tip and turn pots are tight.

Arm movement

An arm does not operate: Follow the same steps as with the head tipping/turning described above except look at if the head tipping, turning, eyes and hands are working and refer to the arm motor control circuits and wires.

If the other arm operates, check the arm signal wire and connector going to the arm's motor circuit board in the chest box. To locate this wire and connector, go to the Head and Arm Electronics diagram in the Appendix.

Both arms do not operate but all the other upper robot functions operate: Check the power connector on the arms circuit board.

The arm motor is constantly running: Check the arm pot set screw located on the arm motor. This could be loose.

Hands

If the hands do not operate: If you cannot hear the hand servos when hitting the switch on the radio control, the servo wire could have come disconnected. The servo wire is coming out of the chest box under the arm and has an in line connector. If the wires are connected, move the connector around while operating the hand to check for a bad connection.

If you can hear the hand servos, then take the gloves/fur off and check if the hand cable and hand cable set screw are loose. If the screw is loose, put the hand switch on the radio control in the hand closed position and while holding the hand closed, tighten the set screw which holds the cable in position.

Eyelids and Eyes Left and Right

The eyes and eyelids do not operate: If all three functions do not operate, check the 16-pin connector that is inside the head. The back cover of the head must be removed. To locate the eye parts, see the Head Inside View in the Appendix.

If the 16-pin is secure, check the wires to the eye and hand servo board located in the chest box. See the Head and Arm Electronics diagram for the location of this board. If

these wires have come off see the Eyes Servo Board Diagram in the Appendix for proper connection. Also make sure that the signal to eye servo board wire is connected to the Chest Processor 2 Board and that all wires are intact.

An eyelid or the eyes left and right do not operate: If you cannot hear the servo when you activate it from the radio control, check the eye servo connection in the head. Also check the 16 pin round connector. If you can hear the servo, check the eyelid rod set screws.

If the eyelid or eyeballs are out of position, the rod length can be changed.

Mouth

If the mouth does not operate when you talk through the robot: First try moving the headset mic closer to your mouth and talking louder. If the voice is not very loud, make sure the UHF receiver volume is near or at maximum and that the UHF operator's voice transmitter has a good 9 volt battery. Check the mouth servo motor connection in the head, especially the red/black/white wires. Look for broken wires. Make sure the head 16 pin connector is connected well. Check the mouth servo wire connector located in the chest box (see the Head and Arm Electronics diagram in the Appendix). This wire connects to the eyes and mouth servo board.

If you have to talk very loudly and then it works, the mouth sensitivity may need to be adjusted. Refer to the Robot Main Circuit Board diagram located in the Appendix to find this adjustment. You could adjust it a small amount and then try it again. Turning the adjustment clockwise makes the mouth more sensitive in responding to your voice. It is best to mark the original position on the adjustment pot before you adjust it in case the adjustment has no effect, you can put it back to that position.

If the mouth runs constantly: If the mouth runs constantly, the mouth servo could be bad or the mouth sensitivity could be set too high.

CHAPTER 9 Eyelids and Eyes Left and Right

The eyelid and eyes left and right movement is accomplished by three servo motors in the Character head. 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 in the chest box of the upper robot. To see it, the chest plastic would have to be removed and the chest box opened. The wires connected to this board take the signal to the servo itself and operate the shaft of the servo motor to turn clockwise or counter-clockwise for opening or closing. The rotation of the servo motor shaft is coupled to the eyelid and eyeballs with a servo arm and then an eyelid rod.

Troubleshooting - Eyes

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

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

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

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

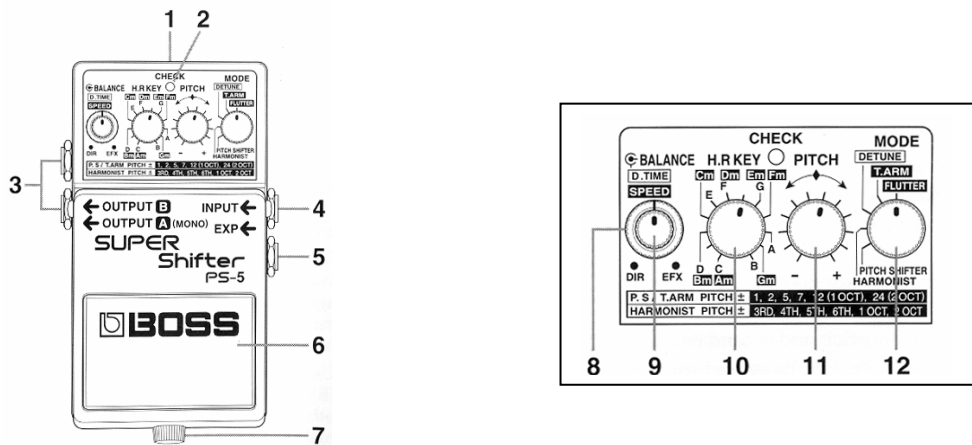
There is no operation of any of the eye functions:

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

CHAPTER 10 OPTIONAL ACCESSORIES

OPTIONAL ACCESSORIES: VOICE MODIFIER (PITCH SHIFTER) INSTRUCTIONS

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



1. Power Jack – 9 Volts center negative
2. Check indicator – Power indicator and show whether an effect is on or off.
3. Output Jacks. Output A is what we us.
4. Input Jack.
5. EXP Jack. No used.
6. Pedal Switch. Turns it on or off.
7. Thumbscrew. To release pedal.
8. D.Time Speed Knob – Delay time. Not used in pitch shifter or harmonist mode.
9. Balance knob – This adjust the output balance between the direct sound and the effect sound. Typically set this on EFX for the full effect.
10. H.R. Key switch. Not used.
11. Pitch Switch. Adjusts the amount of pitch shift.
12. Mode Switch. Selects the mode. Typically use the pitch shifter mode.

You can turn the pitch shifter on and off with the small switch just above the main on/off switch. This can be accessed through the hole in the lower right leg. The pedal on the pitch shifter can also be used to turn it on and off. When the pitch shifter is on, the power light labeled 'check' will be lit. The shifter will take a few seconds to power up. To turn it off, push the pedal again. If the pitch shifter is not turned on, your unmodified voice will come through the Smoke Alarm.

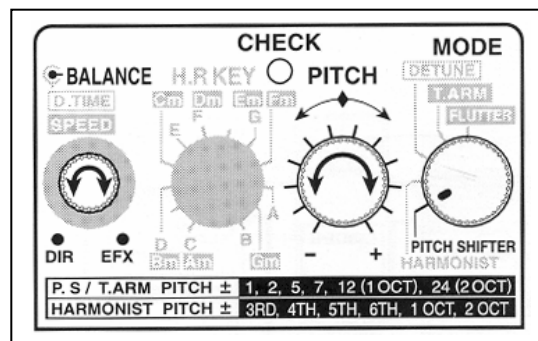
The pitch shifter has two basic effects; a digital pitch shifter and a delay. There are many variations of these two effects. When used as a pitch shifter, you can vary the shift within +/- 2 octaves. Set the mode knob to Pitch shifter and then vary the pitch knob until you get the sound

of voice that you want. You can get a similar effect with the harmonist position but the pitch shifter gives you the best sound. These are the most common modes used because these modes give you the ability to adjust the shift of your voice to exactly what you want whether up or down. About 2:00 on the pitch knob gives you a good voice but this depends on what type of robot you have.

The shifter gets power from the robot battery; no internal battery is needed. If the cover of the main electronics box ever needs to be removed, do not allow the shifter power wire plug, to contact the metal box. The metal box surface has a ground connection. The fuse related to the shifter is the audio fuse located on the fuse block.

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

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



PART 3

CHAPTER 11 Assembly & Disassembly

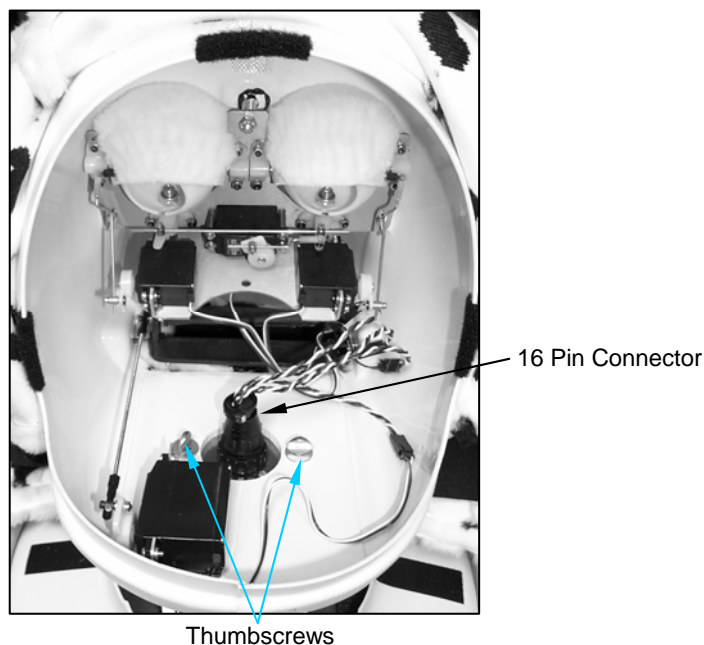
Removing the head from the body:

1. Remove the head cover on the back of the head (underneath the hair on the little man and underneath the fur on McGruff and Dalmatian).
2. Unplug the round 16-pin connector by turning the outer ring counter clockwise until it releases. This connector is located inside the head.
3. Unfasten 2 thumbscrews located inside the head on either side of the 16-pin connector.
4. Remove head by lifting straight up slowly.

Installing the head on the body:

1. Remove the head cover on the back of the head (underneath the hair on the little man and underneath the fur on McGruff and Dalmatian).
2. Lower the head on to the head tipping plate in the neck.
3. Screw in the thumbscrews in the two holes which are on each side of the 16-pin round connector.
4. Plug in the round 16-pin connector by turning the outer ring clockwise until it is tight.

Important: When installing the head, make sure the two thumbscrews are very tight to hold the head on.



Removing the upper body:

1. Remove the rear hatch located underneath the pants.
2. Unplug the round 37 pin connector by turning the outer ring counter clockwise until it releases. This connector is located on the electronics metal box.
3. Locate the upper to lower body latching mechanisms (See the diagram in the Appendix). There are two mechanisms on the left and right of the inside lower body. Turn the rotating handle counter-clockwise until the Link Latch releases from the slotted mounting bracket. Swivel the Link Lock Latch back until it clears the mounting plate. The upper robot can now be removed from the lower body.

Removing the arms:

1. Unplug servo wire between the body and arm.
2. Use 7/16" socket and remove 1/4" x 1/2" bolt. (These are located in the opening on the shoulders.) Hold firmly when loosening the 1/4" x1/2" bolt because there will be pressure from the spring.
3. Remove spring and washers.
4. Remove arm by pulling straight off of motor shaft.

