

# Robotronics®

*The Leader In Safety Education Products*

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## Vehicle Robot Operating Manual

Version 1

# Vehicle Operating Manual

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

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

Sincerely,

**ROBOTRONICS, Inc.**



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Springville, Utah 84663  
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\* These sections can be used to place additional notes that you would like to record, during your use of the robot.



## Limited Warranty

All robots and accessories have a limited 6-month warranty, which covers all parts and labor. This period covers the normal burn-in for electronic components. Experience has shown that this warranty period catches most component defects and other possible flaws. If you have a problem, we are anxious to help. Our desire is to be certain you receive a quality product and excellent service.

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

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

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

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

### If You Have A Problem

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

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

Record the vital information from your robot here for future access

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

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

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

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

**Service Department phone number: 801-489-4466.**

# Part 1 General Operating Instructions

## CHAPTER 1 Getting Started

### OPERATING HINTS

ROBOTRONICS, Inc. robots are a unique and exciting tool in the hands of a skilled and trained operator. The operator provides much of the excitement the robot conveys. The selection and training of the operator should be done carefully, so as to provide a person with good judgment and an outgoing personality. The operator is the single most important feature that the robot has. Nevertheless, with a little practice anyone can learn to operate the robot and even those with a shy personality can be very effective using the robot. The following points will help in your operation of the robot.

- Operate the robot with charged batteries in the transmitter and robot.
- Never operate the robot out of line-of-sight.
- The operator must have the radio control in their hands when the robot is on. If you need to set the radio control down, turn the robot off first.
- Always have a trained person posted near the robot to help in crowd control, and to protect the robot from vandalism. This person is also available to answer questions and interact with the robot.
- Operating distance should never exceed 100 feet. When moving the robot through crowds, the robot should be operated slowly and smoothly without any sudden changes of direction. Walls, turns, and other obstacles are hazards to be avoided. Safe clearance should be maintained between these obstacles and the robot.
- Never leave the robot "ON" when unattended or in direct sunlight for extended periods of time.
- The robot is designed to be operated on hard, smooth surfaces and carpet. Avoid extra deep shag carpet, dirt, gravel, or grass surfaces. Avoid steep inclines or large uneven surfaces such as curbs, gutters, or uncovered electrical lines.
- When using the robot on a stage, the area just in front of the stage should be clear of children for about 10 feet.
- When attempting to operate the robot for the first time, do so in a large flat area without obstacles. The operation of the controls should be done in a smooth, fluid manner. Avoid jerking starts and stops or overreacting to the controls. When first practicing movement, it is sometimes helpful to follow behind the robot, as robot movement will match stick movement. (Controls respond opposite when the robot is facing the operator.)

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

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

### **Step # 1**

Read and study this manual completely before operating the robot.

### **Step # 2 Charge the batteries**

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

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

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



### **CAUTION**

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

### **Step # 3 Attaching the upper robot to the lower**

1. Set the upper robot on the lower robot body.
2. As you put the top on, connect the 37-pin connector, which is a round connector and wire bundle running from the upper robot to the lower robot. When connecting this rotate it until it sits down into its mate connection and turn the ring until it is secure.
3. Locate the four body latches (just two on certain robots) and push the pins into the body to secure the upper robot to the lower. Two of the latches are located in the compartment where the Character sits. The pins are to the left and right of Character. The other two are at the back of the robot. To latch these you will need to reach in through the back trunk or door.



### **CAUTION**

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

### **Step # 4 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 inside the trunk on the main electronics panel. Push the switch up to turn the robot on.

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

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

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

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

### **Step # 7 Optional Accessories Setup**

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

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

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

### **Step # 9 Charge the batteries again**

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

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

## TRANSPORTING THE ROBOT

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

Double check that the upper robot is latched and secure. There are four latches (two on certain robots) that must be latched to secure the upper robot to the lower robot (See the diagram below). These pins must be pushed in to secure the upper robot.

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

You can leave the robot on the transport cart while the robot is in transit, to keep the robot from rolling around. Have the robot cover on the robot to keep the body from getting scratched. The cover can also help hold the top on if the string is tightly pulled around the bottom of the robot.



### **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.**



**Location of Body Latches for each style of top**

## Part 2 Subsystems of the Robot

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

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

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

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

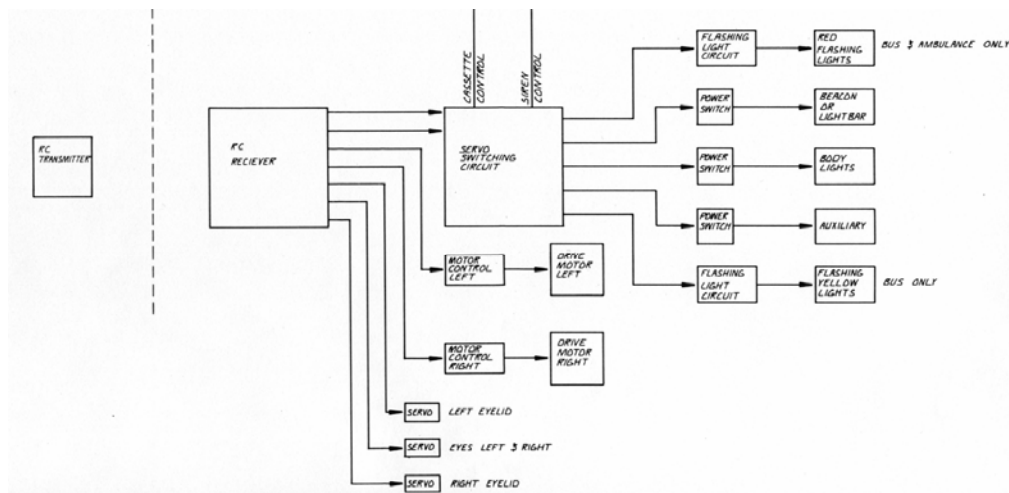
## CHAPTER 2 Radio Control System

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

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

### RADIO CONTROL OPERATING INSTRUCTIONS

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

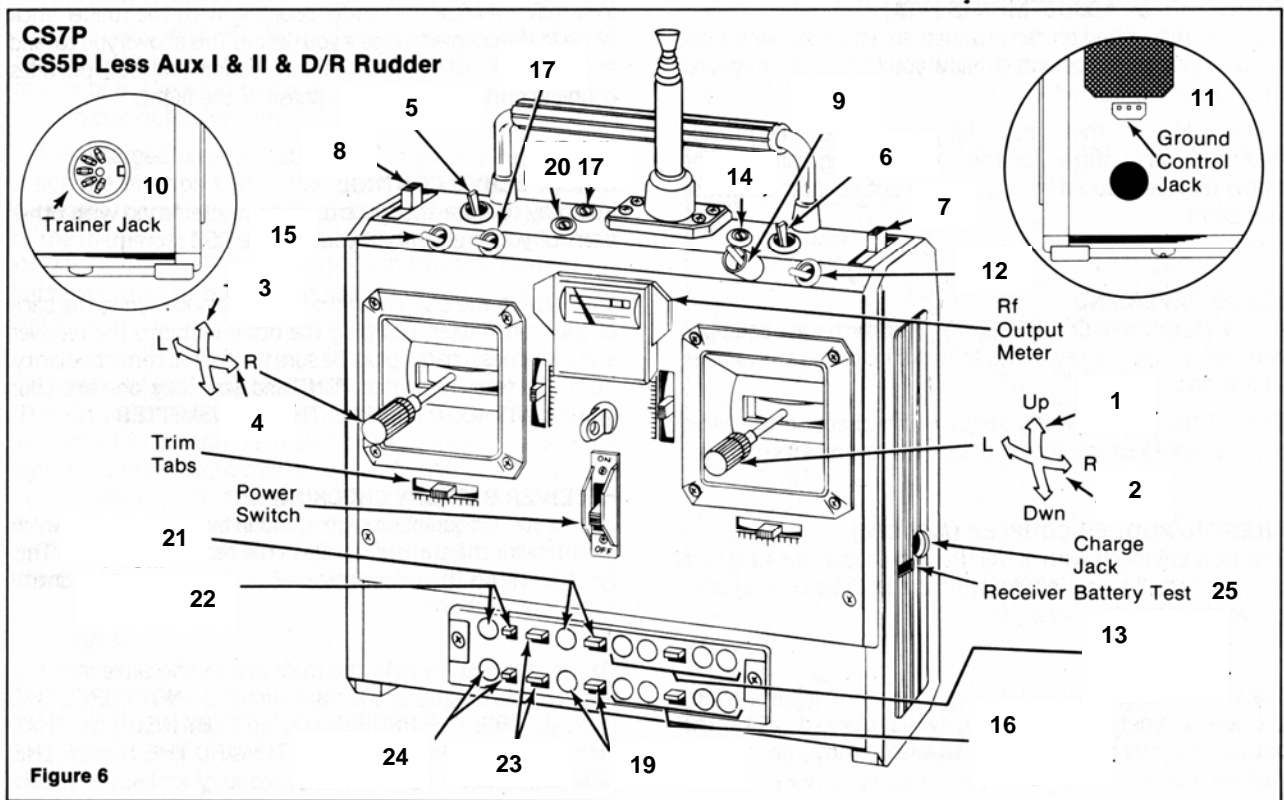


The right hand joystick controls movement of the robot's drive wheels. Pushing the stick forward will cause the robot to move forward. Pulling the stick back will cause the robot to move backward. Moving the stick to the right or left will cause the robot to turn to the right or left respectively. Movement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

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



# RADIO CONTROL TRANSMITTER (Airtronics Champ. Series)



# RC TRANSMITTER CONTROLS

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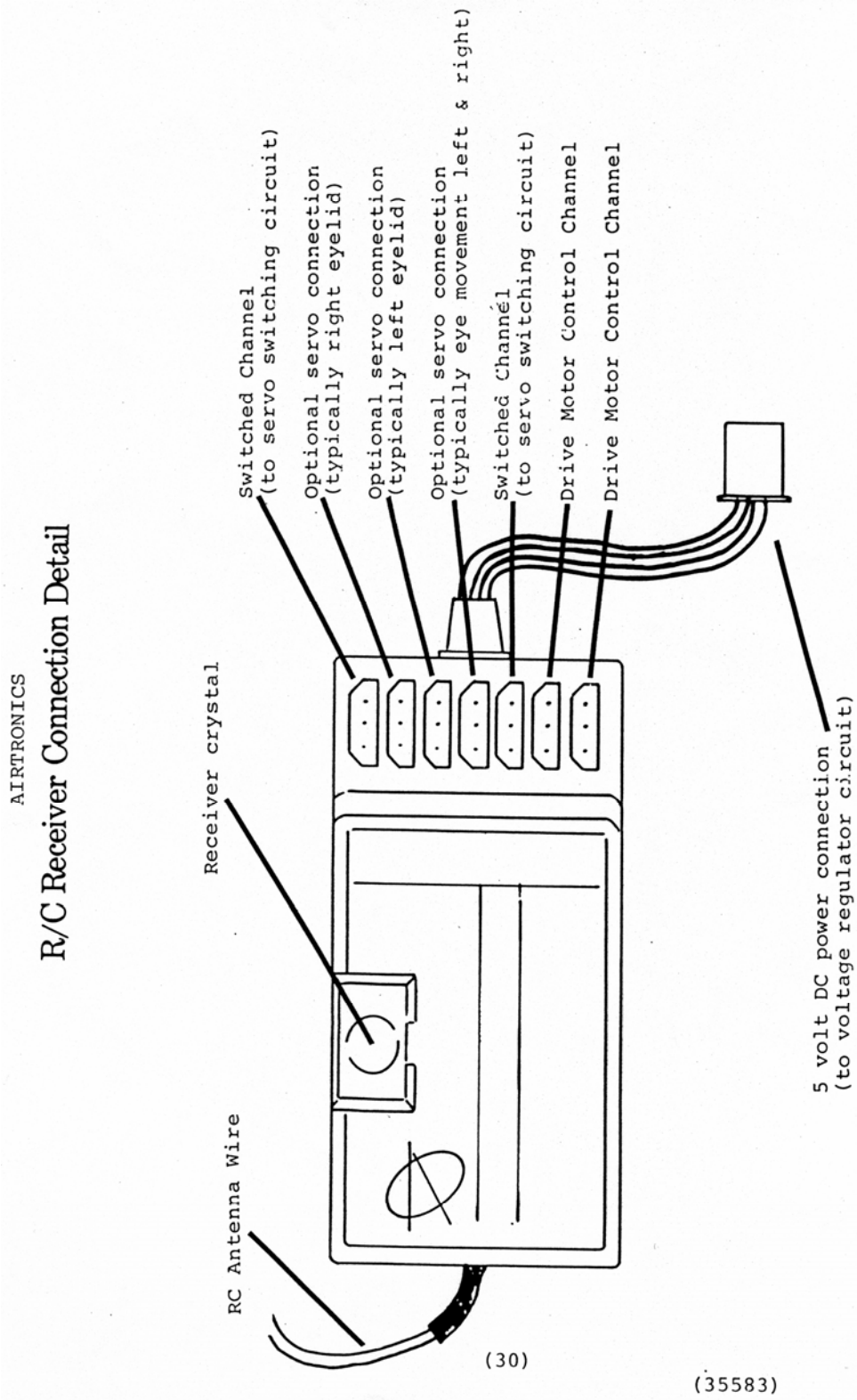
**Note:** The following information on the transmitter controls includes information for a variety of similar robots.

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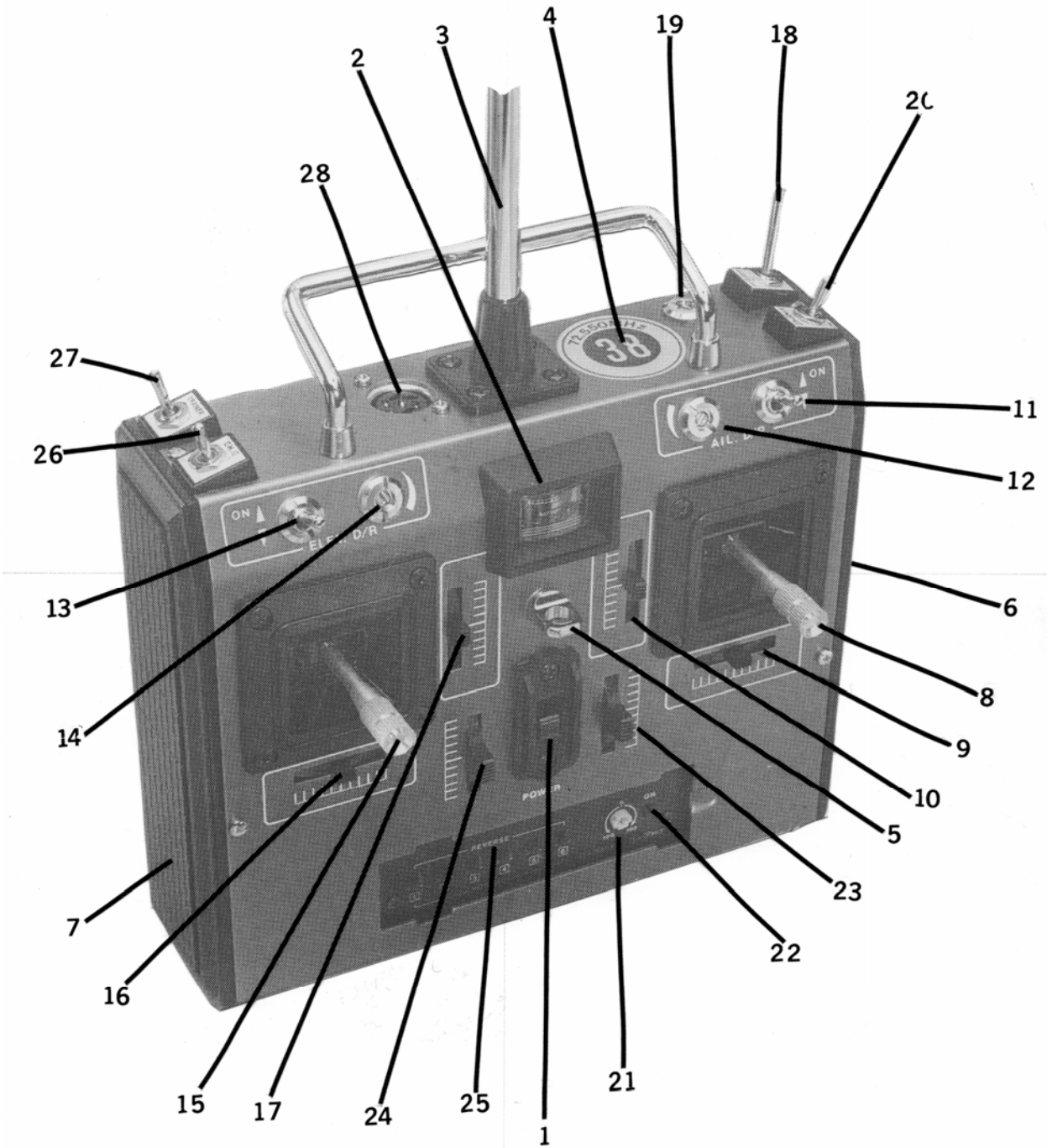
1. Right Joystick up and down- Robot drive motors forward and reverse.
2. Right Joystick right and left- Robot drive motors steering, left and right turns.
3. Left joystick up and down- up activates cassette tape function, down activates optional auxiliary switching function-siren.
4. Left joystick left and right- Optional servo function. (Typically eye movement left and right)
5. Switched servo function (part of channel 5)-Lights.
6. Switched servo function (part of channel 5)-Beacon.
7. Optional servo function (Typically right eyelid movement).
8. Optional servo function (Typically left eyelid movement).
9. Coupler switch-couples #4 into #2 (Typically robot turning left and right makes eyes move left and right in unison).
10. Not used-trainer plug.
11. Not used-ground control jack.
12. Dual rate switch-two speed switch allows for half-speed movement of the robot, turning left and right.
13. Exponential-Linear adjustment, End Point Adjustment, and Stick Reversing Switch for #2, Drive Motors Turning Control.
14. Dual rate adjustment associated with #12
15. Dual rate switch-two speed switch allows for half-speed movement of the robot forward and reverse.
16. Exponential-linear Adjustment, End Point Adjustment, and Stick Reversing Switch for #1, Drive Motors forward and reverse.
17. Dual rate adjustment associated with #15.
18. Dual rate switch for #4 of left joystick. (leave in off position).