Removing the main electronics box

1. Unscrew the nuts that hold the electronics to the lower body. These are located on the bottom side of electronics panel by the speaker boxes.
2. Unscrew the bolt holding the front top of the panel to the lower body. This is located in the navel area.
3. Disconnect the speaker wires. This is a round connector located between the panel and front of the robot. Disconnect the motor control wires, which are blue and yellow hanging down below the panel. Finally, disconnect the power connector which is a square black and red connector going to the on/off switch wire harness.
4. The main electronics panel can now be removed. Remove slowly making sure no remaining wires are still connected.

Assembly:

Assembly in each of the areas listed above involves performing each of the steps in reverse order.

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, coloring books 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. 303 Fabric cleaner is a good cleaning option also. **Do not get the robot wet!** Finally, rub gently with a dry towel and brush the fur if needed. To fluff the fur back up again you can use a compressed air sprayer.

PAINTING OF THE ROBOT BODY

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

Preparing the surface:

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

Painting the surface:

Method 1

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

Method 2

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

Brand- Dupont

Primer: Acrylic Urethane Flexible Primer Surfacer. Use a Dupont Primer. For additional flexibility: Can use Dupont Plas-stick Flex Additive (2350S) with the primer.

Paint: Acrylic Enamel. Dupont ChromaBase Basecoat.

Brand- PPG

Primer: Check with painter.

Paint: Deltron DBU

Brand- Sikkens

Primer: Plastoflex primer by Sikkens

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

The information listed includes suggestions and general information. This material is designed for application only by trained professional painters using proper equipment.

If you have any questions, call our service department at 801-489-4466.

REPAIR OF THE ROBOT BODY

General

The plastic body is ABS plastic. PVC or ABS glue is the best glue for this material. You can get PVC in a clear version. We typically use Weldon PVC 710.

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. You can use two types of materials for support behind the crack. You can use 1/8" ABS plastic or fiberglass mesh. The plastic pieces provide more strength. Call Robotronics if you cannot get these materials locally.
3. Cut a piece of fiberglass mesh or ABS plastic 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 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 by using latex or latex free gloves.
5. Immediately put the fiberglass mesh on the glue and pat it down to saturate into the glue. If you using an ABS plastic strip, hold it on with a clamp.
6. Apply some more PVC glue over the fiberglass mesh to saturate it some more. Avoid any pooling of the glue as this can cause the body to melt and change shape.
7. It will dry to the touch in about 30 minutes. Allow 24 hours for complete drying.

Bead Glue – If you need to create a new bead on the outside of the body, you will need to call us for plastic shavings. You can mix PVC glue with this and create a colored glue that is the color of the body. The best mix is something similar to the thickness of maple syrup.

General Precautions:

Use in a well ventilated area.


Use latex gloves to avoid getting glue on your hands.

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

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

STORAGE

Storing your robot for any length of time.

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

APPENDIX A

Quick Reference Troubleshooting

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

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

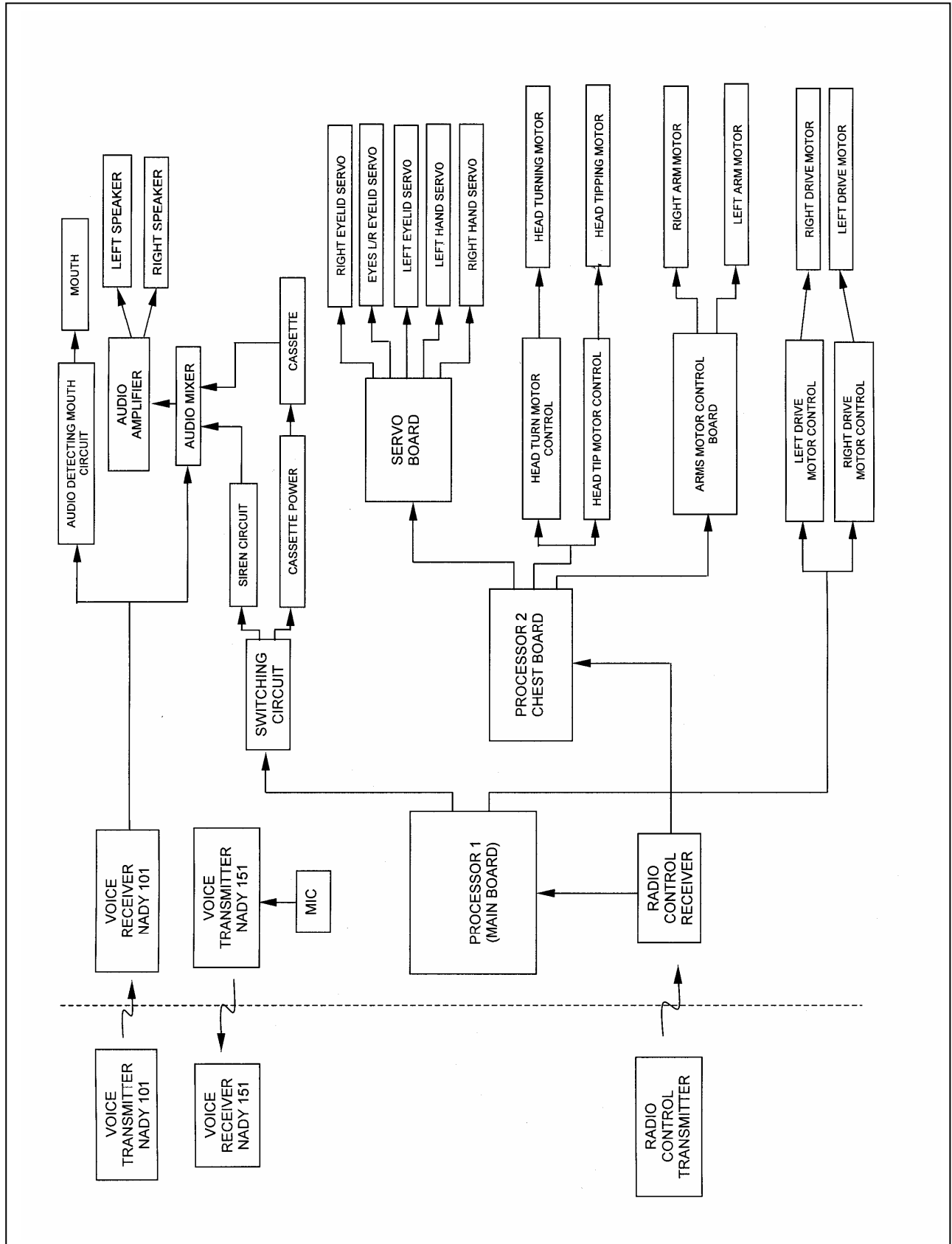
More detailed troubleshooting by system is included with each subsystem. For additional help or parts call our service dept. at 801-489-4466.

Problem	Cause	Solution
Robot Battery System No functions will operate.	1. Check wires and connector from battery to the robot. 2. Battery is very low or bad.	1. Push battery connector pins in until it clicks in place. Pin could have slipped out of position. 2. 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.	1. Battery has not been kept fully charged	1. Charge and discharge repeatedly. Replace battery if it does not start charging.
Drive Motors Neither drive operates only. To correctly evaluate drive problems, look at wheels off the ground.	1. Both drive fuses blown. 2. Radio control drive section problem. Contact Robtronics for help.	1. Replace drive fuses on fuse block.
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.	1. Drive motor pulley loose. 2. Broken connection at motor connector. 3. Drive circuit not getting power. 4. Drive motor damaged. 5. Drive Circuit on main board problem.	1. Tighten motor pulley set screws. 2. Check blue/yellow wires and in line motor connector at motor 3. Check drive motor fuses on fuse block (blue wires). Check wires coming from fuse block to motor circuit on the main board. Broken solder joint? 4. Repair or replace motor. 5. Send main electronics box back to Service Dept.
Drive motors moving on their own even when the stick is in the center.	1. Drive trim sliders not in center. 2. Joystick potentiometer broken.	1. Move drive stick sliders to center or position to neutral the robot. 2. Send to Robotronics for repair.
Robot not driving straight.	1. One motor pulley set screw loose. 2. Straight drive adjustment needs to be adjusted.	1. Tighten set screws. 2. Find adjustment on the main circuit board. See diagram of main board in Appendix.
Character Head Turning System Head is out of position but operates.	1. Loose head set screw or head was hit.	1. Re-position head and tighten set screw. Better to do this with the robot on.
Head motor is keeping head in not centered position	1. Head turning pot or pot shaft slipped	1. Re-center head by adjusting head turning feedback pot- blue pot below motor. Then tighten the set screws on the metal tube. See procedure in head section.
Head motor is not operating	1. Character board is not getting power 2. Broken wire.	1. Check fuse on main fuse block. 2. Check power (red/black) and motor wire (blue/yellow).
Eyelids and Eyes Left and Right An eyelid or eyes L/R does not operate	1. Rod linkage came off. 2. Servo wire broken or wire came out of eye servo board	1. Get to eyelid rods and ball links and re-attach. 2. 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	1. Eyelid rod bent or eyelid out of adjustment	1. Straighten bent rod or change eyelid position by removing the servo arm. Then shorten or lengthen the rod by twisting the servo arm. You can also change the position of the servo arm on the servo shaft.
No operation of any eye functions.	1. Connection at eye servo board has come off. 2. Wire(s) bringing 5 Volts and signal to servo board are not making a connection. Broken out of 37 pin connector. 3. No 5 Volts going to eye servo board.	1. Vehicle- located on underside of upper robot. Robots with Character- located in character. 2. Vehicles- locate the wires (red/black/gray/yellow/black) going from the 37 pin up to the eye servo board. Repair broken wiring. Robots with Character- Check gray/yellow/black and red black to eye servo board. 3. 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
Voice Modifier Voice not being modified	1. Modifier not turned on. 2. Audio wires not plugged in correctly	1. Push pedal on modifier. Light should come on. 2. Jumper wire goes from Nady Receiver to Input of Modifier. Wire in Output A of modifier goes to the main board.

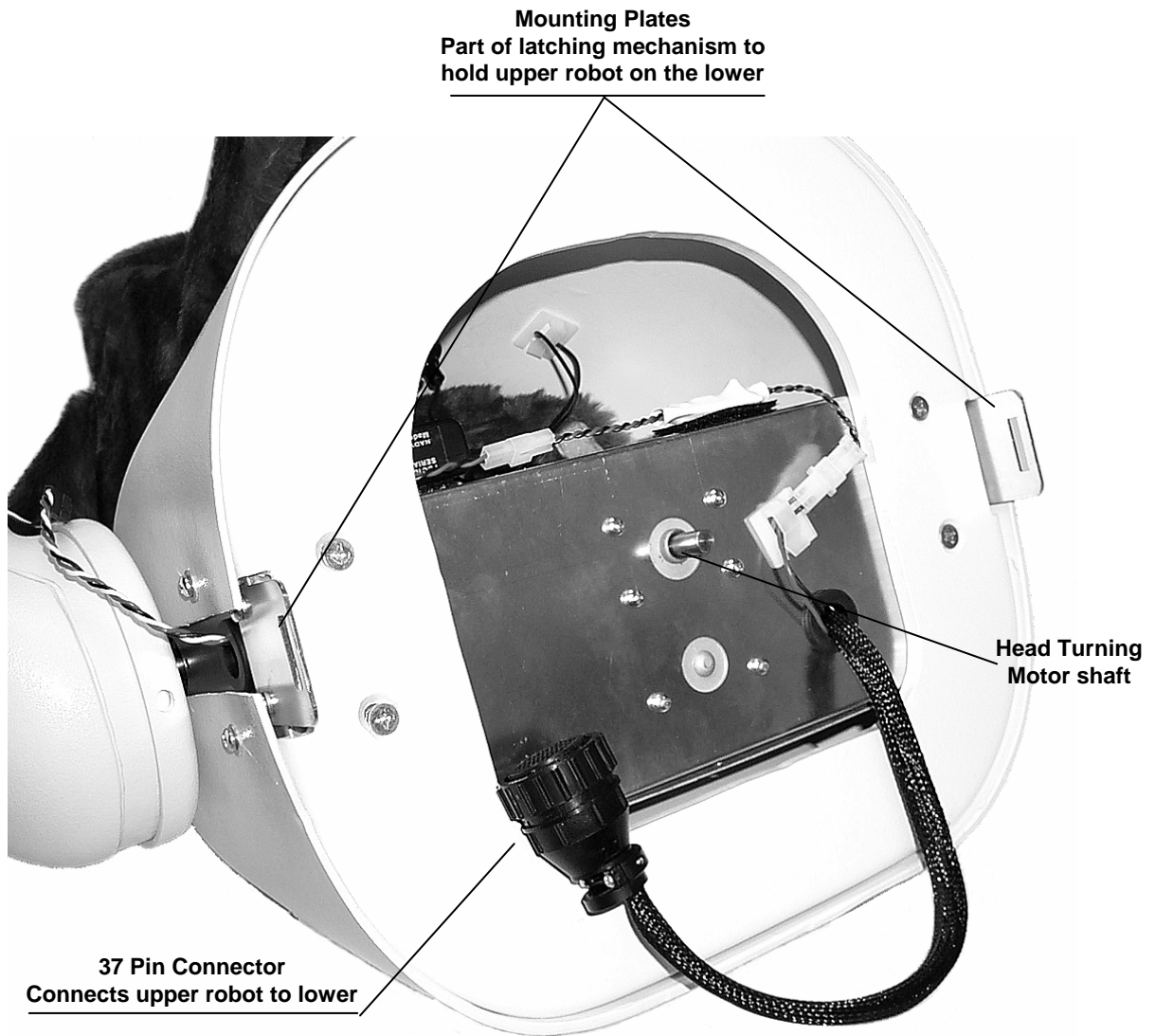
Robot Functional Block Diagram



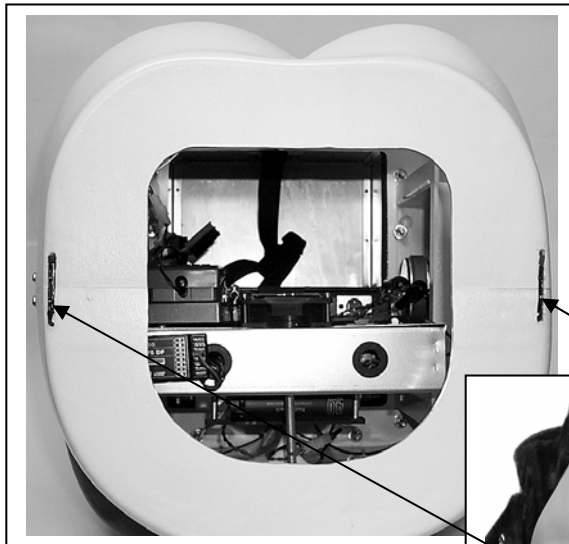
APPENDIX B

ROBOT PARTS IDENTIFICATION

Upper Robot Bottom View



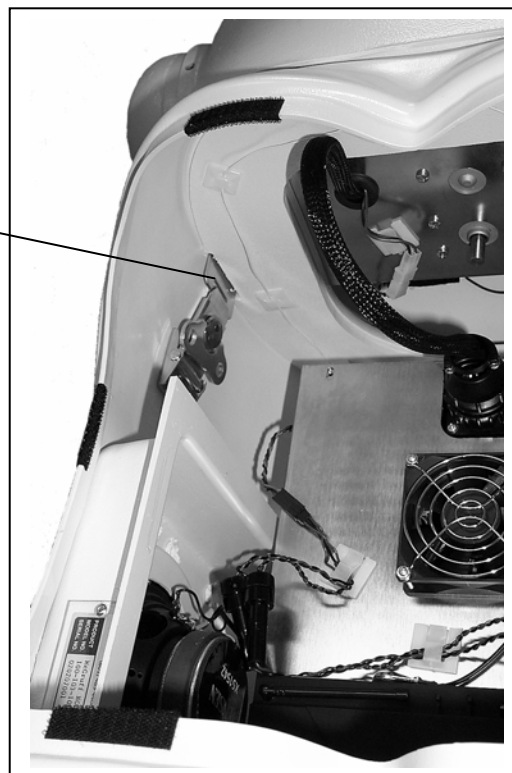
Upper to Lower Body Latching



Mounting Plates go in slots

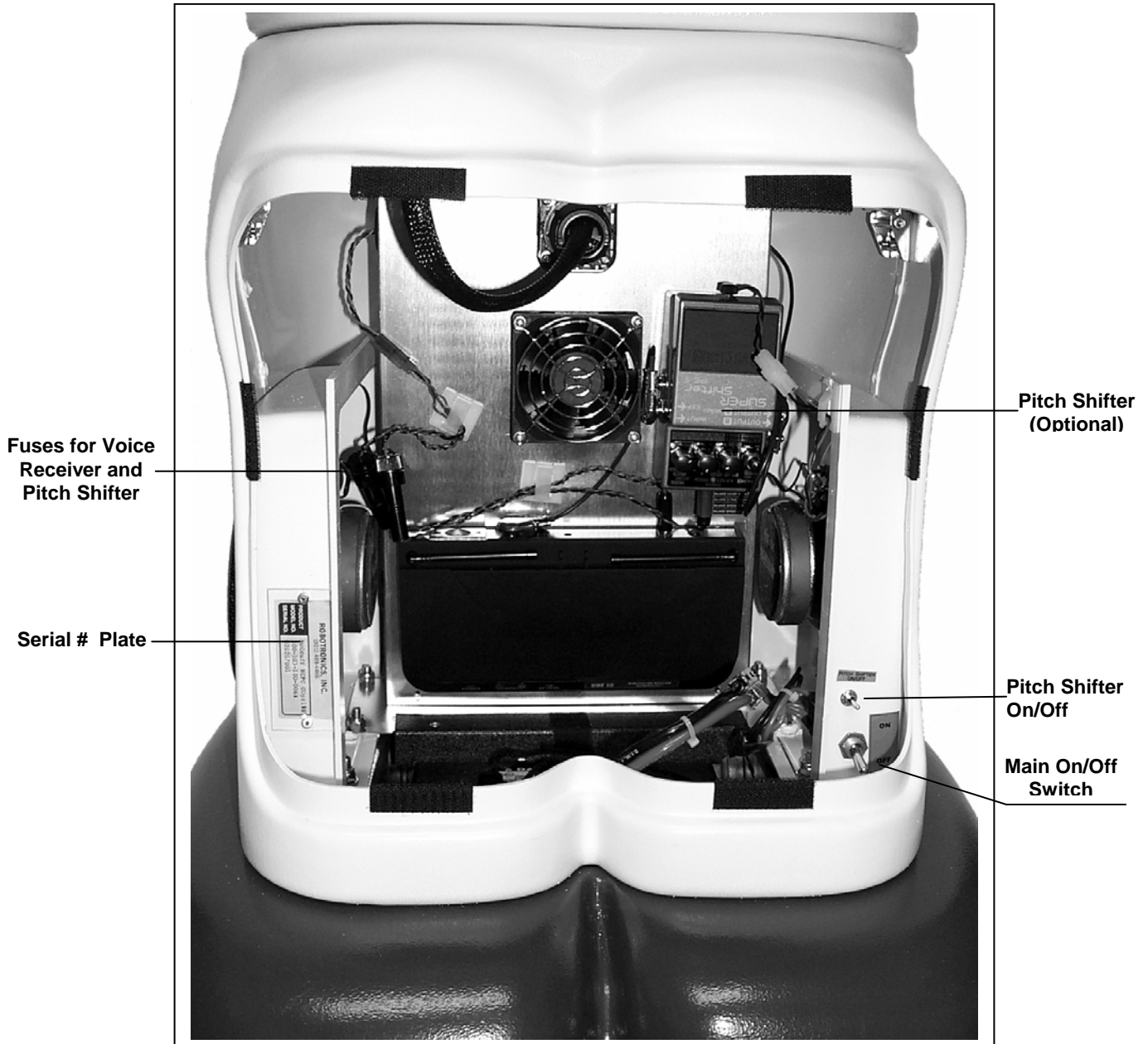


Link Lock Latch
In slot and secured

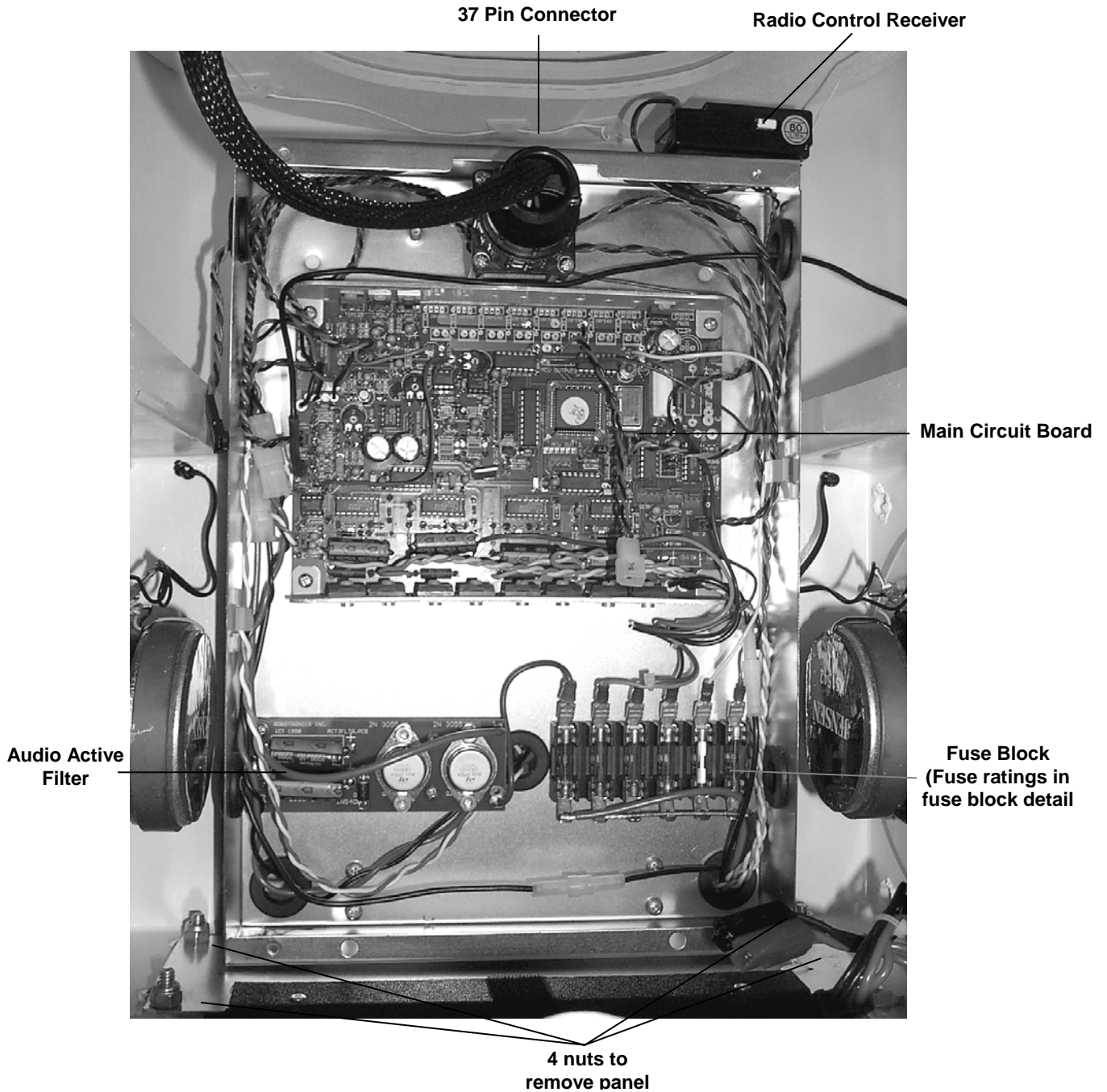


When the latch is in the mounting plate groove, rotate the turn handle completely and lay it down to secure it.