19. Range of travel adjustment and stick reversing switch for #4.
20. Dual rate adjustment for #4.
21. Range of travel adjustment and stick reversing switch for #3.
22. Not used-Disconnected function associated with channel 5, shown as #5, on a unmodified RC transmitter.
23. Stick reversing switches for Auxiliary channel I, #7; and Auxiliary channel II, #8.
24. Coupling adjustment and reversing switch associated with #9. (Controls direction function and amount of coupling of #4 into #2.)
25. 25. Not used-receiver battery test jack.

# RC Receiver Connection Detail (Airtronics)



# Cirrus Radio Control

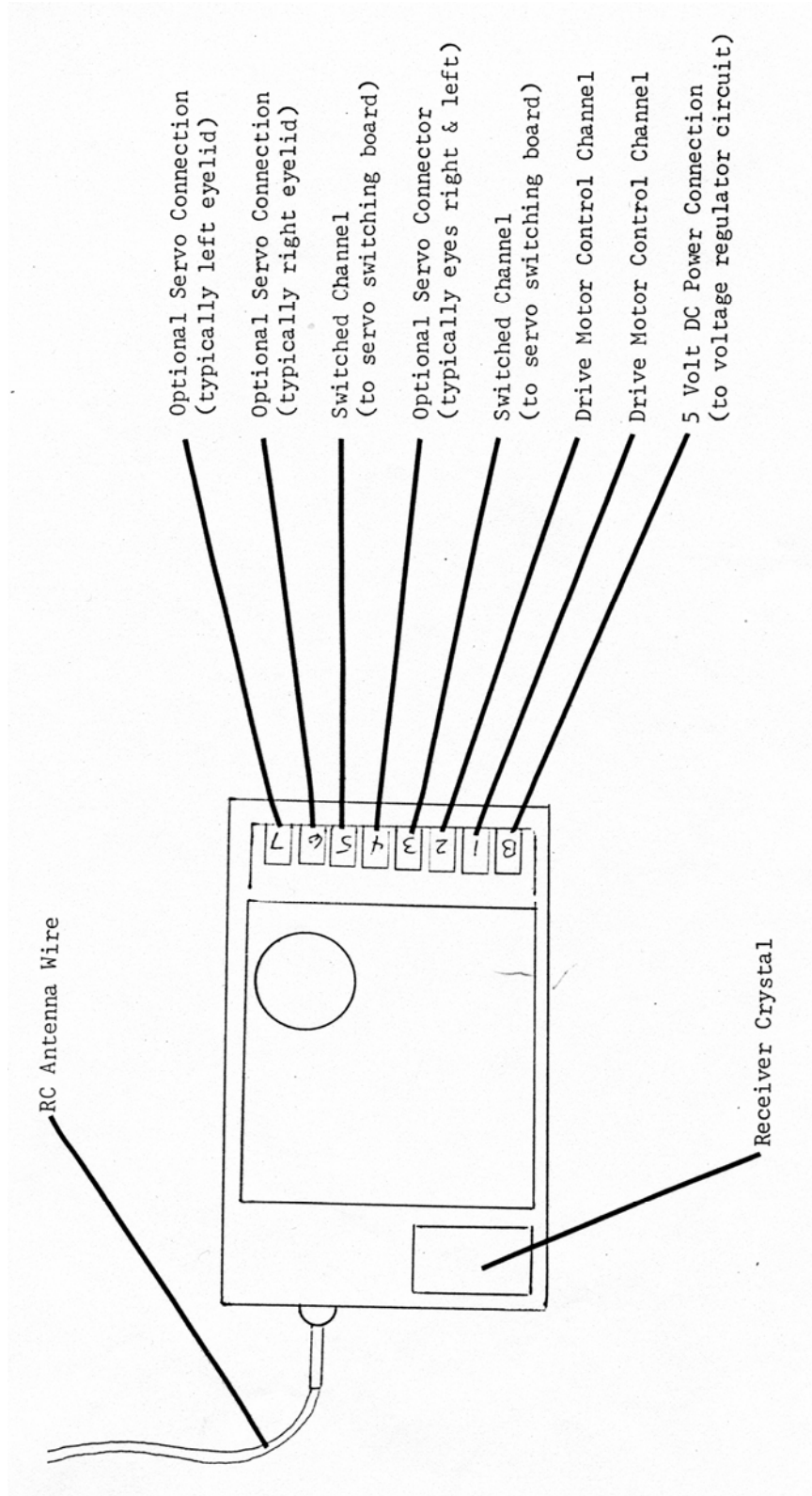


# Cirrus RC Transmitter Controls

1. Power Switch On/Off
  2. Output Meter-indicated RF output level and battery charge level.
  3. Antenna- during use extend at least half way.
  4. Frequency tag.
  5. Neck strap mount.
  6. Recharge jack.
  7. External power jack.
  8. Right control stick- Ch. 2- drive forward and rev. drive. Ch. 1- drive left and right movement.
  9. Trimmer associated with #8 adjusts centering of left and right steering.
  10. Trimmer associated with #8 adjusts centering of forward and reverse drive.
  11. Dual rate switch- two speed switch allows for slower movement of robot, turning left and right.
  12. Adjustment for #11 sets alternate speed range.
  13. Dual rate switch- two speed switch allows for slower movement of robot forward and reverse.
  14. Adjustment for #13 sets alternate speed range.
  15. Left control stick- Ch. 3 up activates switched function/down activated another switched function, usually tape and siren. Ch. 4 left and right control optional servo function, usually eyes left and right.
  16. Trimmer associated with #15 adjust centering of stick movement left and right.
  17. Trimmer associated with #15 adjust centering of stick movement up and down.
  18. Dual rate switch for Ch. 4 (not used)
  19. Adjustment for #18 (not used)
  20. Eyes to turns coupling-makes Ch. 4 move with Ch. 1 so eyes look in the direction the robot is turning.
- Cirrus RC Controls**
21. Adjuster for #20 affects amount of coupling of Ch. 1 to Ch. 4.

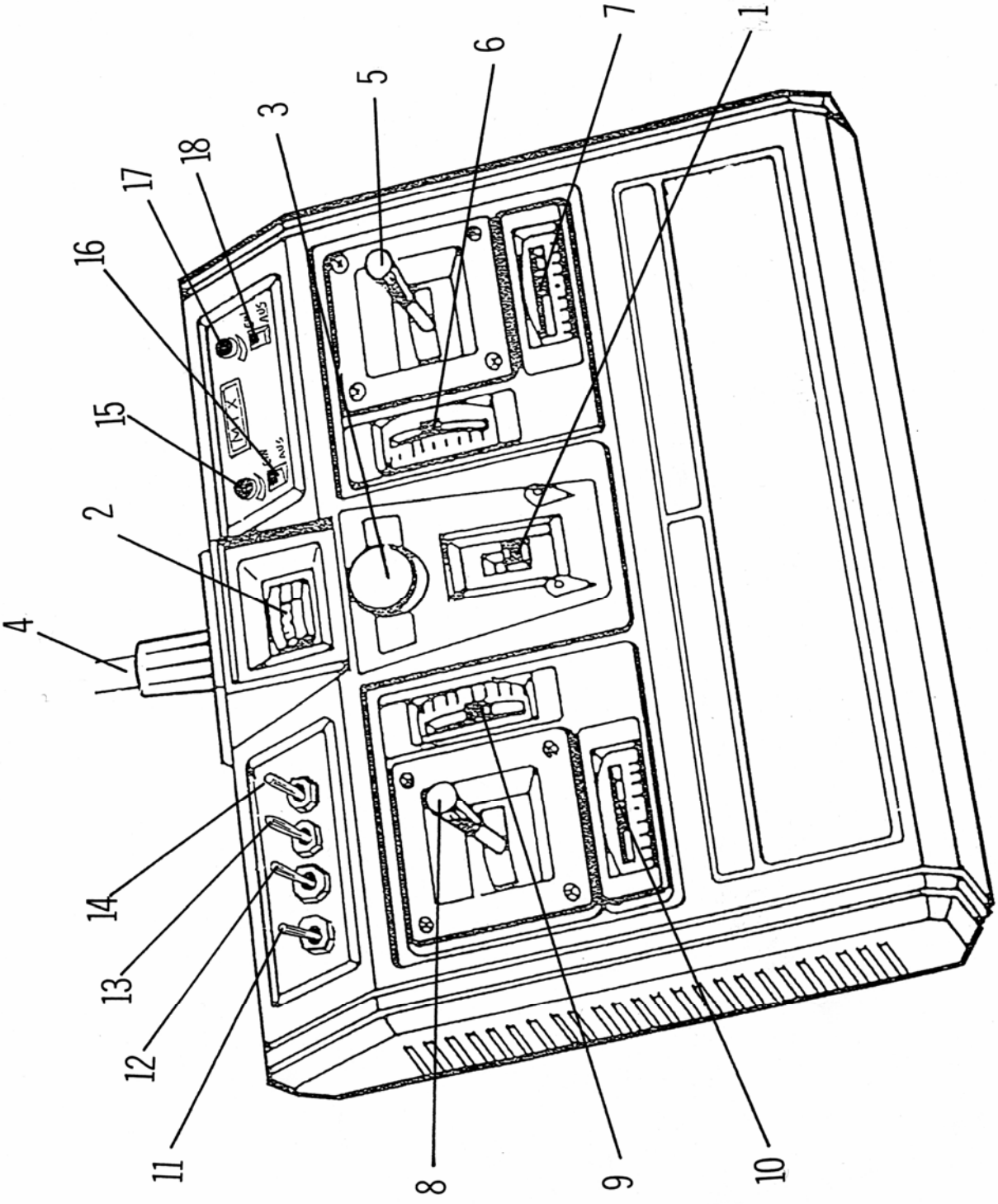
22. Mixer switch (should be on)-mixes channels 1 and 2 equaling together for proper steering and drive control of the robot.
23. Channel 6 control lever – used normally for control of the right eyelid.
24. Channel 7 control lever- used normally for control of the left eyelid.
25. Reversal switches for channels 1 through 6.
26. Channel 5 lever switch- 3 position switch controls “on-off” functions of the robot. Center position is off. Usually this is headlights and beacon.
27. Trainer switch- not used.
28. Trainer jack- not used.

# Cirrus RC Receiver Connection Detail





# RADIO CONTROL TRANSMITTER (Robbe Terra Top)



# RC TRANSMITTER CONTROLS

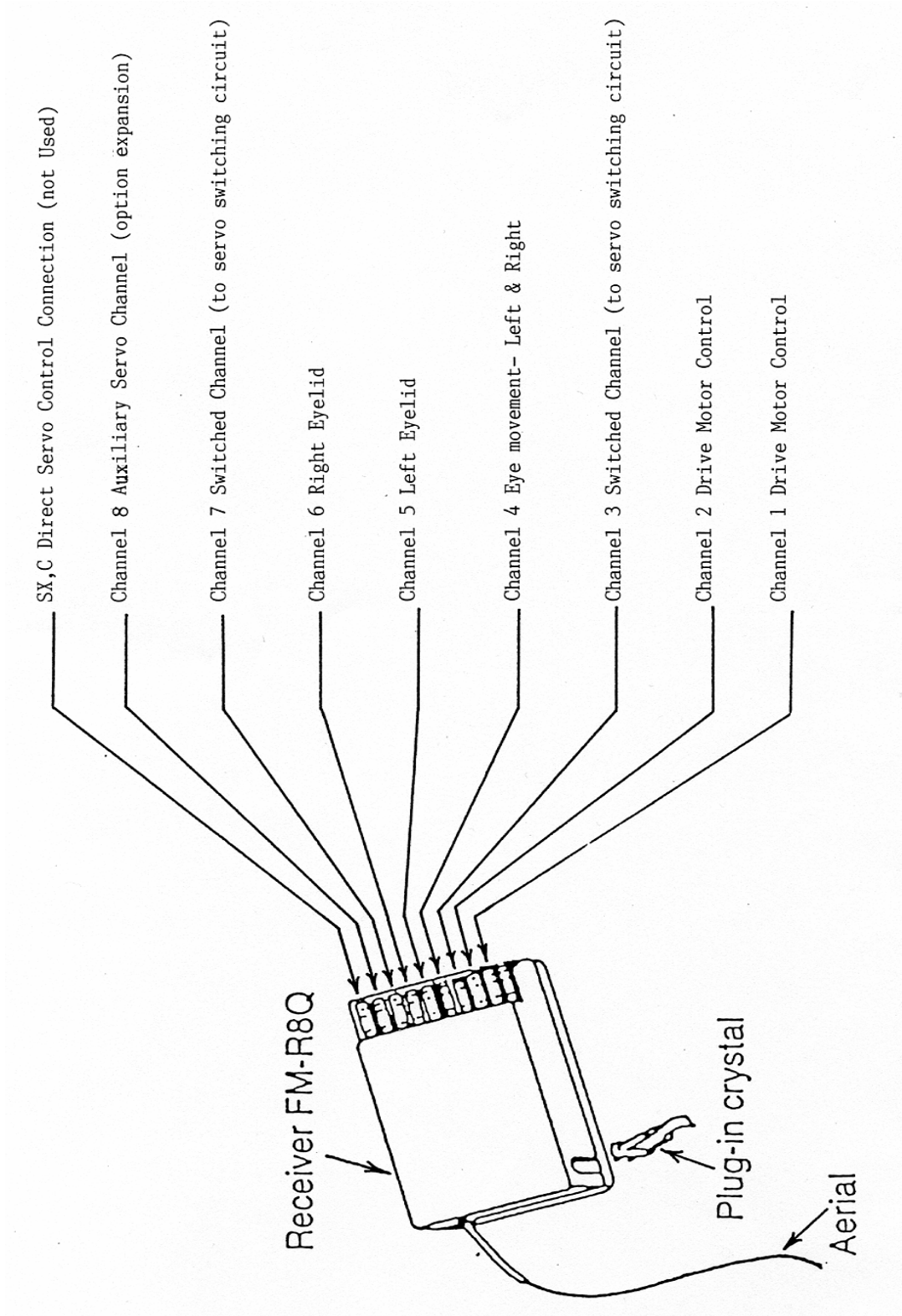
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**Note:** The following information on the transmitter controls includes information for a variety of similar robots.