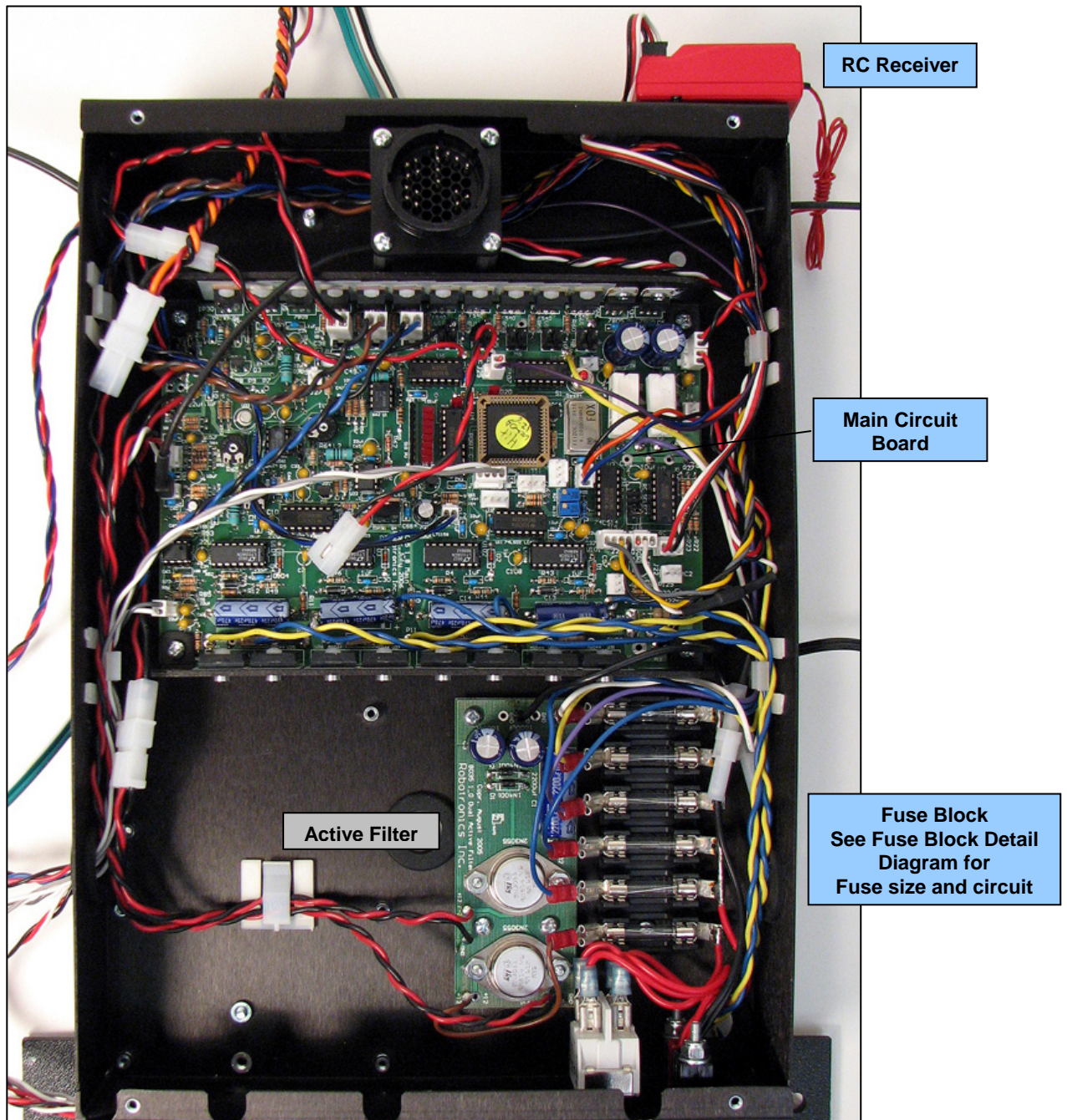
Lower Robot Inside View



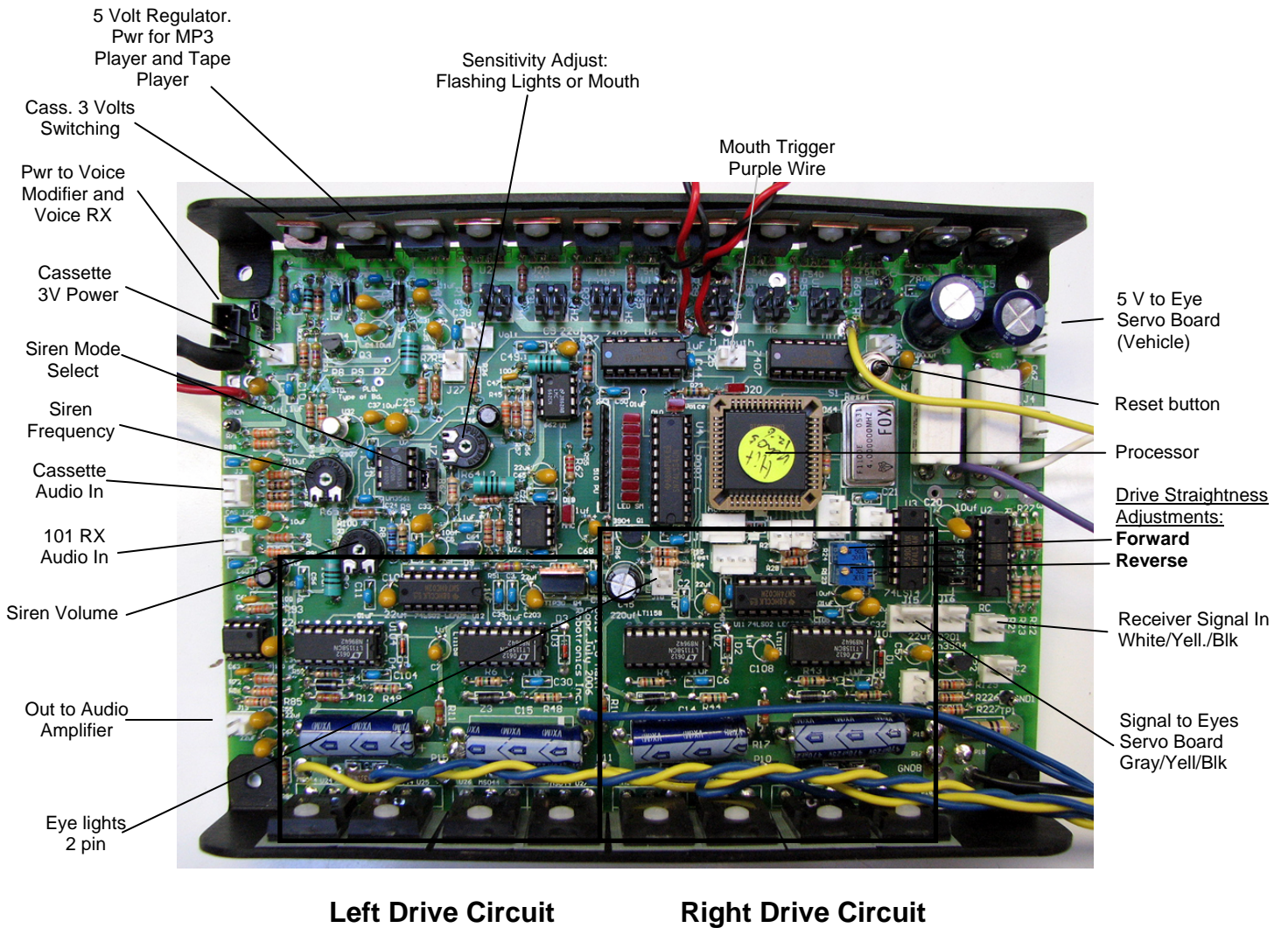
Electronics Main Box – Inside View



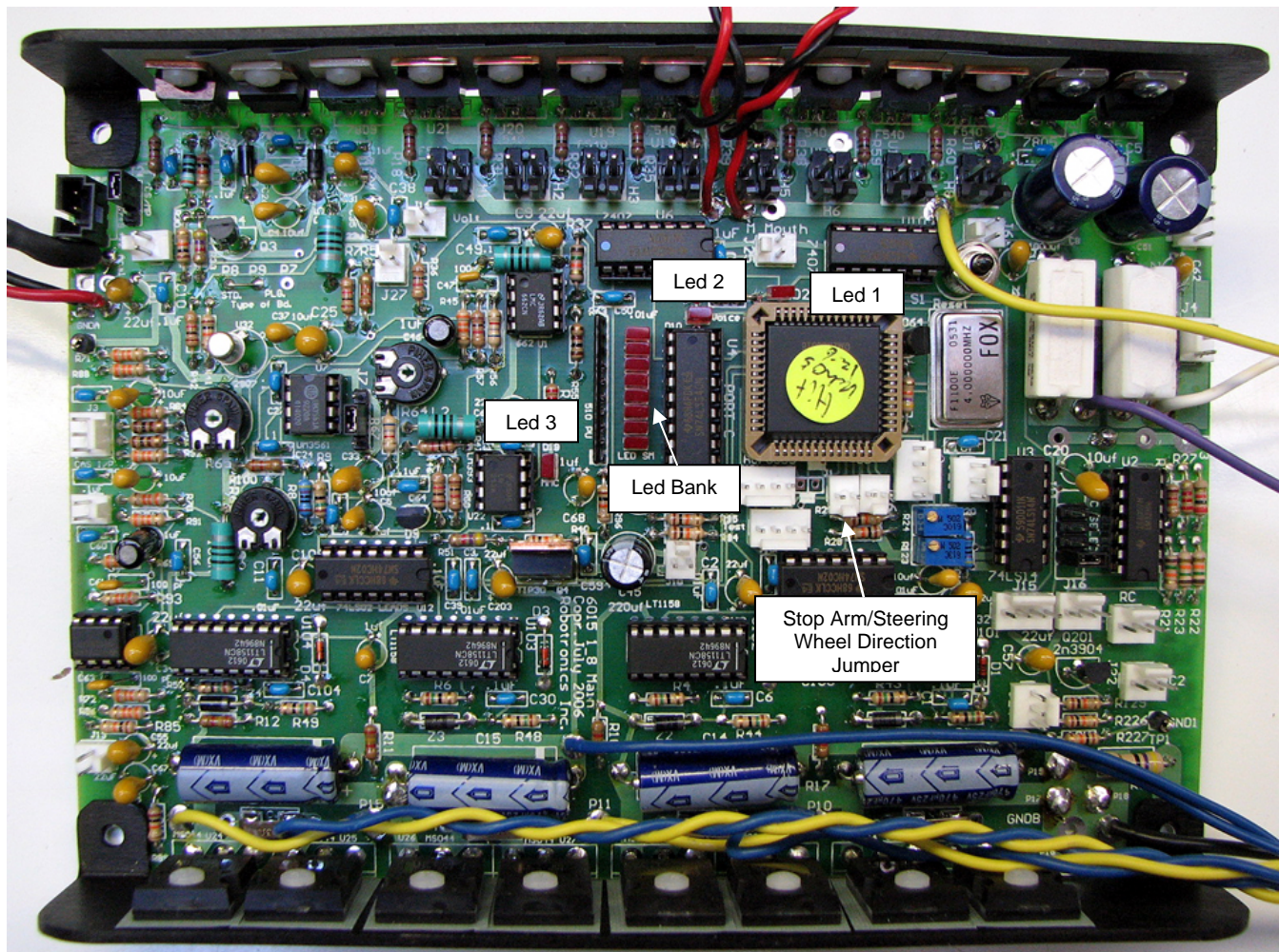
Main Electronics Box



Vehicle Main Electronics Board



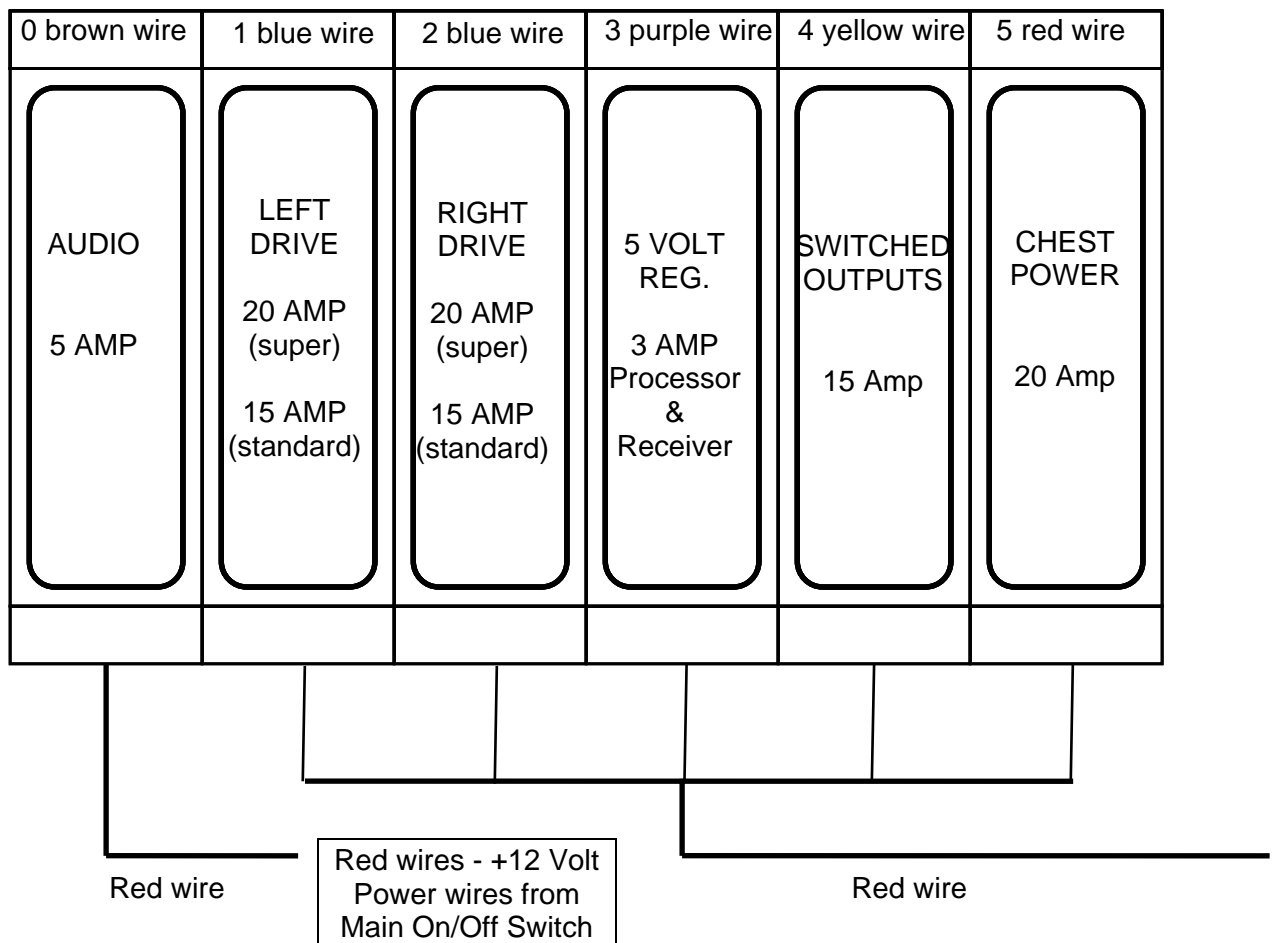
Main Board – LED Functions



Led 1- Failsafe and presence of RC signal. If there is no signal, robot is in failsafe and light is on.
Led 2- Moving mouth or flashing eye-lights detection. This flashes if there is audio coming through.