---

1. Power Switch.
2. Transmitter Battery Voltage Meter (Expand Scale Voltmeter)
3. Transmitter Battery charge Socket.
4. Telescopic Transmitter Aerial.
5. Right control Stick-  
Up and Down – Robot drive motors, forward and reverse.  
Right and Left – Robot drive motors steering. Left and right turns.
6. Forward/Reverse Trim lever for right control stick. Normal = Center. Neutrals the drive motors. If the robot is moving slightly slide this a few clicks until robot stops moving.
7. Left and Right Turns Trim Tab.
8. Left Control Stick  
Left and right movement - Turning of the eyes left and right.  
Up- Tape and Down– Siren
9. Up/Down Trim Tab for left control stick.
10. Left and right Trim lever for right control stick. Normal = Center. Neutrals the drive motors. If the robot is moving slightly slide this a few clicks until robot stops moving.
11. Switch-Left eyelid open and close.
12. Switch- Right eyelid open and close.
13. Switch: Up- Light bar or flashing red light / Down- Yellow flashing on Bus and Body lights on other Vehicles
14. Switch: Up- aux. Option / Down- Water Squirter
15. Mixing adjustor (Fully clockwise)
16. Mix On-Off (ON)
17. Mixing adjustor (Fully clockwise)
18. Mix On-Off (ON)

# RC Receiver Connection Detail



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

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



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

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

### NI-MH RC Battery and Charger Specifications

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

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

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



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

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

## CHAPTER 3 Voice System

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

The second voice link transmits the audio detected by the Mic element (located in the front of the robot) to the 151 receiver (which is worn by the operator). This is amplified and sent to the speaker in the operator's headset.

---

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

---

### Location of Voice Units

Voice Transmitter -	Operator wears
Voice Receiver -	On the frame in the lower robot.
151 Transmitter -	On the frame connected to the microphone wire coming from the microphone on the hood.
151 Receiver -	Operator wears

### How to Operate the Operator's Transmitter

1. Open the battery door.
2. Use a 9 volt alkaline battery and insert it according to the diagram inside the battery compartment.
3. Place the headset on your head and adjust the microphone to approximately 1 inch from your mouth.
4. Plug the round connector from the headset into the top of the transmitter.
5. Move slide switches to the "ON" position.
6. On the UB-10 there is a volume adjust on the unit.

### Function of the LED

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

<p><b>Tip:</b> 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.</p>
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## How to Operate the Receiver (in Robot)

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

### Function of the LEDs

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

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

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

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

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

### Function of the LED

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

## How to Operate the 151 Receiver (Operator)

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

### Function of LED

When turning the volume knob on with a fresh alkaline battery, the red light will blink 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.



### **Warnings**

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

## **Troubleshooting the Voice**

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

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

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



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

## MOVING MOUTH

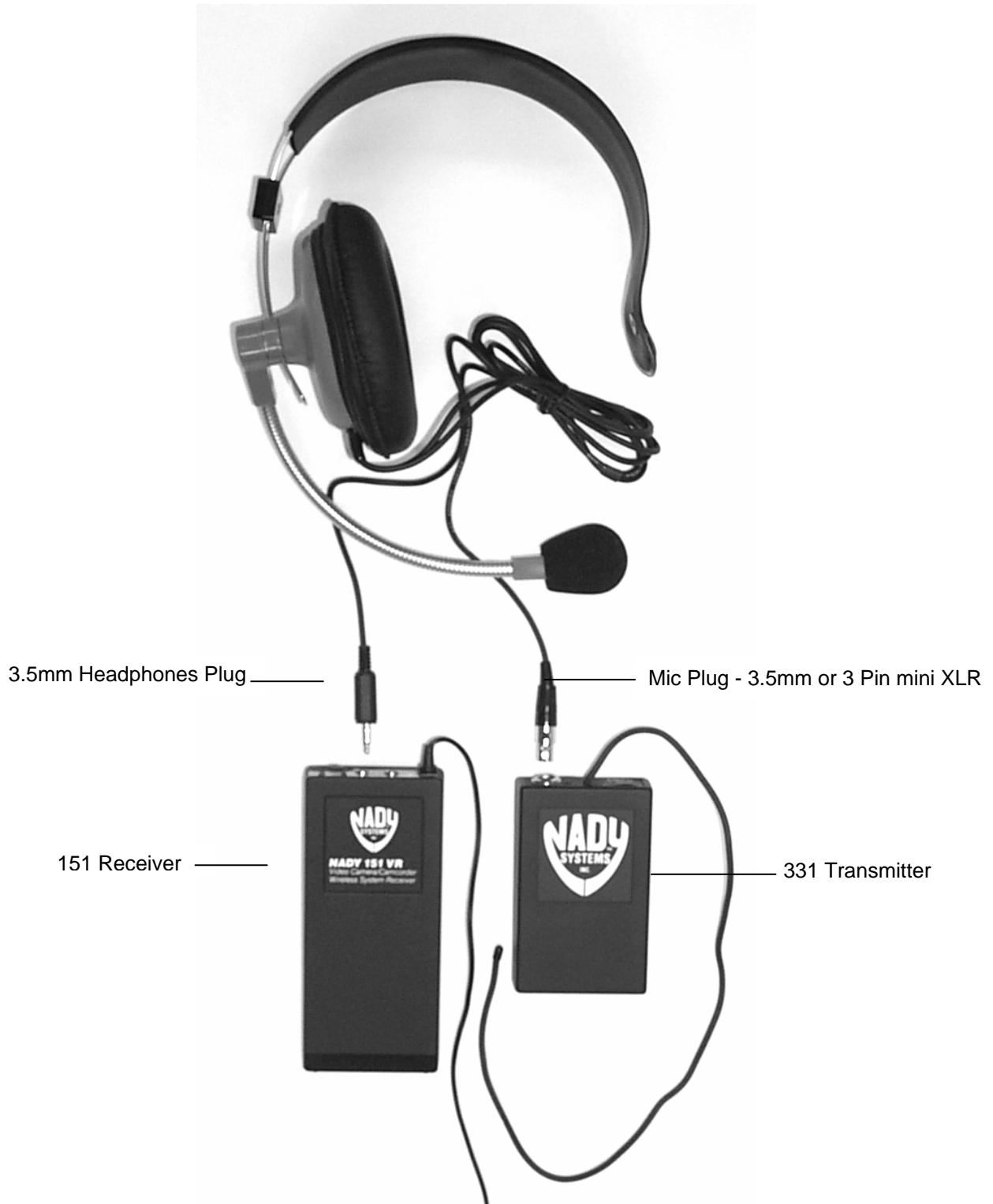
Function- The moving mouth is a feature where the mouth moves as the operator speaks through the robot. The amount of the movement is effected by the level of volume of the voice. This level is effected by the Receiver volume level and the position of the headset microphone to the operator's mouth. The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

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

### Location of the Adjustment

Main Electronics Box in Vehicle.

# Operator's Voice Transmitter and Receiver



**VOICE UNIT DIAGRAMS**

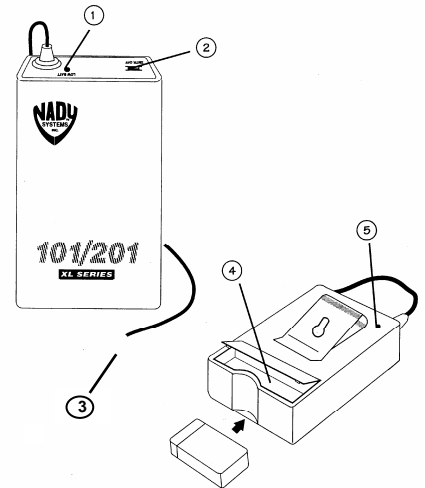
**101 (Operator to Robot)**

**331 Transmitter Operation**  
**Operator-labeled LT-SX Transmitter**

- (1) **Low Battery indicator-** Will give a single quick flash when the on/off switch is turned on. When the 9-volt battery is low it will be on constant.
  - (2) **Off/Mute/On switch-** With flip open battery door-switch toward the outside is on. With Slide open battery door-switch toward the center is on. On some models there is a separate audio switch.
  - (3) **Antenna**
  - (4) **Battery Compartment**
  - (5) **Audio level trim-** Effects the speaking volume of the robot. Factory preset to maximum, which is fully clockwise.
- Plug the headset into the 3-pin jack in the center.

**USE ALKALINE TYPE 9 VOLT BATTERIES**

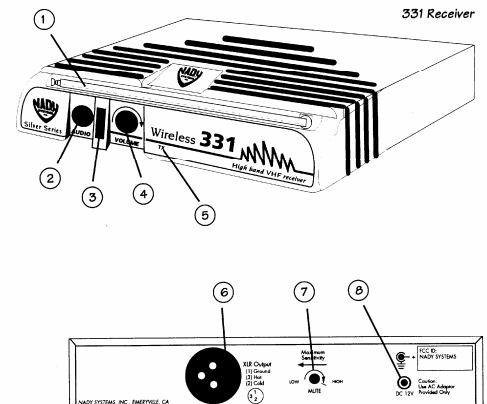
**331 TRANSMITTER**



**331 Receiver Operation (Robot)**

- (1) **Antenna-** Extend as much as possible for greater range.
- (2) **Audio Out Jack-** Outputs audio to go to the audio booster and then the speakers.
- (3) **Power switch-** LED lights when unit is switched on and getting power. Leave on because unit powers up when the robot is turned on.
- (4) **volume adjust**
- (5) **Red TX LED-** It is on when the 101 transmitter is on because a signal is being sent and received.
- (6) **Audio Out** – XLR microphone level output socket. Unused.
- (7) **Mute control (Sensitivity)-** Used if RF activity in your area causes loud static through the robot when the 101 transmitter is off. In this case, turn it about 1/8 turn counter-clockwise to eliminate the static. Turning too far will effect range.
- (8) **Power input jack- CAUTION:** Do not plug in or unplug with the robot power on.

**331 RECEIVER**



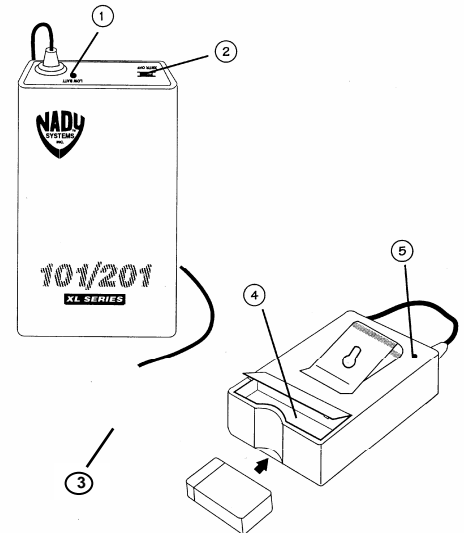
**VOICE UNIT DIAGRAMS****151 (Robot to Operator)****151 Transmitter Operation**  
**(Robot- labeled LT-SX Transmitter)**

The switches are preset at the factory to be on and the adjustment at maximum.

- (1) **Low Battery indicator**- Will give a single quick flash when the on/off switch is turned on. Because this unit gets power from the main robot battery if it stays on, the main battery is low.
- (2) **Off/Mute/On switch**- With flip open battery door-switch toward the outside is on. With Slide open battery door-switch toward the center is on. On some models there is a separate audio switch.
- (3) **Antenna**
- (4) **Battery Compartment**
- (5) **Audio level trim**- Effects the speaking volume of the robot. Factory preset to maximum, which is fully clockwise.

Plug the headset into the 3-pin jack in the center.

**USE ALKALINE TYPE 9 VOLT BATTERIES**

**151 TRANSMITTER**

No 9V battery is needed in robot transmitter

**151 Receiver Operation (Operator)**

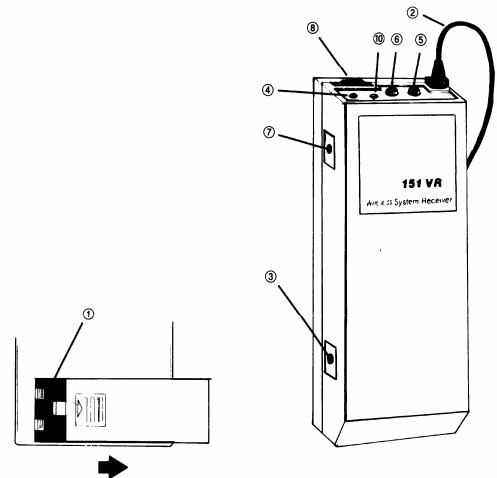
- (1) Slide off the battery door and insert a 9 Volt battery observing correct polarity.

Turn the receiver on by rotating the on/off volume wheel (8) clockwise. The **LOW BATTERY LED** (10) will flash briefly, indicating adequate battery strength. If the LOW BATT. LED is on constant, during use, replace the battery.

- (2) **Antenna**- Hang down fully. Do not allow it to wrap around the headset wire or other antenna.
- (3) **Mute control**- Used if RF activity in your area causes a loud static sound in your headset when the robot is off. In this case, turn it clockwise slightly to eliminate the static. Caution: Turning too far will effect the range.
- (4) **Green TX LED**- Is on when the robot is on because it indicates that the receiver is picking up a transmission.
- (5) & (7) Unused.

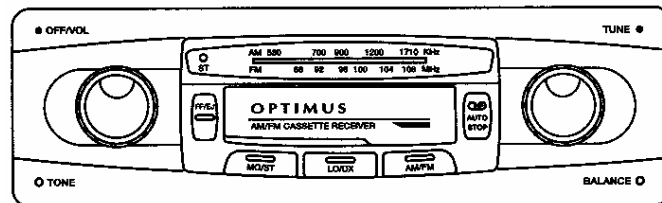
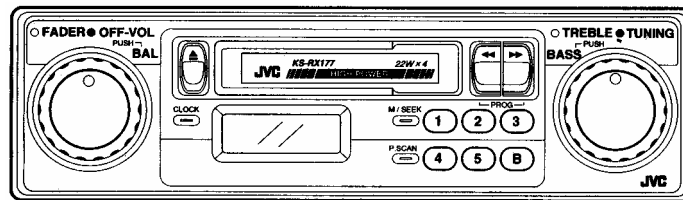
- (6) **Headphones jack**- Plug the headset into it.

**USE ALKALINE TYPE 9-VOLT BATTERIES.**

**151 RECEIVER**

## CHAPTER 4 Cassette Tape System

The cassette tape player is located inside the robot on the frame. When you pop off the cap, you will see it. If you have a tape in the tape player, to play the music just hit the tape switch on the radio control. Pluggies will get different models of tape players depending on what is currently available. Two common types are shown below with their controls.



### How To Play A Cassette Tape

1. Insert a regular type cassette tape into the player with its open side facing right until it locks into position.
2. Activate the tape from the control box.
3. Adjust the volume, balance and tone to the desired level.
4. Press **FF** if you need to cue the music on a different song.

### Correcting Tape Tension

Before you load a cassette in your cassette player, take up any slack in the tape by turning the cassette's hub with a pencil, as shown. Tape that is too loose might tangle in the cassette player's playback mechanisms. Do not touch the tape. If you play one cassette a lot, the tape can wind too tightly on a hub and distort when you play it. To restore the tape's normal tension, fast-forward the entire tape and then completely rewind it.

### Care and cleaning of the Cassette Player

The tape head of the cassette player should be cleaned after every 20 hours of use. Always remove the cassette tape when not in use. This will prevent flat spots on the capstan

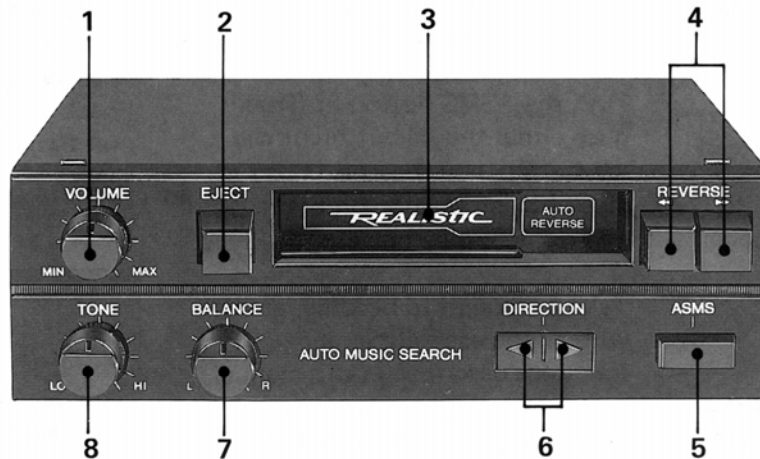
roller. Protect the cassette player from dust and dirt, which can cause premature wear of parts. The best the way to do this is to keep a robot cover on the robot when it is not being used.