Led 3- Half-way point of the audio detection. Flashes when there is audio present.
Led Bank- Used for looking at states of the processor, outputs etc. If these are on, the processor is getting 5 V.

Fuse Block Detail

Use AGC Fast Acting Type Fuses

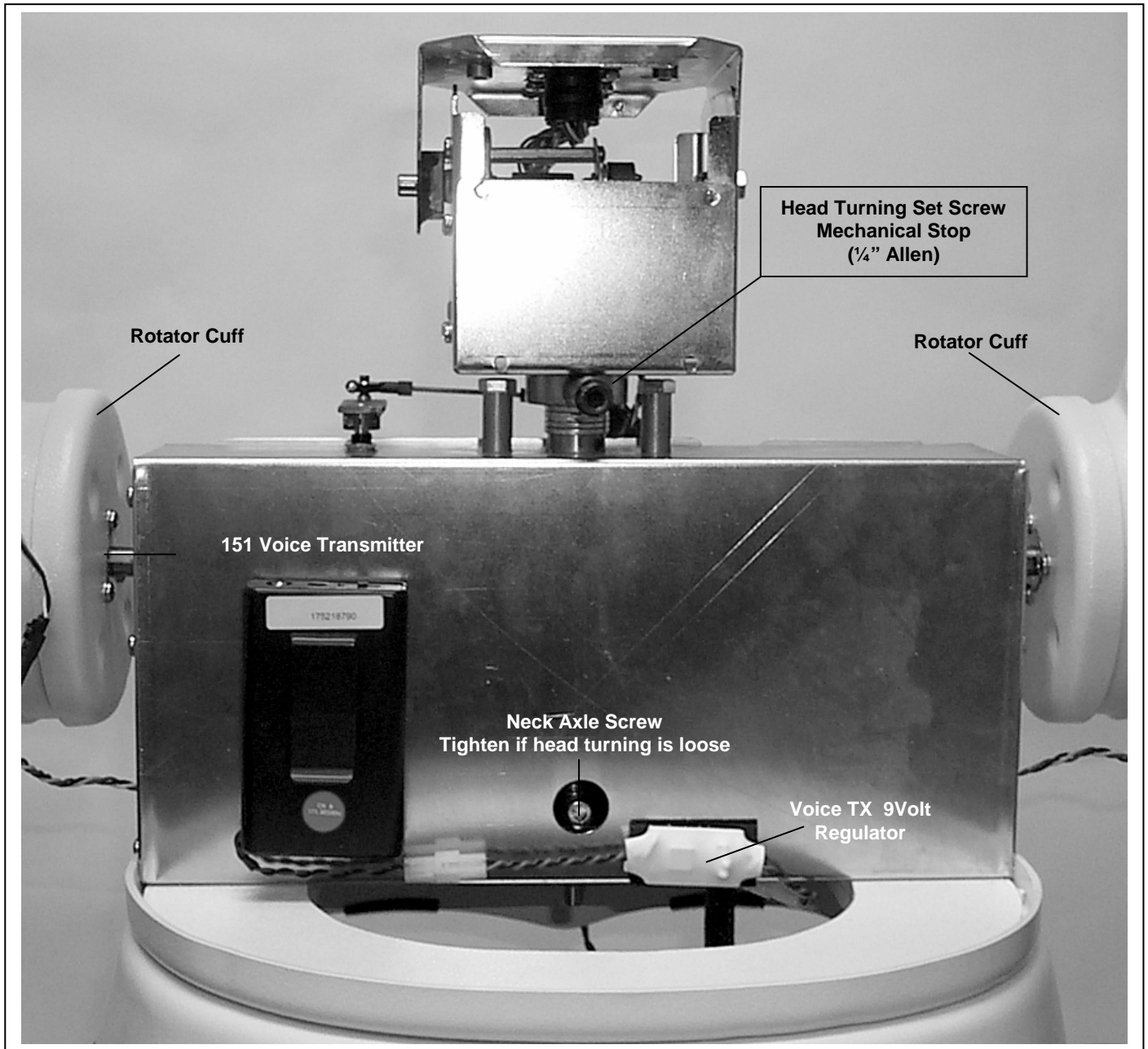


Audio - (Fuse 0) Robot voice transmitter (151), Robot voice receiver (101), audio booster, active filter, cassette player, siren.

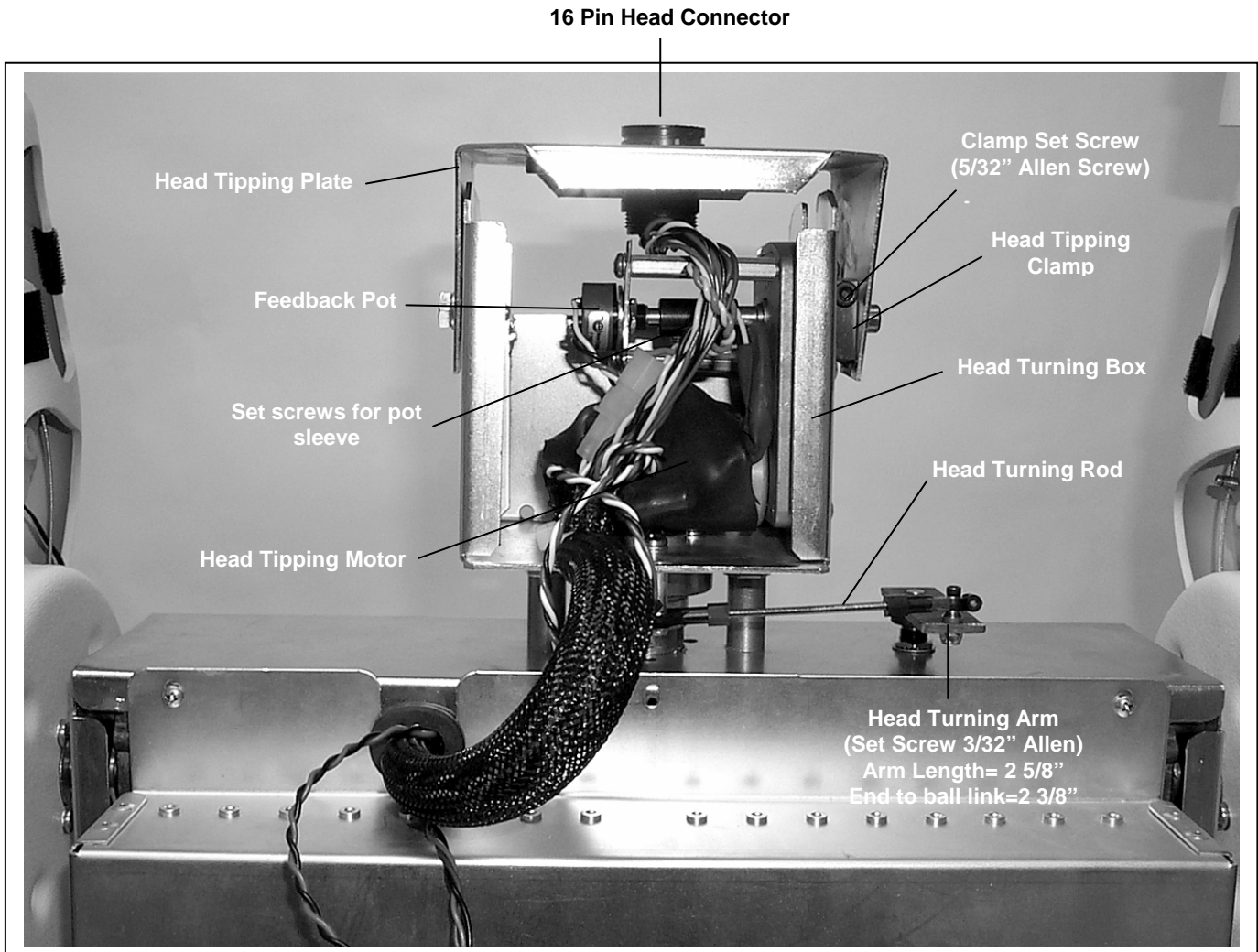
Switched Outputs – Power to fan

Power to Chest – This power to the chest board includes power to head tip, turn, arms, and the eye servos. Power for voice transmitter in chest also comes off this.