### Trouble-Shooting

1. Is cassette fully inserted.
2. Is the cassette unit receiving power?  
If not check the wiring, plugs and the **audio fuse** on the fuse block.
3. Check the volume control.
4. Is the Radio Control Transmitter "ON" and working? Check if all other functions on the robot working. Listen for the cassette motor. If you hear the cassette motor but no sound, check the connections going from the booster to the speakers. Also check if the voice audio is working through the robot. if it is not, the audio wire on the main circuit board could have come off or the wires are broken. Check the **audio out** connection on the main circuit board.
5. If sound quality is poor, test the cassette tape on some other player. If cassette tape is OK, clean player and try again.

# CASSETTE/AMP CONTROLS

## Realistic Cassette Unit



1. **VOLUME CONTROL KNOB** adjusts the volume for both speakers.

2. **EJECT BUTTON** ejects the cassette.

3. **CASSETTE LOADING SLOT** receives the cassette for play.

4. **REVERSE/FAST FORWARD BUTTONS** when pushed simultaneously, switch tracks by reversing the tape-travel direction. pushing either the << button or the >> button activates the fast-wind function, according to the direction of the arrows selected.

5. **AUTO SEARCH MUSIC SYSTEM BUTTON** when pushed in, gives you an automatic search for specific selections. When this function is activated, and then one of the REVERSE/FAST FORWARD (<< or >>) buttons is pushed, the tape moves to the beginning of the

next segment of the recording, or moves back to the beginning of the current portion of the tape, according to the directions of the arrows selected.

6. **TAPE DIRECTION INDICATORS** light to show the direction of tape travel.

7. **BALANCE CONTROL KNOB** adjusts the relative volume between the left and right channels. Rotated clockwise, it increases the volume of the right speaker; counter clockwise increases the volume of the left speaker. At center detented position, the sound level from both speakers is the same.

8. **TONE CONTROL KNOB** adjusts the treble response. rotated clockwise, it enhances the treble; counterclockwise decreases the treble.



## CHAPTER 5 Siren

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

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

### Troubleshooting – Siren

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

## CHAPTER 6 Robot Battery System

### ROBOT BATTERY

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

### How to Recharge

To recharge the robot battery, first open the trunk hatch and unplug the battery from the main component board. Next connect the charger wire to the battery. Finally connect the line cord of the charger into a 110-volt AC outlet. Leave the trunk cover off or open during charging for ventilation. The robot is supplied with an automatic type battery charger. This will recharge the battery full in 10 to 14 hours. This type of charger will not overcharge the battery if left "ON" indefinitely. Avoid leaving it charging for more than 5 days. Generally remove the battery from the charger when the charger indicates a full charge.

More charging instructions are in the charger section

### Cautions



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

It is best not to allow the robot battery to go completely dead as this shortens the life of the battery and makes recharging more difficult. **Fully charge the battery after each use.**

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



## ROBOT BATTERY CHARGER

### Instructions for Proper Use and Operation

#### WARNING: HAZARD OF EXPLOSIVE GAS MIXTURE

When charging, a lead acid battery gives off hydrogen gas. The 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. Do not position your face over the battery, at any time while making connections.
2. Do not smoke, strike a match, or cause a spark in the vicinity of the battery during charging.
3. Charge battery in a dry, well ventilated area.
4. Always unplug the AC supply cord before connecting or disconnecting the charger leads from the battery.

As additional protection from the hazard of electrical shock:


5. Do not expose the charger to rain.
6. Replace defective cords and wires immediately.

### General Information for Charging Gel type Batteries

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

2. When fully charged, a new battery in good condition may cause the meter to "bounce" around the "0" mark. This is normal and, in fact, indicates a true "full" charge.

As it ages or is wearing out, a battery may, in some cases, not drop below 1 ampere no matter how long it is left connected to the charger.

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

4. In some cases, a severely discharged battery can cause the circuit breaker to open because the battery is drawing more current than the charger can safely provide. If such is the case, it is permissible to let the charger run for as much as 10 minutes with the circuit breaker

#### **Robot Battery Charger**

turning the charger on and off. The circuit breaker resets automatically. There is no reset button provided.

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

5. In some cases, a battery, which is discharged completely, will not draw any noticeable current when the charger is connected and the power cord plugged in. A battery that behaves in this way is most likely in a "sulfated" condition. The condition is caused by leaving a battery in a discharged condition for a length of time.

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

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

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

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

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

## CHAPTER 7 Drive Motor System

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

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

### Trouble-Shooting Drive

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

1. **Do the other radio control functions operate?** Do the other RC features work such as siren and tape? If they do not, check the fuses on the robot battery and fuses on the main fuse block in the main electronics box. Especially look at the fuse labeled 5 Volt Regulator Processor and 5 Volt Regulator Receiver (see the fuse block detail in the Appendix).
2. **Check drive belts and motor pulley set screws.** Especially if you hear the motors activate but the robot does not move.
3. **Check connections to power drivers and motors.** These are blue and white wires coming from the power drivers and going to the drive motors. The joystick could be pushed in the on position while the connector is being checked for an intermittent connection.

Perform the following depending on the symptoms indicated:

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

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**Neither drive operates:** Check the in line fuse on the power wires that are black and red coming from the power drivers. Check the channels on the radio control that control the drive. You can change a function wire at the receiver into a drive channel to see if the channel works.

**One drive does not operate either direction:** Check the in line fuse on the power wires that are black and red coming from the power drivers.

- **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/white wires connected to the power driver in the middle of Pluggie. 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 power driver or speed controller could be the cause of the problem. Since there are two power drivers and two speed controllers, do a swap test to determine what component is the problem.

**One drive motor operates only in one direction:** On a Robbe Terra Top RC, make sure the mix module switches on in the on ein position. The adjustments should be fully clockwise. Contact the Robotronics' Service Department.

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

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**Note:** Be sure that both motors are operating forward and reverse at about the same speed, and that the motor pulley set screws and drive belts are tight. If this adjustment is done when there is something else wrong other than the adjustment, it will be difficult to get this adjustment back after the actual problem is corrected.

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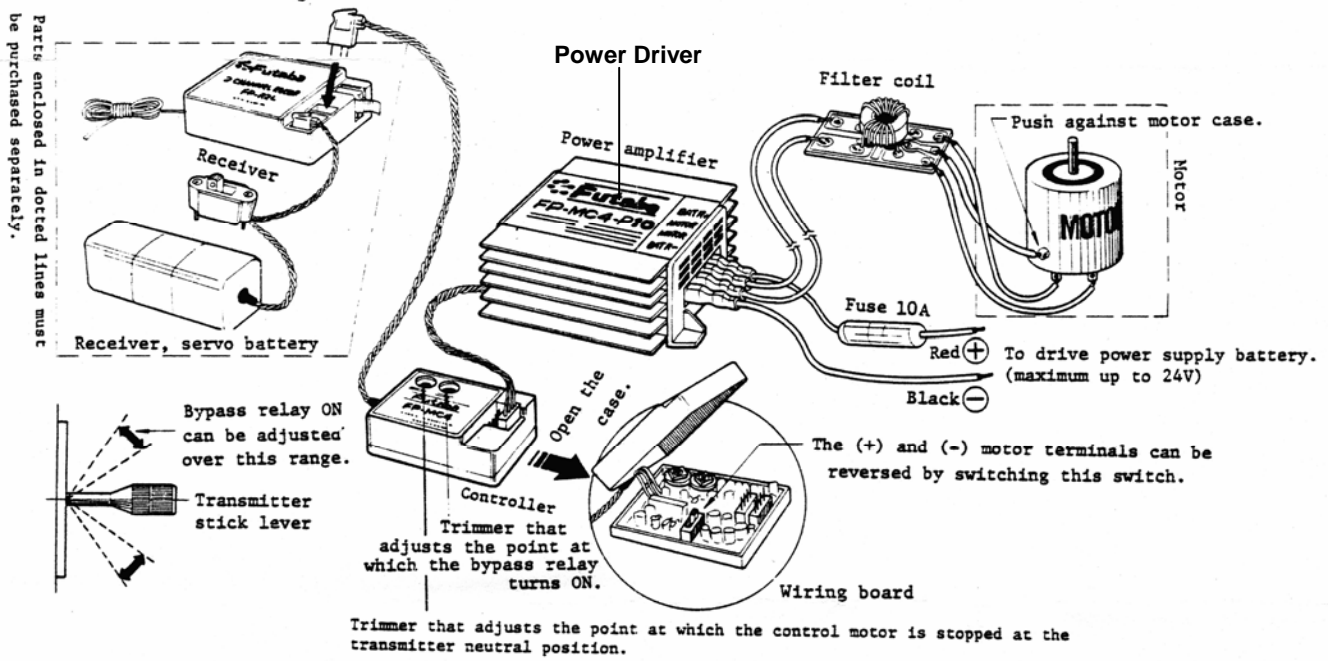
Find the bypass adjustment on the speed controllers. This adjustment slows the motor down when turned clockwise. On the side that is going too fast, adjust this until the robot is driving straighter.



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. 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.

## Drive System Components



## Speed Controller



## CHAPTER 8 Character Head Turning System

Vehicle robots that have characters driving them will have this system. The main components of this system consist of the head turning motor, motor control circuit, and the feedback pot. When you move the joystick on the radio control, a signal is sent to the receiver in the Robot. The receiver sends this signal to the microcontroller on the Character board. The motor control circuit is on the Character board. The motor control circuit is directed by the signal to send 12 Volts to the motor and in what polarity. What polarity is sent to the motor will cause the motor to move right or left.

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

### **Location of Parts**

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

Feedback pot- directly below the motor.

Set screw- on the inside of the neck.

### **Troubleshooting - Head**

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

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

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

1. The in line connector to the feedback pot has come disconnected.
2. The feedback pot shaft could have slipped out of position. The feedback pot which is a blue pot just below the head turning motor will need to be lowered clear of the tubing that joins its shaft to the shaft of the head turning motor. Now you will have access to be able turn the shaft of the feedback pot until the head comes back into center position. Bolt the pot back up into its correct position.

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

1. Check the in line fuse on the head motor wire. This is a 1.5 Amp fast acting fuse.
2. Check the motor wire to see if it came disconnected at its in line connection.
3. The Character board is not getting power- if this is the case you would not be getting eyelid movement. Check the fuse inside the main electronics box. See the main electronics box diagram for location of the fuse.

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



## CHAPTER 9 Eyelids and Eyes Left and Right

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

### Troubleshooting - Eyes

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

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

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

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

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

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

## CHAPTER 10 OPTIONAL ACCESSORIES

### WATER SQUIRTER SYSTEM

#### Water Squirter parts and where to find them

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

**Refill bottle** - Comes with the robot.

**Water squirter nozzle** - Typically located in the front of the lower robot. In the mouth on some models

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

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

**Overflow nozzle** –Under the back of the robot.

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

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

#### How to fill your water squirter system

1. Unplug the water line coming from the water squirter nozzle to the female water connector and plug in the filler bottle in its place.
2. Hold the water squirter switch on the robot in the momentary position and the water will pump from the filler bottle to the reservoir. You will know the reservoir is full when water comes out the overflow. There is a change in the sound of the motor when the water starts filling and then another change when it is full.
3. Plug the water line back in and switch the water squirter switch to the "on" position.

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

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



#### CAUTION

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

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

Water Reservoir

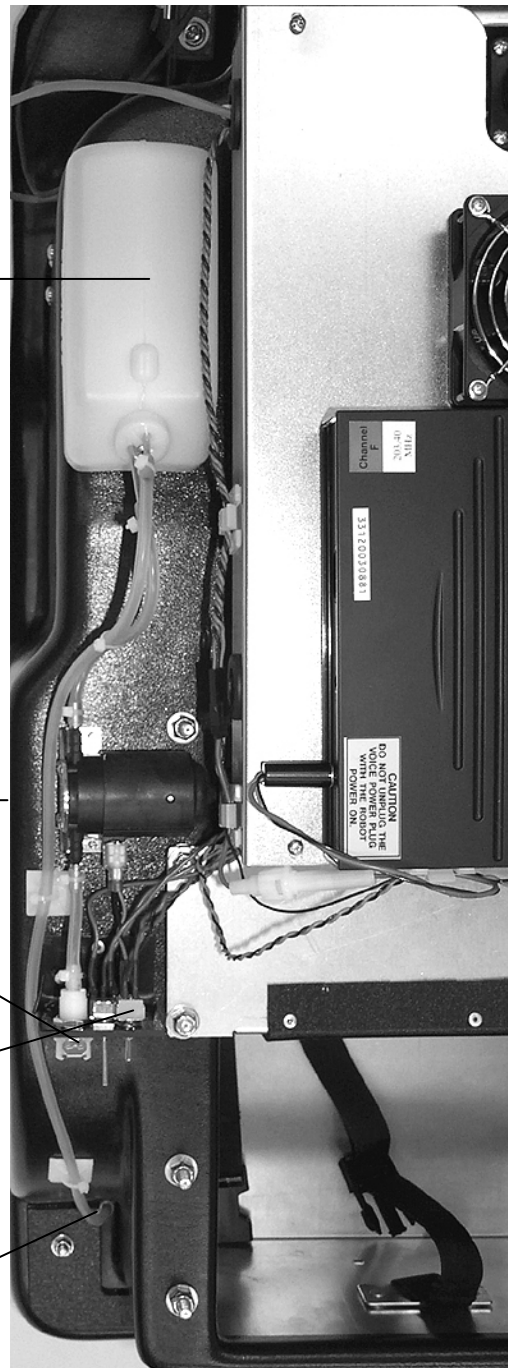
**Note**  
On earlier models these elements are in the front of the robot and the water squirter switch is under the front bumper.

Water pump

Female Water Connector

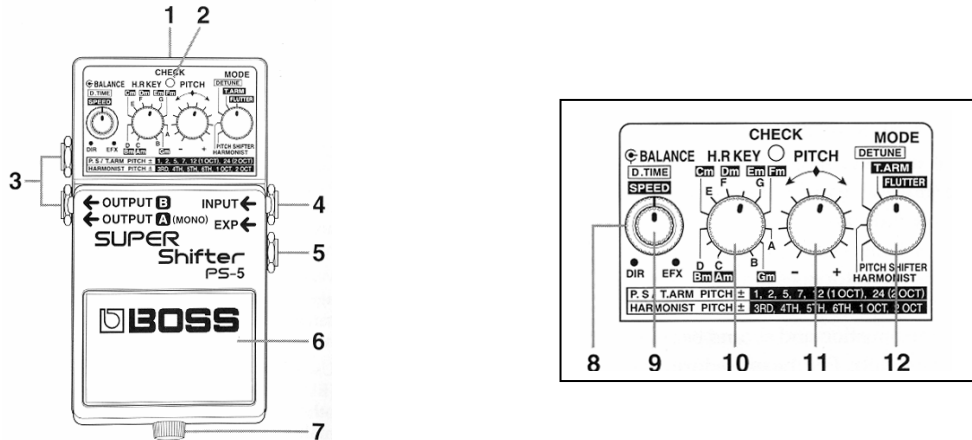
Water squirter switch

Overflow nozzle



## 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.

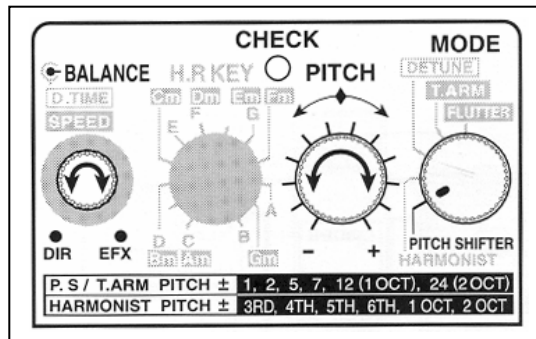
The pedal on the pitch shifter is used to turn it on and off. When the pitch shifter is on, the power light labeled 'check' will be lit. The shifter will take a few seconds to power up. To turn it off, push the pedal again. If the pitch shifter is not turned on, your unmodified voice will come through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

The pitch shifter has two basic effects; a digital pitch shifter and a delay. There are many variations of these two effects. When used as a pitch shifter, you can vary the shift within +/- 2 octaves. Set the mode knob to Pitch shifter and then vary the pitch knob until you get the sound of voice that you want. You can get a similar effect with the harmonist position but the pitch shifter gives you the best sound. These are the most common modes used because these modes give you the ability to adjust the shift of your voice to exactly what you want whether up or down. About 2:00 on the pitch knob gives you a good voice.

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

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

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



## PART 3

### CHAPTER 11 Assembly & Disassembly

#### Interchanging or removing the body:

1. Remove the upper robot (top).
2. Remove the four nuts under the front and rear bumper that hold the body on the frame. You will need a 3/8" socket or wrench.
3. Disconnect the headlights wire and microphone wire from the transmitter.
4. Lift the body off the frame.
5. Install the new body, re-connect the wires and put the nuts back on under the bumpers.
6. Put the upper robot on; connect the 37-pin connection and pop the body latch pins outward to hold the top on.

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

1. Set the upper robot on the lower robot body.
2. Locate the four body latches and push the pins outward into the body to secure the upper robot to the lower. If you have a typical vehicle robot, two are in the middle left and right and two at the back. To latch these you will need to reach in through the rear hatch. If you have a character in the top, two of the latches are located in the compartment where the Character sits. The pins are to the left and right of Character.
3. Connect the 37-pin connector that is a round connector and wire bundle running from the upper robot to the lower robot. When connecting this rotate it until it sits down into its mate connection and turn the ring until it is secure.

Reverse order for removal.



#### **CAUTION**

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

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

1. Disconnect the battery connector before working with or removing the main electronics box. There are 4 nuts to remove at the back bracket of the main box. There are some wires to disconnect also. These include the speaker wires, headlights, drive motor wires (blue and yellow), power wire to the 151-voice transmitter, and the receiver antenna wire.
2. Now lift up on the back of the panel until it clears the 4 studs, then slide the box back and out. When removing, do it slowly, making sure that all wires are disconnected.

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

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

Installing the drive base back into the body:

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

Reverse steps for disassembly or assembly.

## PART 4

### CHAPTER 12 Maintenance

#### Regular Maintenance Checklist

Periodically the robot should receive a thorough inspection.

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

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

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



## Recommended Tool Kit

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

## 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. **Do not get the robot wet!** There are certain foam carpet & upholstery cleaners that work good also such as Armor-All or Woolite upholstery cleaners. Typically you spray the foam on the area, wait for about 3 minutes and then wipe off with a damp white terry cloth. Finally rub gently with a dry towel and brush the fur if needed.

## PAINTING OF THE ROBOT BODY

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

### Preparing the surface:

The robot body is an **ABS plastic** and should be cleaned before painting to remove oils and dirt. This is especially true if the surface has had a silicone-based product such as Armor-All put on it. Clean the plastic with a plastic cleaner designed to clean before painting. Use a 600-grit sandpaper to smooth the scratches before painting. You can use a body filler, like Bondo to fill the scratches then sand them out again after it's dry. You may also rough up the surface with 600-grit sandpaper or a Scotch-Brite 7448 pad for better adhesion. This is not a required step.

### Painting the surface:

#### Method 1

Enamel spray paints such as Krylon Interior/Exterior enamel does adhere to the body. This method can be touched up easily if the paint ever gets scratched. This is typically a method for painting trim, bumpers, gauge plates etc. Carefully cover parts that are not to be painted with masking tape and paper, to protect against over spray. Use a very narrow masking tape to tape the line and then much larger tape beyond that.

#### Method 2

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.

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

#### ***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)

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

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

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

## REPAIR OF THE ROBOT BODY

### Materials

Super glue

ABS or PVC clear medium bodied glue

Fiberglass mesh

Rubber gloves

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

### General Precautions:

Use in a well ventilated area.


Use gloves to avoid getting glue on your hands.

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

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

## STORAGE

Storing your robot for any length of time.

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

# APPENDIX A

## Quick Reference Troubleshooting

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

Problem	Cause	Solution
<b>General</b>		
No functions operate	<ol style="list-style-type: none"> <li>1.RC battery not charged</li> <li>2.Broken wire from the receiver to main board</li> <li>3.Fuse blown.</li> <li>4.Main board in robot not getting power</li> <li>5.Radio Control transmitter or Receiver Crystal broken.</li> </ol>	<ol style="list-style-type: none"> <li>1. Fully charge until the needle is up.</li> <li>2. Resolder or repair wire.</li> <li>3. Check 5 Volt Reg. and processor fuse.</li> <li>4. Check pins of battery and robot connector. Check on/off switch wires. Check ground wires.</li> <li>5. Replace crystals. Send RC and Receiver in to determine if it is a crystal.</li> </ol>
<b>Voice System</b>		
<u>Always do the following first:</u>		
<ol style="list-style-type: none"> <li>6. Replace the 9 Volt batteries with new ones. USE ALKALINE!</li> <li>7. Bend the battery contact out for better contact with the post of the 9 Volt battery.</li> <li>8. Check power and audio switches, and lights on all voice units.</li> <li>9. Check plug to and from the voices for proper connection.</li> <li>10. Check if the transmit (TX) lights are coming on.</li> </ol>		
Operator cannot talk	<ol style="list-style-type: none"> <li>1. Low Battery. LED on steady or no LED flash.</li> <li>2. Battery posts not touching the metal clips in the operator's transmitter.</li> <li>3. No power to the 101 Receiver. If yes, continue.</li> <li>4. No TX light on the Receiver. If yes, continue.</li> <li>5. Audio wires going through pitch shifter connected wrong.</li> <li>6. Headset plug to transmitter broken.</li> <li>7. Still not working. Call Robotronics.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace the 9 Volt battery. Is battery inserted in correct polarity?</li> <li>2. Bend out the metal clips. Put foam under clips.</li> <li>3. Check the in line fuse to the Receiver in robot and audio fuse on main fuse block.</li> <li>4. Check Sensitivity adjustment on back of Receiver. It should be on Max. Sens.</li> <li>5. The wire should go from audio out of receiver to <b>input</b> of pitch shifter, then from <b>output A</b> into the main box and plug on to the main board.</li> <li>6. Take apart and look for broken wire or solder joint. TEST- Connect robot mic to transmitter. If it now works, problem is in headset. Repair or replace.</li> <li>Send transmitter, receiver, and headset in.</li> </ol>
Operator cannot hear	<ol style="list-style-type: none"> <li>1. Low Battery. LED on steady or no LED flash.</li> <li>2. Battery posts not touching the metal clips in the operator's receiver</li> <li>3. Headset plug to 151 RX has a broken wire.</li> <li>4. Robot 151 transmitter not turned on.</li> <li>5. Power plug to robot 151 transmitter unplugged.</li> <li>6. If you have no TX light on 151 RX mute could be out of adjustment</li> <li>7. Robot microphone in robot is bad.</li> <li>8. Still not working. Call Robotronics.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace the 9 Volt battery.</li> <li>2. Bend out the metal clips. Put foam under clips.</li> <li>3. Unscrew cover of plug and look for broken wire.</li> <li>4. Turn on audio and power.</li> <li>5. Find wire and plug it back in.</li> <li>6. Adjust the mute on the 151 RX to max. which is fully CCW.</li> <li>7. Order a replacement. TEST- Plug your headset into the robot transmitter in place of the robot microphone and test.</li> <li>8. Send robot mic, transmitter, receiver, and headset.</li> </ol>
Voice Operates but cuts out. Should get 50 feet without any cutouts.	<ol style="list-style-type: none"> <li>1. Low Battery.</li> <li>2. Sensitivity Adjustment down too far.</li> <li>3. Broken, loose or retracted antenna</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace the 9 Volt battery.</li> <li>2. Sensitivity adjustments should be at max. on the 151 Receiver and robot receiver.</li> <li>3. Extend robot receiver antenna or replace broken antenna.</li> </ol>
Squelch coming from robot	<ol style="list-style-type: none"> <li>1. No signal being sent to the robot</li> <li>2. Sensitivity is too sensitive.</li> </ol>	<ol style="list-style-type: none"> <li>1. Turn on the operator's transmitter.</li> <li>2. Very slightly adjust sensitivity down from max. (This will decrease your range)</li> </ol>
Squelch in headset when turning robot off.	<ol style="list-style-type: none"> <li>1. 151 Receiver slightly too sensitive.</li> <li>2. 151 RX picking up interference in your area.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust 151 RX mute slightly CW</li> <li>2. Always turn off 151 RX the robot.</li> </ol>
<b>Quick Reference Trouble-shooting</b>		
<b>Problem</b>	<b>Cause</b>	<b>Solution</b>

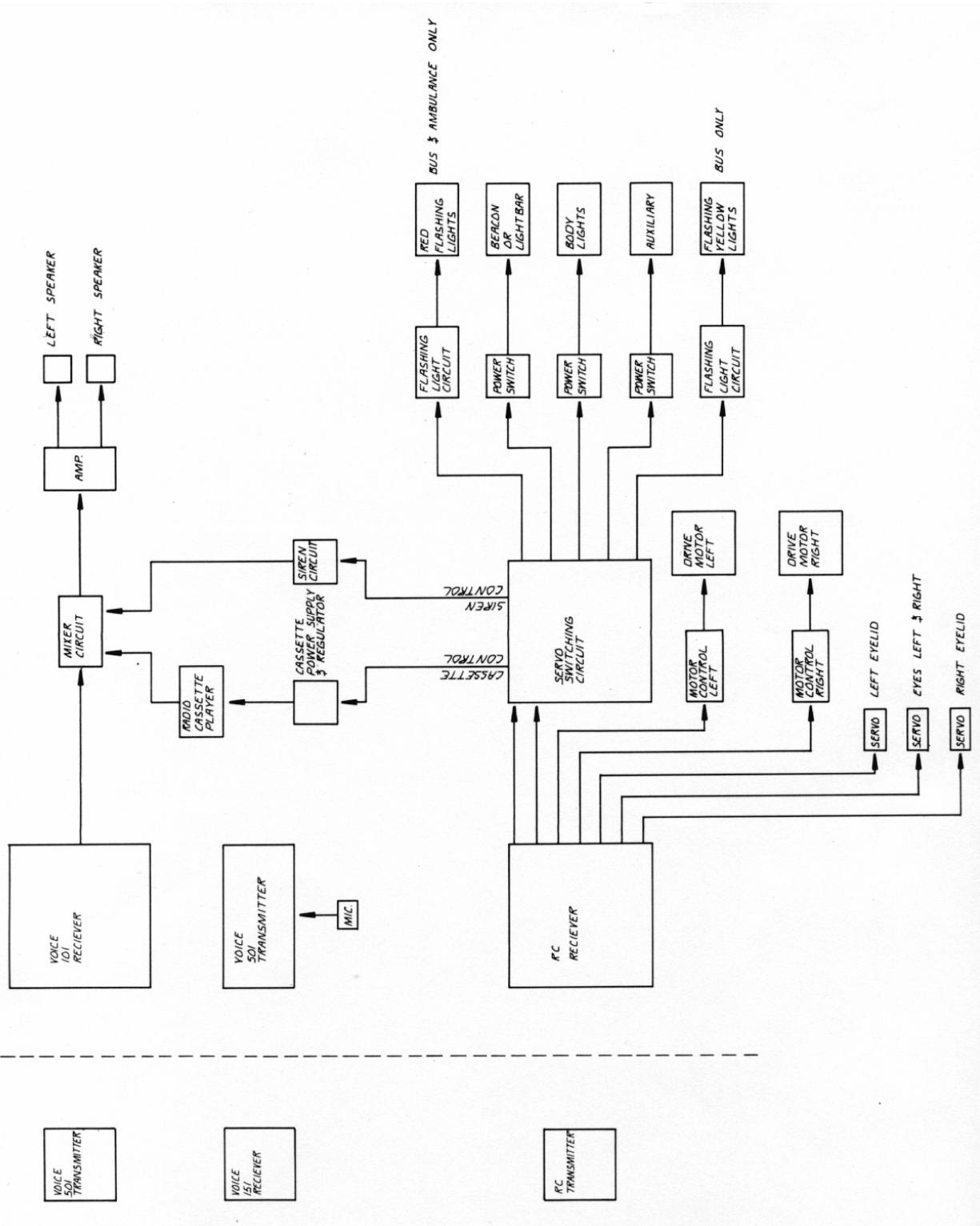
<b>Cassette Player</b> No tape operation	1. Tape player not on tape mode or volume not turned up.	1. Put mode select to tape and turn volume up.
	2. Play button not pushed	2. Must push play button before hitting the switch on the radio control.
	3. Bad Tape.	3. Check tape in other tape player.
	4. Tape is too tight.	4. Loosen with a pencil by spinning tape.
	5. Player is not getting power because power wire or plug is broken.	5. Check for 3 Volts at power plug. Replace plug or repair the wire.
	6. Power or audio wire has come disconnected from the main board.	6. Open the main box and re-connect to board.
	7. Radio control or tape circuit not working	7. Contact Robotronics for help.
No siren, or voice either.	1. Audio booster not getting power.	1. Make sure the audio booster button is on and that the red/black wire is plugged on to the board.
Poor quality sound or slow.	1. Belts worn out and slipping.	1. Replace cassette player or belts.
<b>Siren</b> No siren	1. Check the main fuse on the main circuit board.	1. Replace fuse.
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.
<b>Robot Battery System</b> No functions will operate.	1. Check wires and connector from battery to the robot.	1. Push battery connector pins in until it clicks in place. Pin could have slipped out of position.
	2. Battery is very low or bad.	2. Charge battery or replace if it will not charge. Also test charger.
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.
<b>Drive Motors</b> 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.	1. Tighten motor pulley set screws.
	2. Broken connection at motor connector.	2. Check blue/yellow wires and in line motor connector at motor
	3. Drive circuit not getting power.	3. Check drive motor fuses on fuse block (blue wires). Check wires coming from fuse block to motor circuit on the main board. Broken solder joint?
	4. Drive motor damaged.	4. Repair or replace motor.
	5. Drive Circuit on main board problem.	5. Send main electronics box back to Service Dept.
Drive motors moving on their own even when the stick is in the center.	1. Drive trim sliders not in center.	1. Move drive stick sliders to center or position to neutral the robot.
	2. Joystick potentiometer broken.	2. Send to Robotronics for repair.
Robot not driving straight.	1. One motor pulley set screw loose.	1. Tighten set screws.
	2. Straight drive adjustment needs to be adjusted.	2. Find adjustment on the main circuit board. See diagram of main board in Appendix.
<b>Character Head Turning System</b> Head is out of position but operates.	1. Loose head set screw or head was hit.	1. Re-position head and tighten set screw. Better to do this with the robot on.
Head motor is keeping head in not centered position	1. 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	1. Check fuse on main fuse block.
	2. Broken wire.	2. Check power (red/black) and motor wire (blue/yellow).
<b>Eyelids and Eyes Left and Right</b> An eyelid or eyes L/R does not operate	1. Rod linkage came off.	1. Get to eyelid rods and ball links and re-attach.
	2. Servo wire broken or wire came out of eye servo board	2. Trace wires from servo motor of the eyelid or eyes and follow this wire to the eye servo board to find problem.