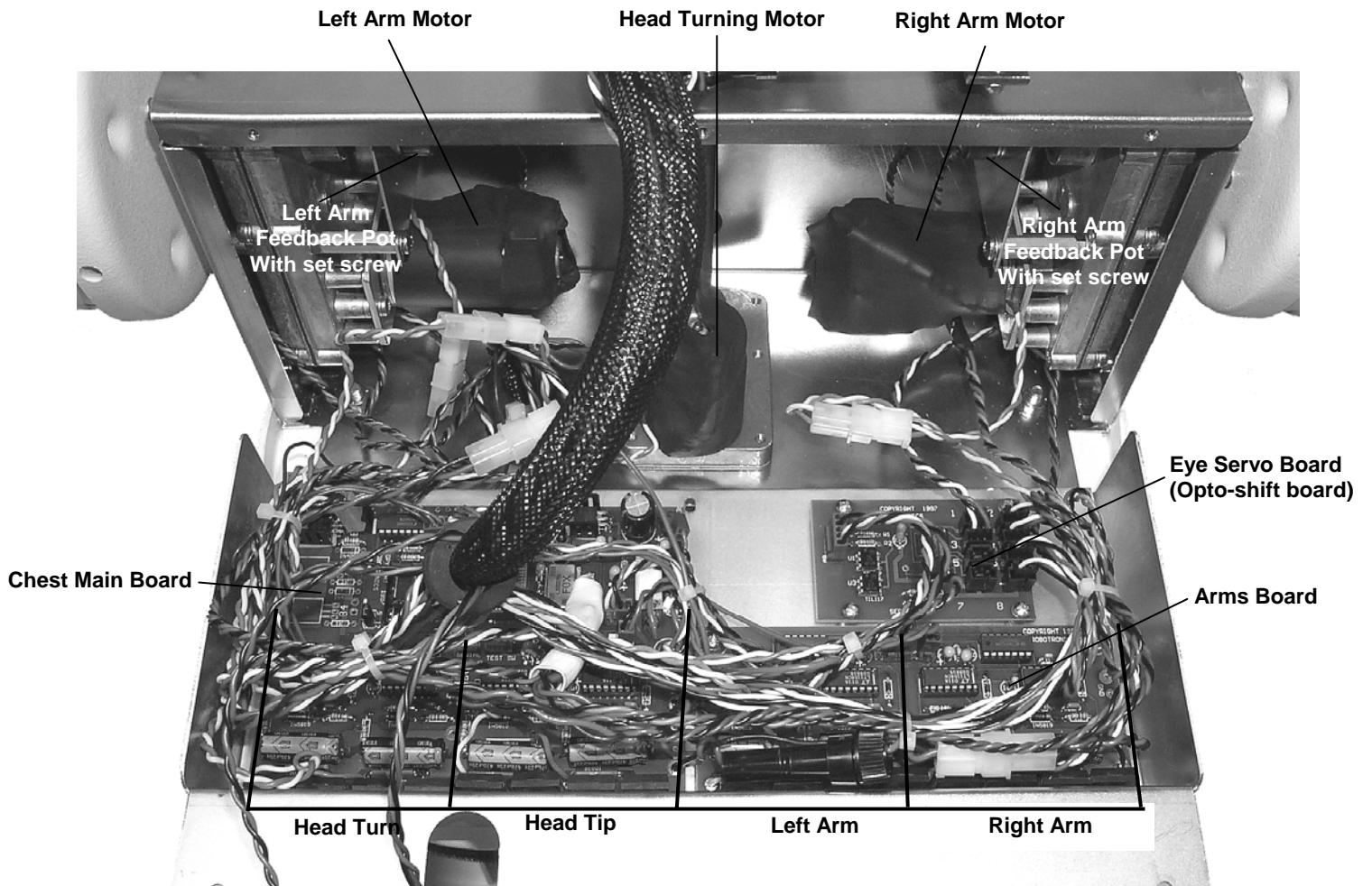
Upper Body Front View



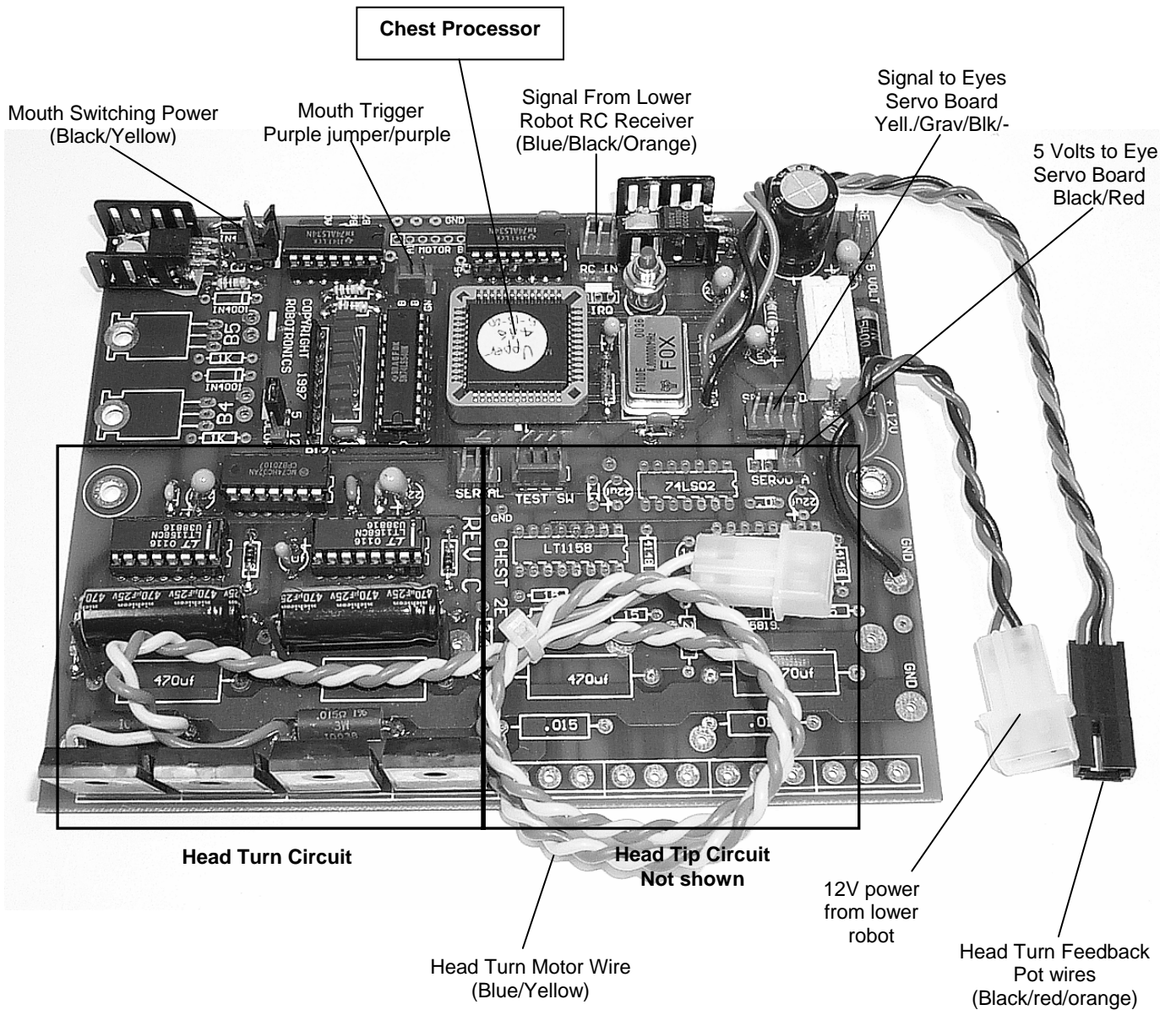
Head Tip and Turn Mechanics



Head and Arm Electronics

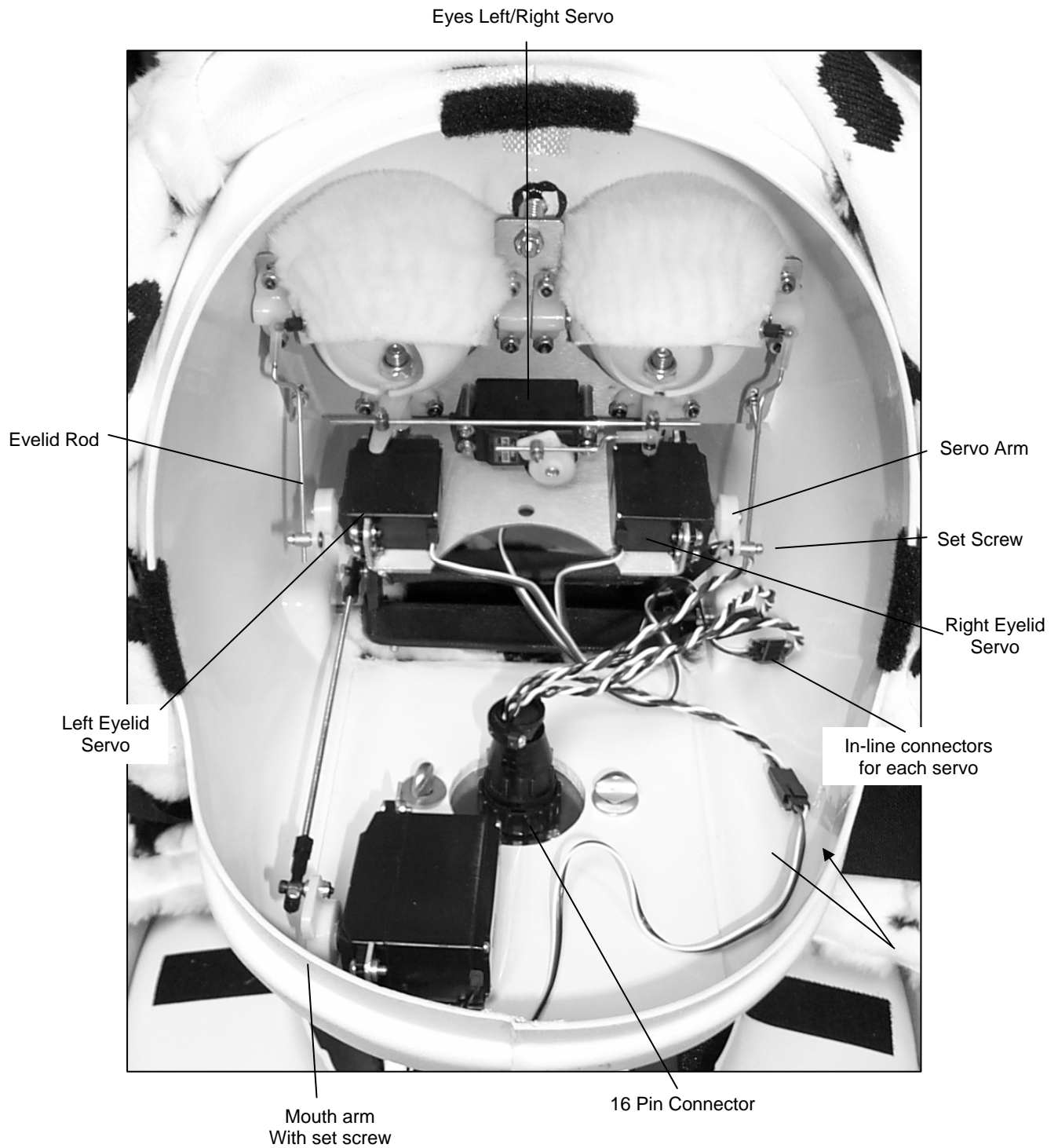


Upper Chest Board



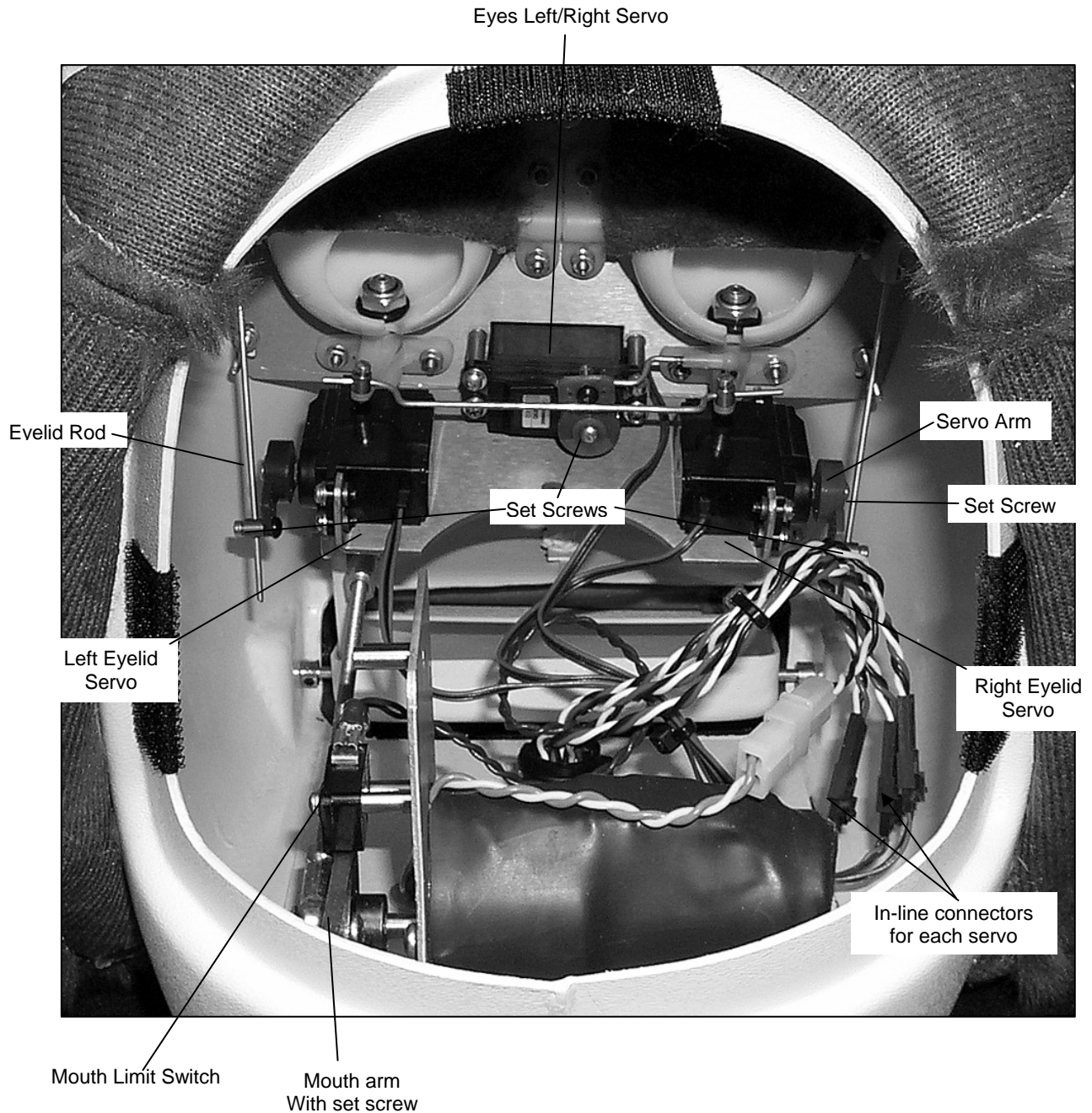
McGruff & Freckles Head Inside View

(With Servo Mouth Motor)