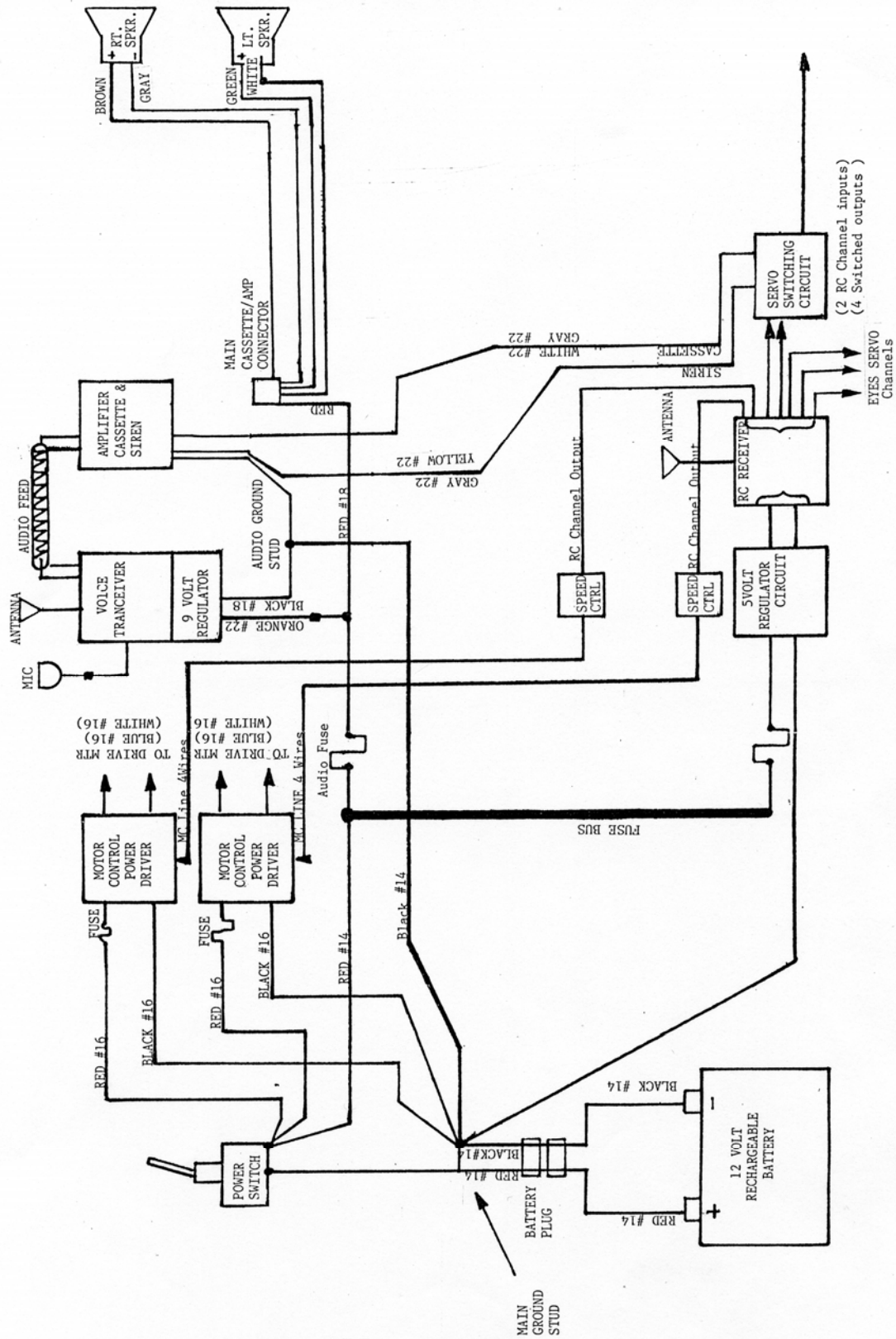
Problem	Cause	Solution
One of the eyelids is at a different level	1. Eyelid rod bent or eyelid out of adjustment	1. Straighten bent rod or change eyelid position by removing the servo arm. Then shorten or lengthen the rod by twisting the servo arm. You can also change the position of the servo arm on the servo shaft.
No operation of any eye functions.	1. Connection at eye servo board has come off.	1. Vehicle- located on underside of upper robot. Robots with Character- located in character.
	2. Wire(s) bringing 5 Volts and signal to servo board are not making a connection. Broken out of 37 pin connector.	2. Vehicles- locate the wires (red/black/gray/yellow/black) going from the 37 pin up to the eye servo board. Repair broken wiring. Robots with Character- Check gray/yellow/black and red black to eye servo board.
	3. No 5 Volts going to eye servo board.	3. Find broken wire on red/black or check fuse for eye servos on fuse block.
<b>Water Squirter</b> Cannot fill reservoir	1. In-line fuse blown.	1. Replace the 5 Amp fuse which is in-line on the wire. Follow wire from water squirter switch.
	2. Broken wire at water squirter switch or coming from main box	2. Repair break.
Cannot squirt: no pump sound.	1. Water squirter switch is not in on position. 2. Broken wire at pump or W.S. switch.	1. On position is not the center position. 2. Repair/re-solder broken wire.
Cannot squirt: pump sound yes	1. Reservoir empty	1. Fill Reservoir with filler bottle.
	2. Water line is not connected to water connector	2. Connect it.
	3. Overflow tube and squirt tube are switched at the reservoir.	3. Swap them back. Overflow tube is the one that is in the top of the bottle and the tube runs to an outlet on the bottom of the frame.
<b>Voice Modifier</b> Voice not being modified	1. Modifier not turned on.	1. Push pedal on modifier. Light should come on.
	2. Audio wires not plugged in correctly	2. Jumper wire goes from Nady Receiver to <b>Input</b> of Modifier. Wire in <b>Output A</b> of modifier goes to the main board.

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

# Robot Block Diagram



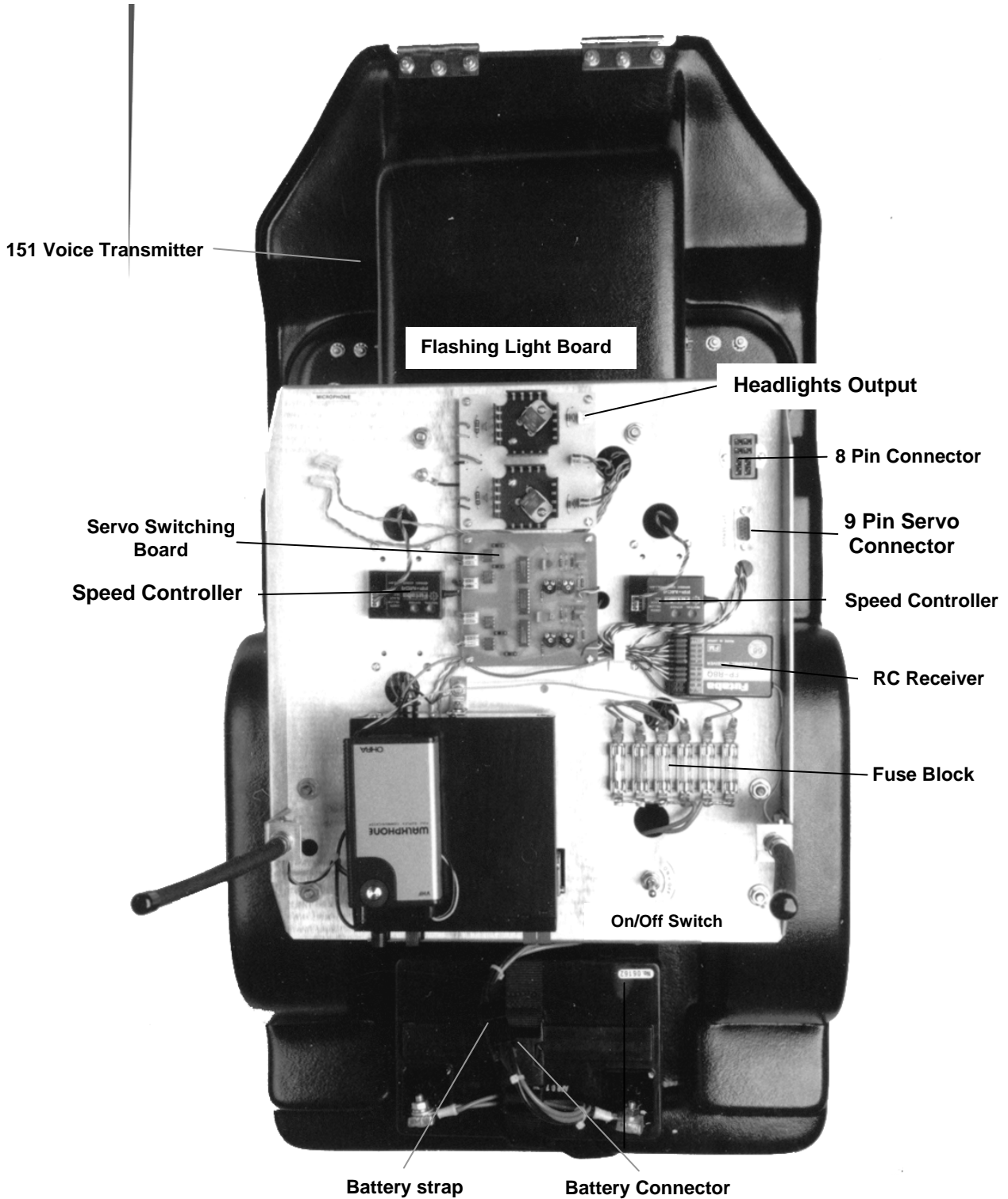
# Robot Circuit Diagram



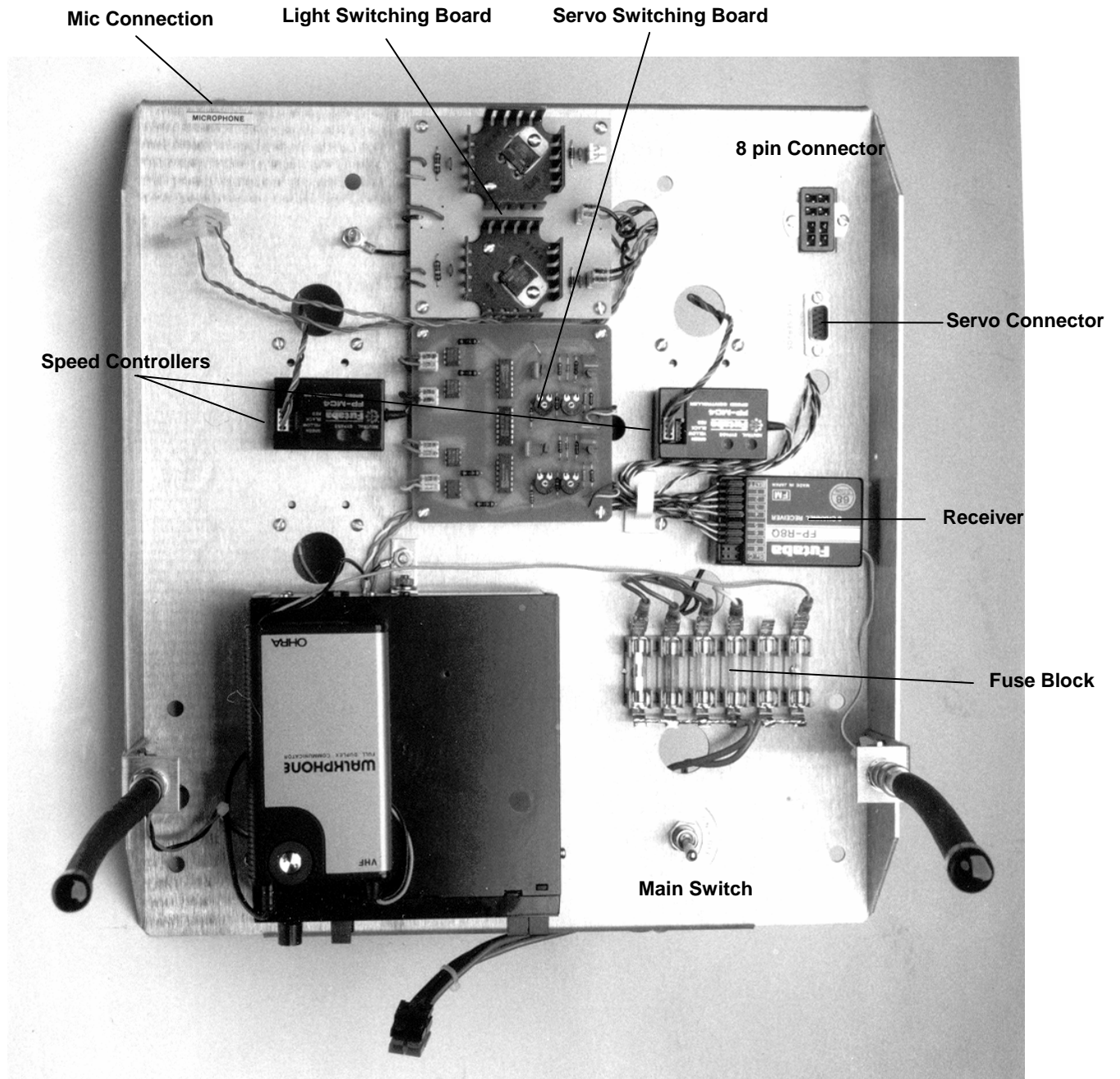
**APPENDIX B**

**ROBOT PARTS IDENTIFICATION**

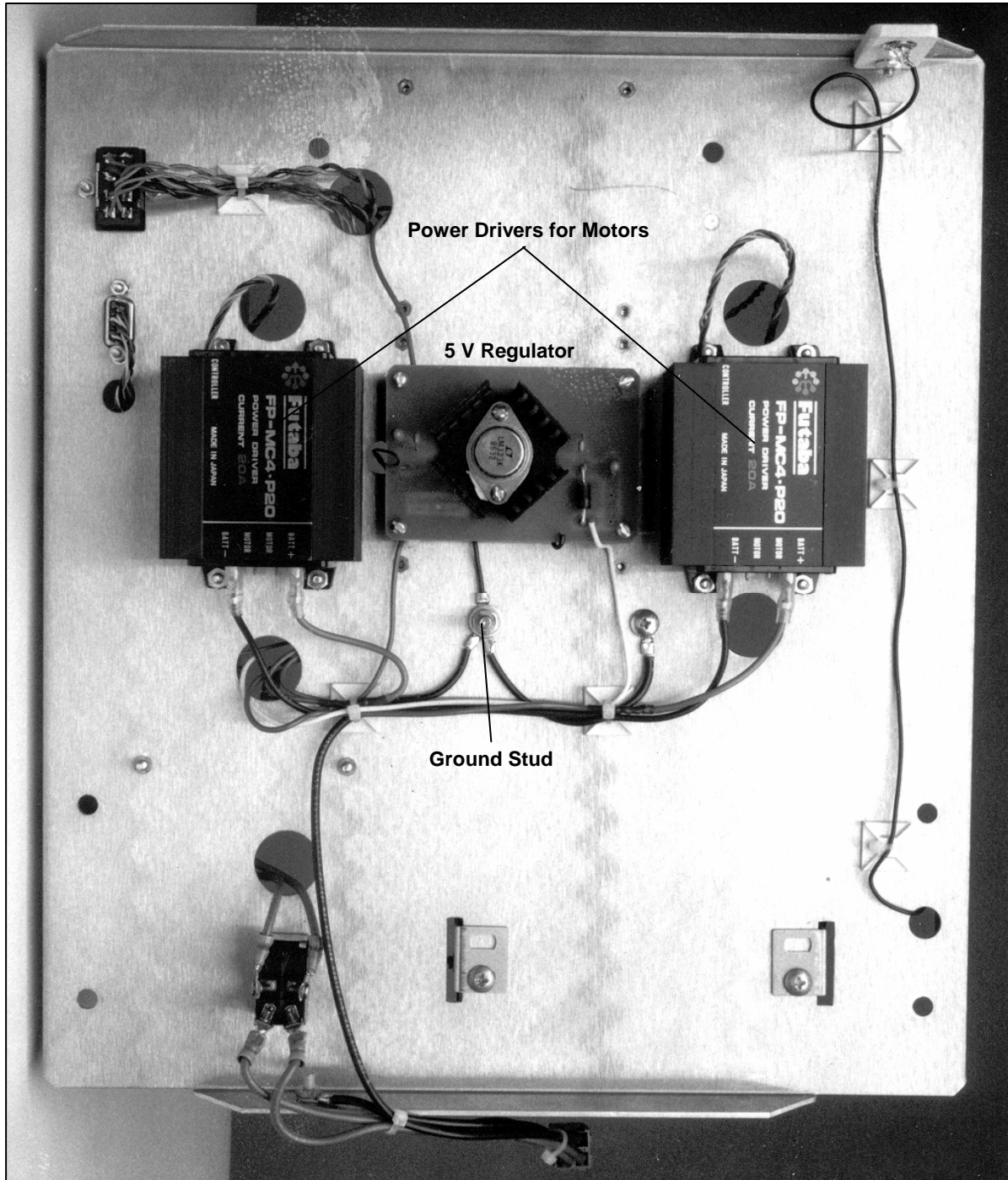
# Robot Frame - Top View



# Electronics Panel



# Electronics Panel-Bottom View



## Main Panel Additional Information

### 5-Volt Regulator Circuit

This supplies 5 Volts to the RC Receiver and the servo switching board.

### 12-Volt Switching Circuits- Light Switch Board

The Switching Circuits receive a signal from the servo switching circuit on a single wire that switches from 0 to 1.3 Volts when read with a Voltmeter.

### Flashing Light Circuit

The flashing light circuit receives a signal from the servo switching circuit on a single wire that switches from 0 to 1.3 Volts. This circuit is used to flash the red and white lights on Andy, the red and yellow lights on a bus as well as the stop arm lights on a bus.

### Audio mixing

This circuit mixes the audio from three sources; the siren, tape and voice. This audio then goes out to the audio booster through a 2 pin audio header.

### Cassette Switching Circuit

The cassette circuit receives a signal from the servo switching circuit on a single wire that switches from 0 to 1.3 Volts. The 3 Volt regulator provides the power which exists at the pin of the TIP 30 transistor until it is switched on. This circuit is usually on the cassette board inside the tape player.

### Servo Switching Circuit

There is a separate servo switching circuit for each channel. The receiver is constantly sending a square wave pulse to the circuit. When a signal is received from the transmitter to turn a function on then the pulse width going to the servo switching board changes. This signal is analyzed by the servo switching circuit and sent along to the switching circuit that needs to be turned on. There are two adjustments for each circuit, the **centering** (50 K potentiometer) and the **deadband** (10 K potentiometer). The centering is typically the only adjustment needed. Initially you put the switch or stick on the radio control to center. To center it you turn the adjustment until one of the functions comes on. Next turn the adjustment until the other function comes on. Put it in the middle between these two points where both are off.

Channel 3 and 7 are for various functions depending what type of robot you have.

#### Channel 7

P.C., Freddie- Body lights/light bar

Andy Ambulance- Body lights/flashing and light bar

Bus- Reds/Yellows

#### Channel 3

P.C., Freddie, Andy Ambulance- Tape/Siren

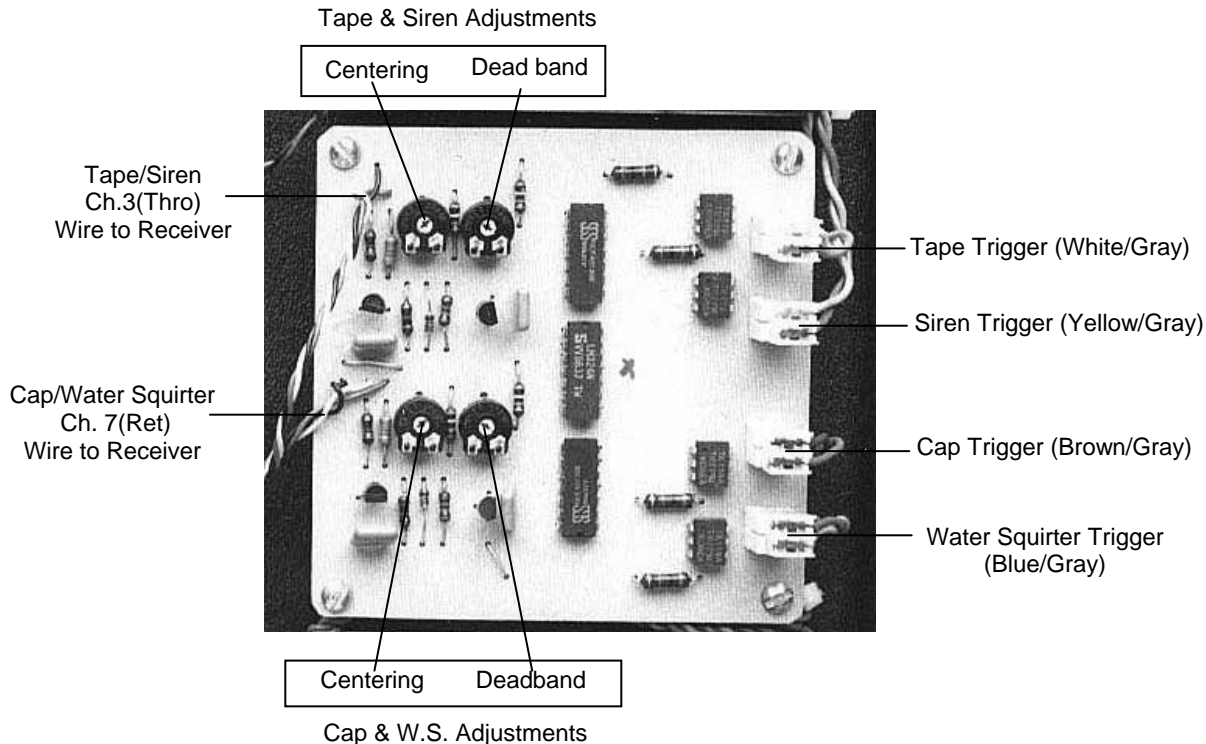
Bus-Tape/Body lights

### Siren Circuit

The siren circuit receives a signal from the servo switching circuit on a single wire that switches from 0 to 1.3 Volts. The siren is outside or in the cassette player on the cassette board.



# Servo Switching Board



## Tape and Siren Adjustment:

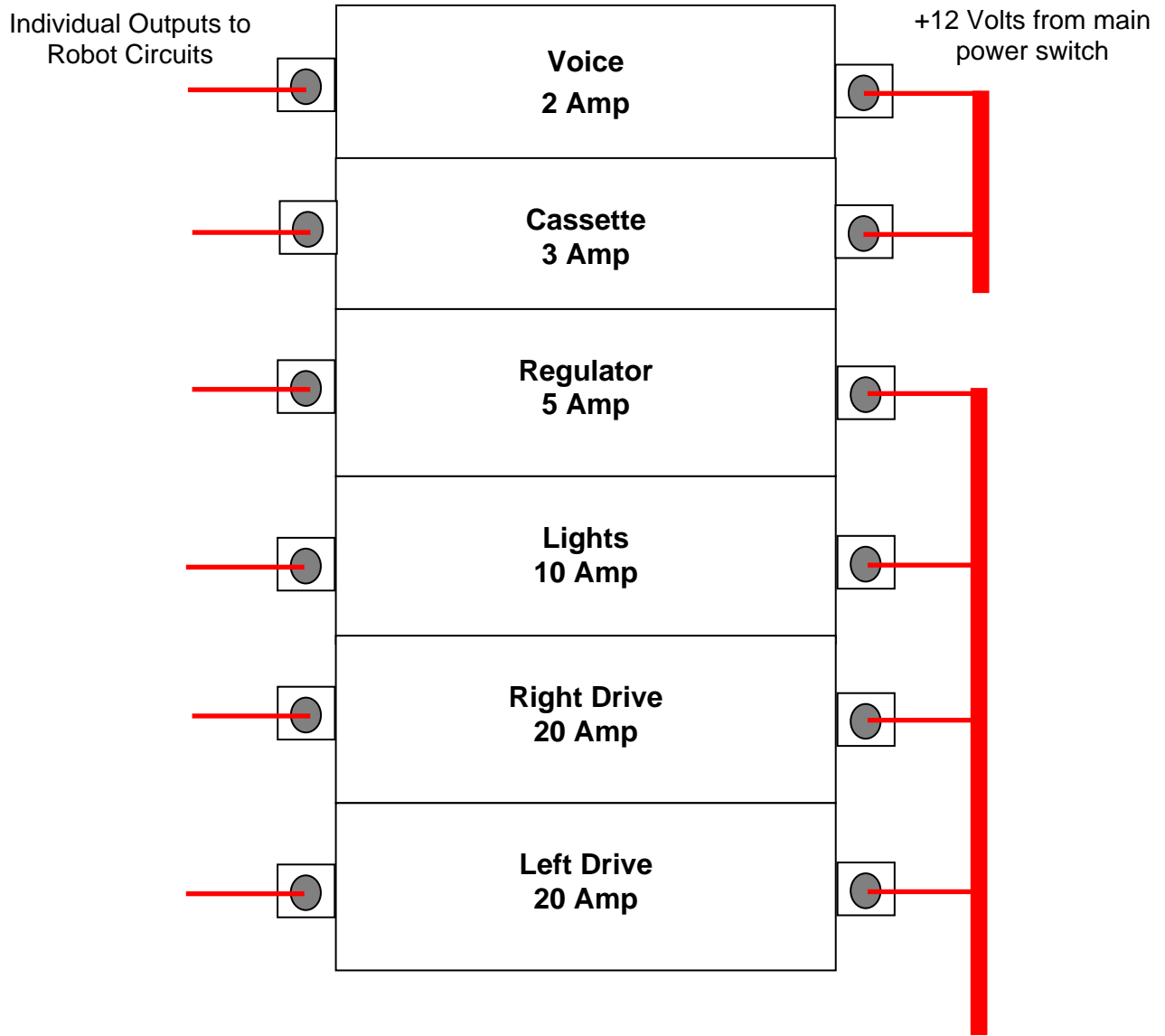
1. Put the stick right in the middle, straight up and down.
2. To center, adjust the centering one way until you find the point that the siren comes on. Adjust the other way until the tape comes on. Put the adjustment right in the middle where both are off.
3. **Optional:** The deadband will adjust the amount of on space or movement of the stick that each function is on. This amount should be about the same for the tape and the siren. If you want you can count the clicks as you move the stick. To increase the on space, adjust the deadband clockwise. After changing the deadband you will need to go back and adjust the centering again.

## Cap and Water Squirter Adjustment

1. Adjust the deadband to full counter-clockwise for max. deadband.
2. Adjust the centering just until the cap starts moving. If you do not have a water squirter, turn the adjustment back about an eighth of a turn and the cap should be off. Each time you make a slight adjustment you will need to wait for the cap to cycle up or down to see if it stops.
3. If you have a water squirter you can find the point where the cap runs and then turn the adjustment the opposite way just until the water squirter pump runs. Put the adjustment right in the middle where the cap and water squirter are both off. Note: You have to have the water squirter switch on the bottom of the robot in the on or squirt position.

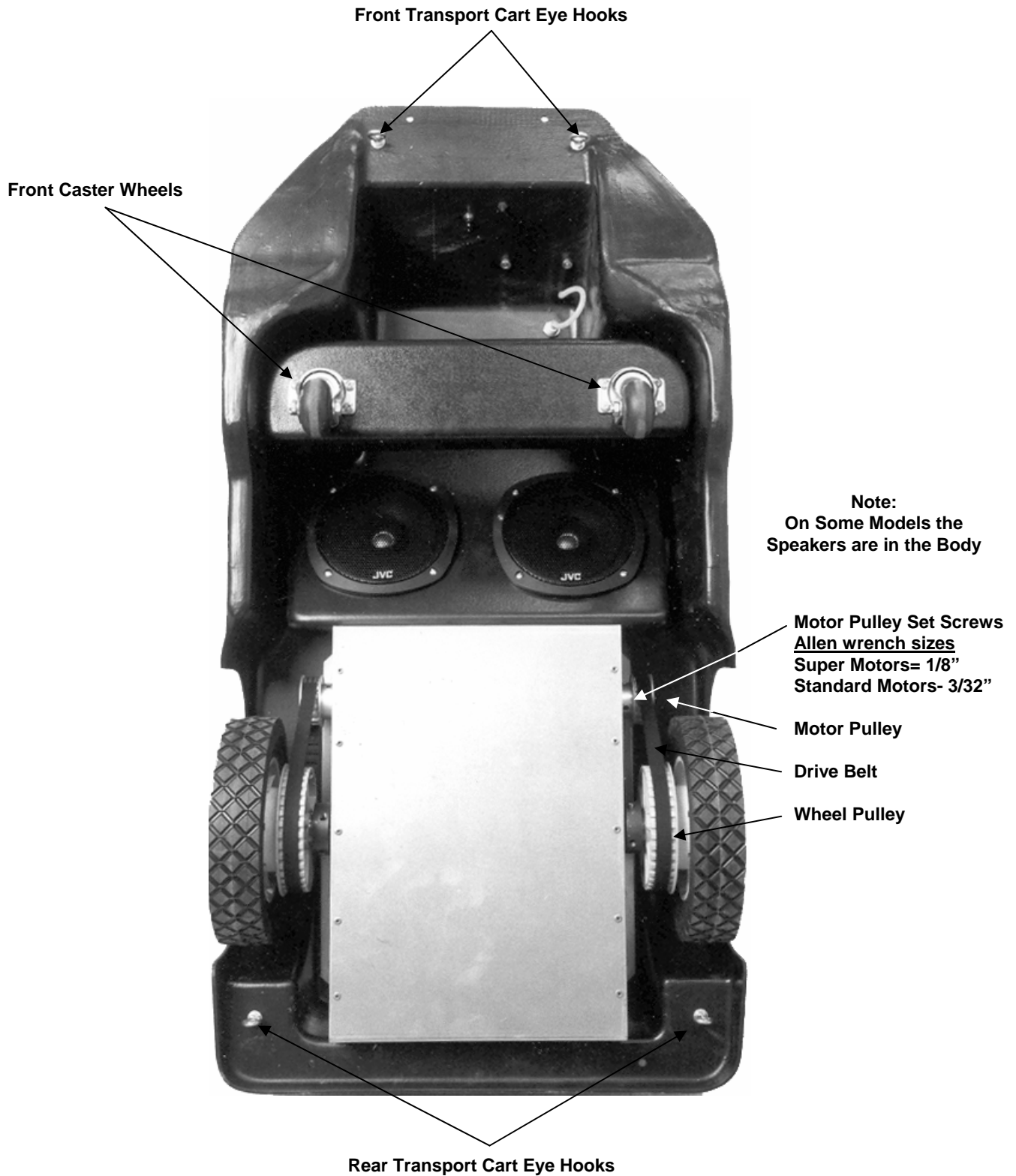
# Fuse Block Detail

Use AGC Fast Acting Type Fuses

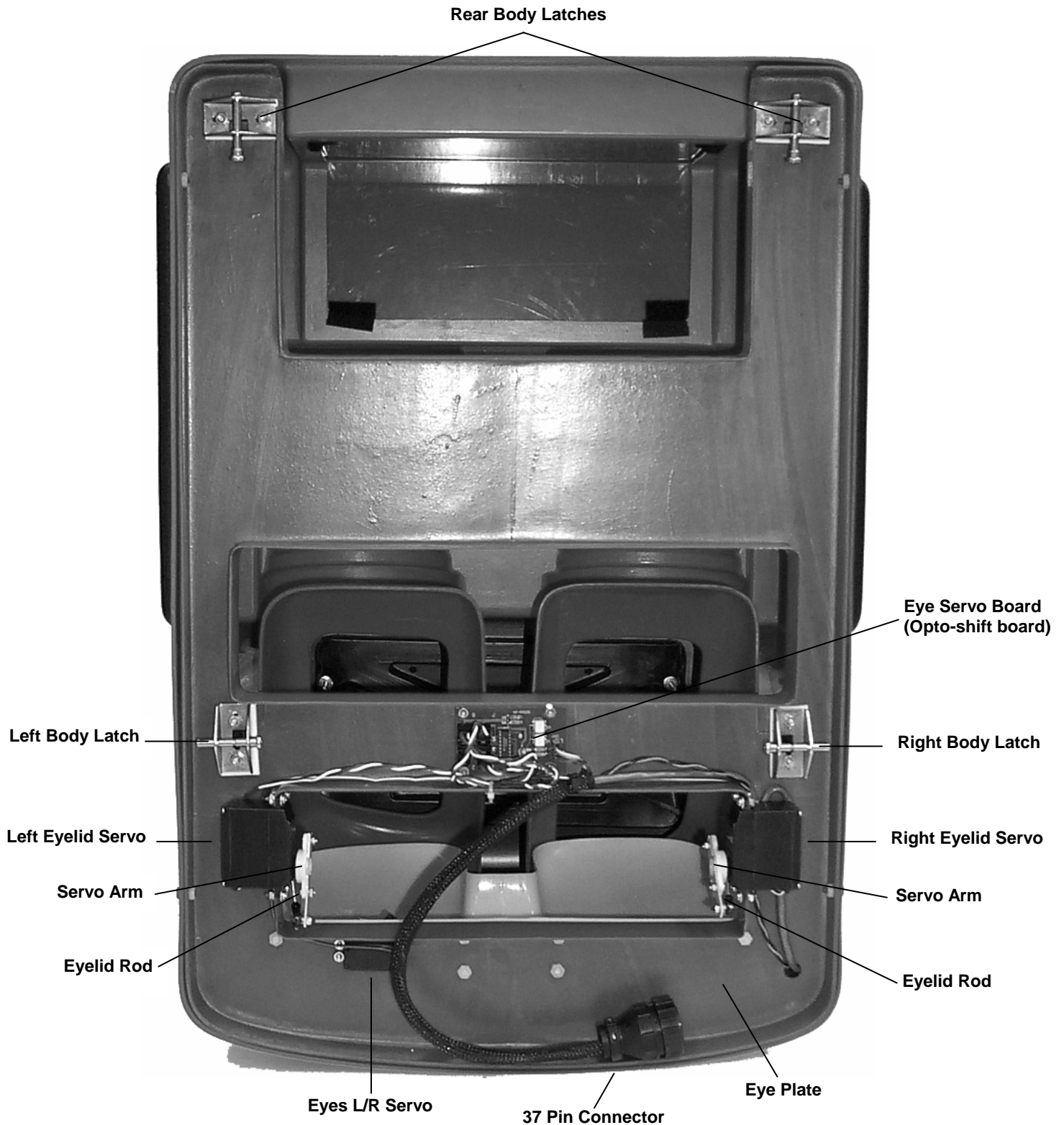


# Robot Frame - Bottom View

Note: Your frame may vary from this but the pulley system is the same.