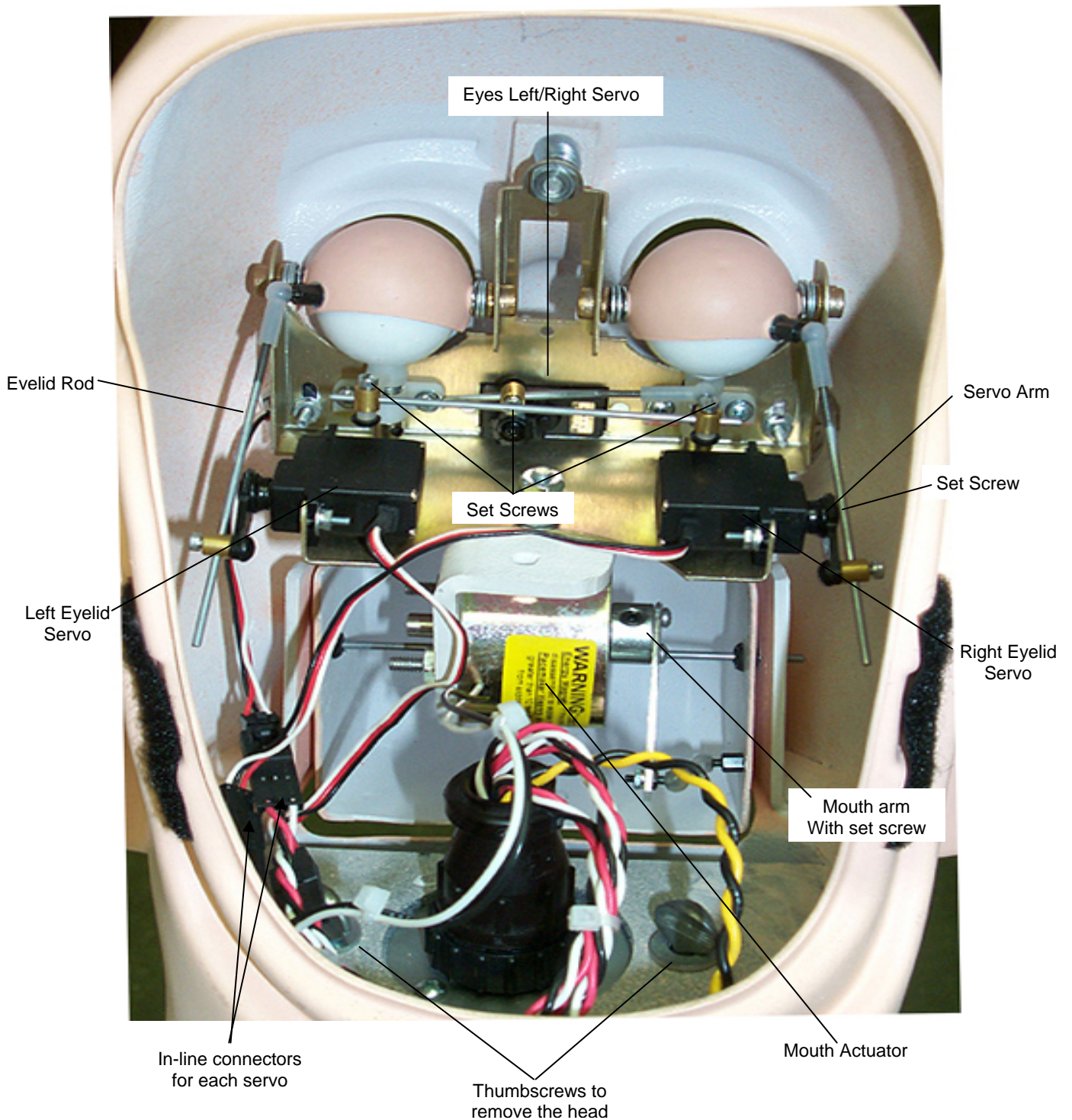


McGruff & Freckles Head Inside View

(With DC Motor Mouth)

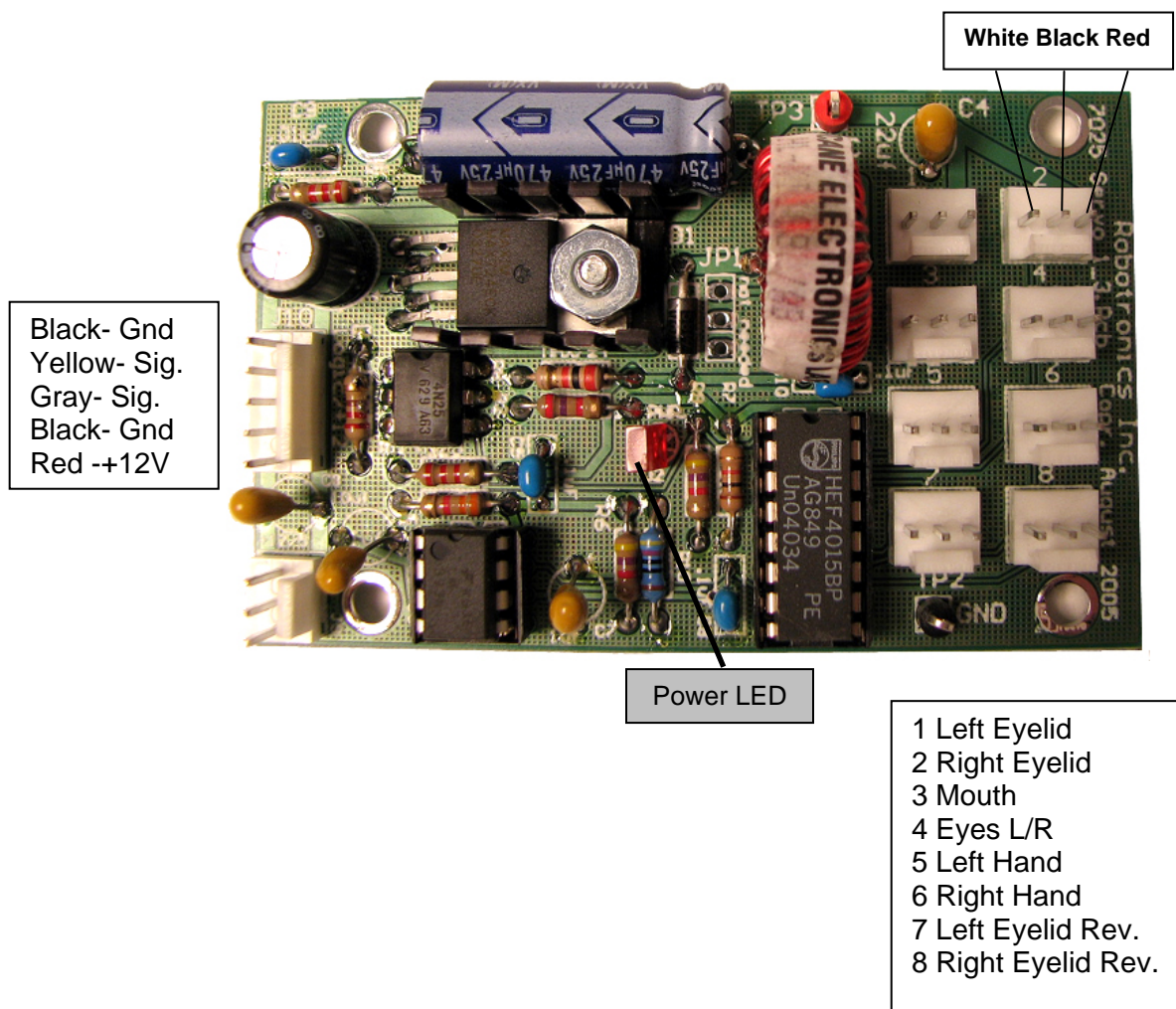


Head Inside View

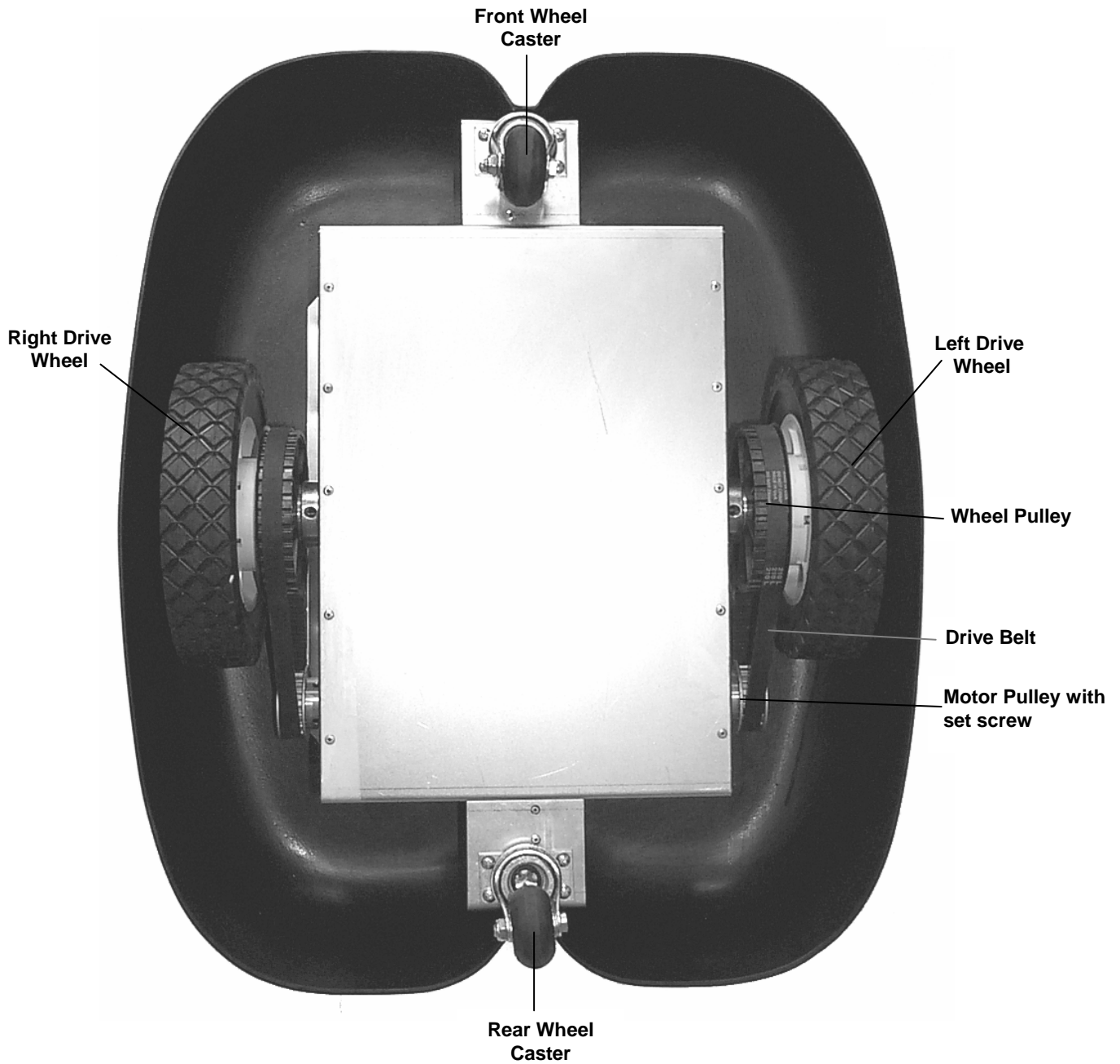


Eyes and Mouth Servo Board

(Switching Servo Board)



Drive Base Bottom View



Notes

Technical Tips