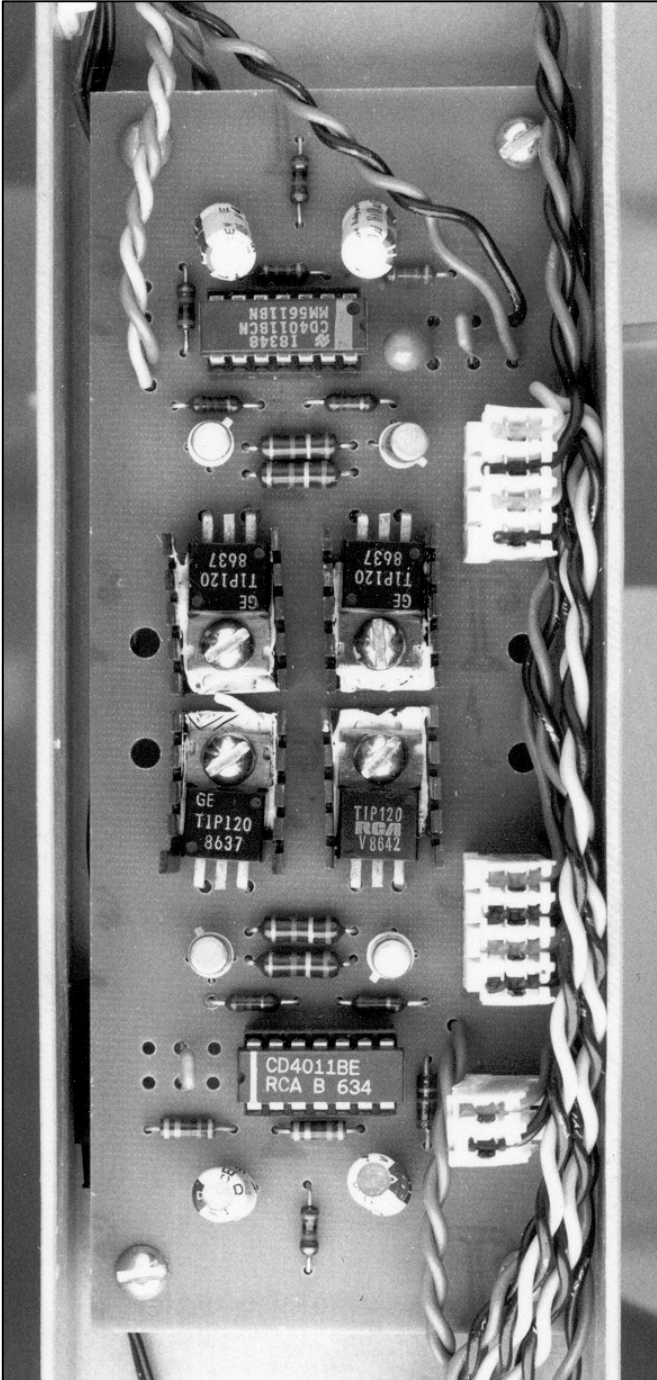


# Vehicle Top 1 – Underside View



Top Style 1 Robots: Freddie, Buster, Andy, Barney, Toby

# Flashing Light Board

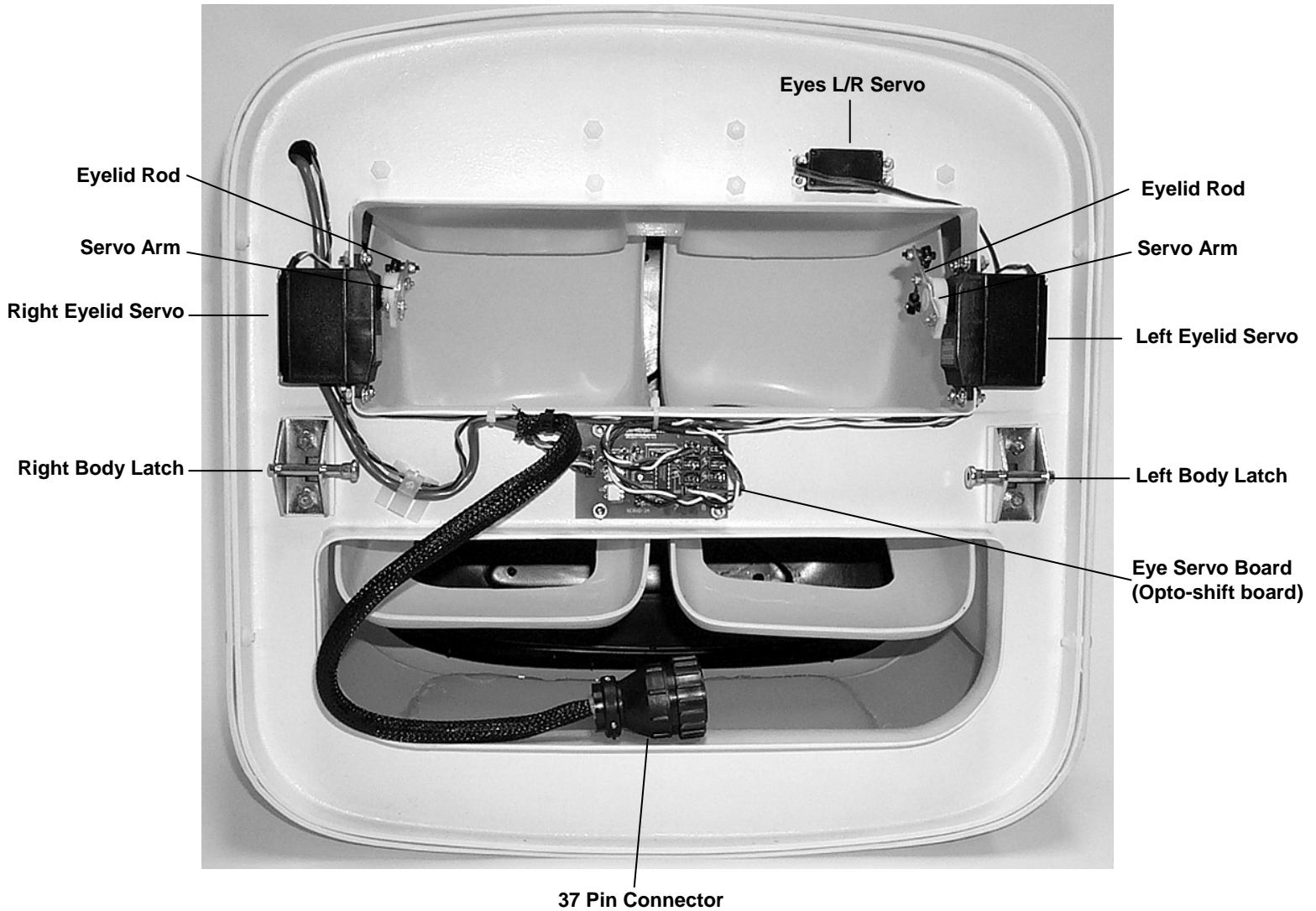


Flashing Output

Flashing Output

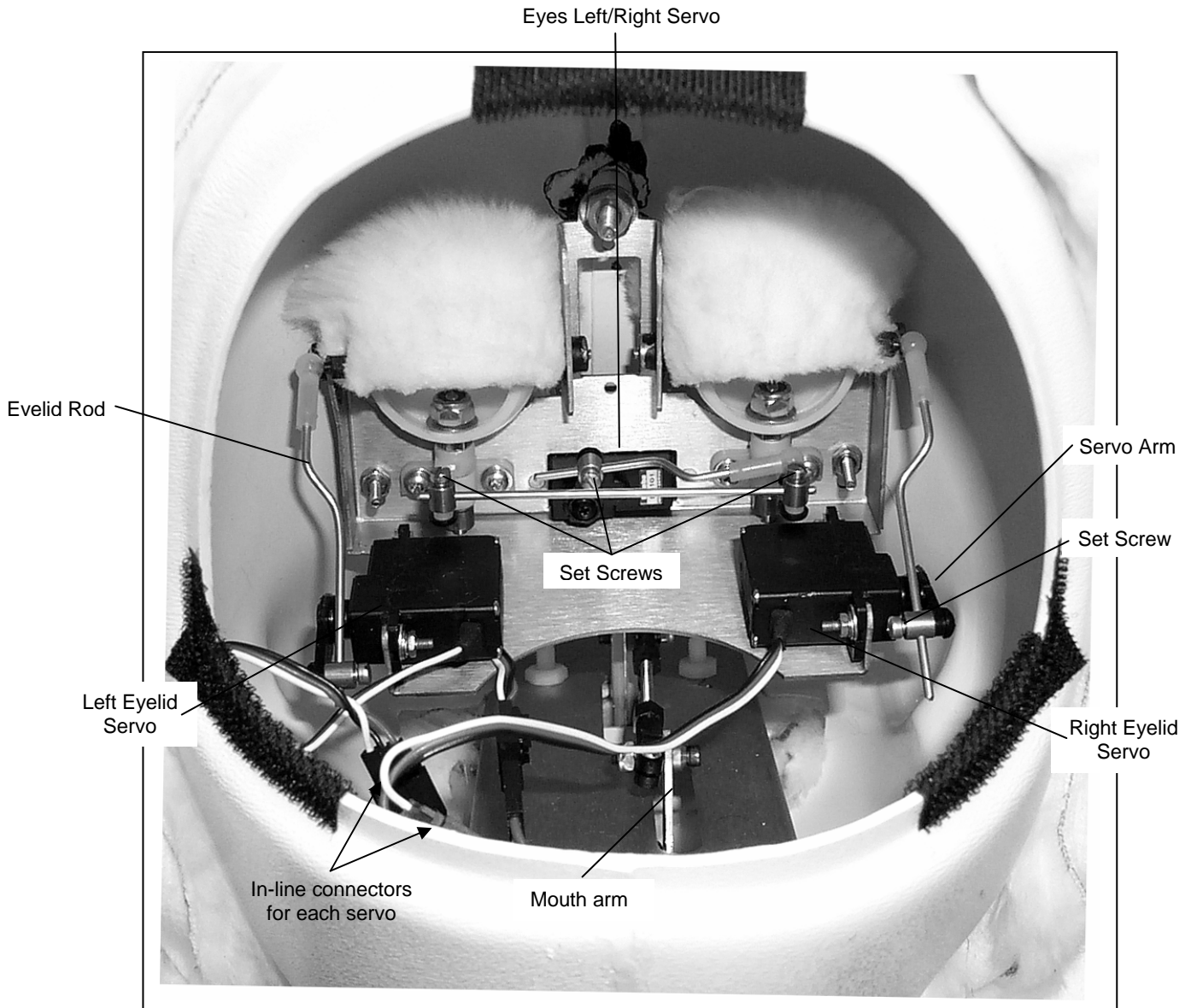
12 Volts In

# Vehicle Top 2 – Underside View (P.C. the Patrol Car™)

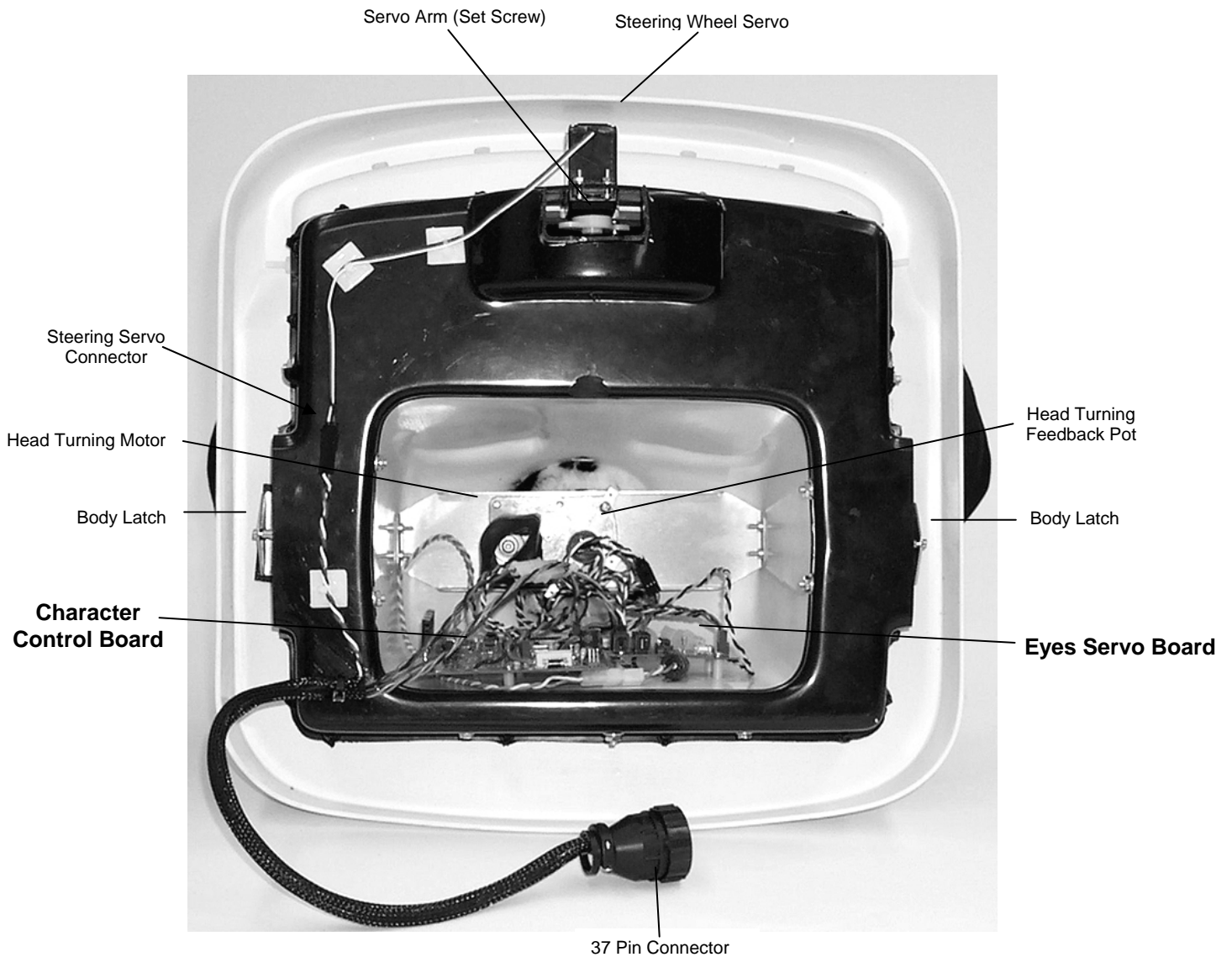


# Character Head - Inside View

(Only on robots with character)



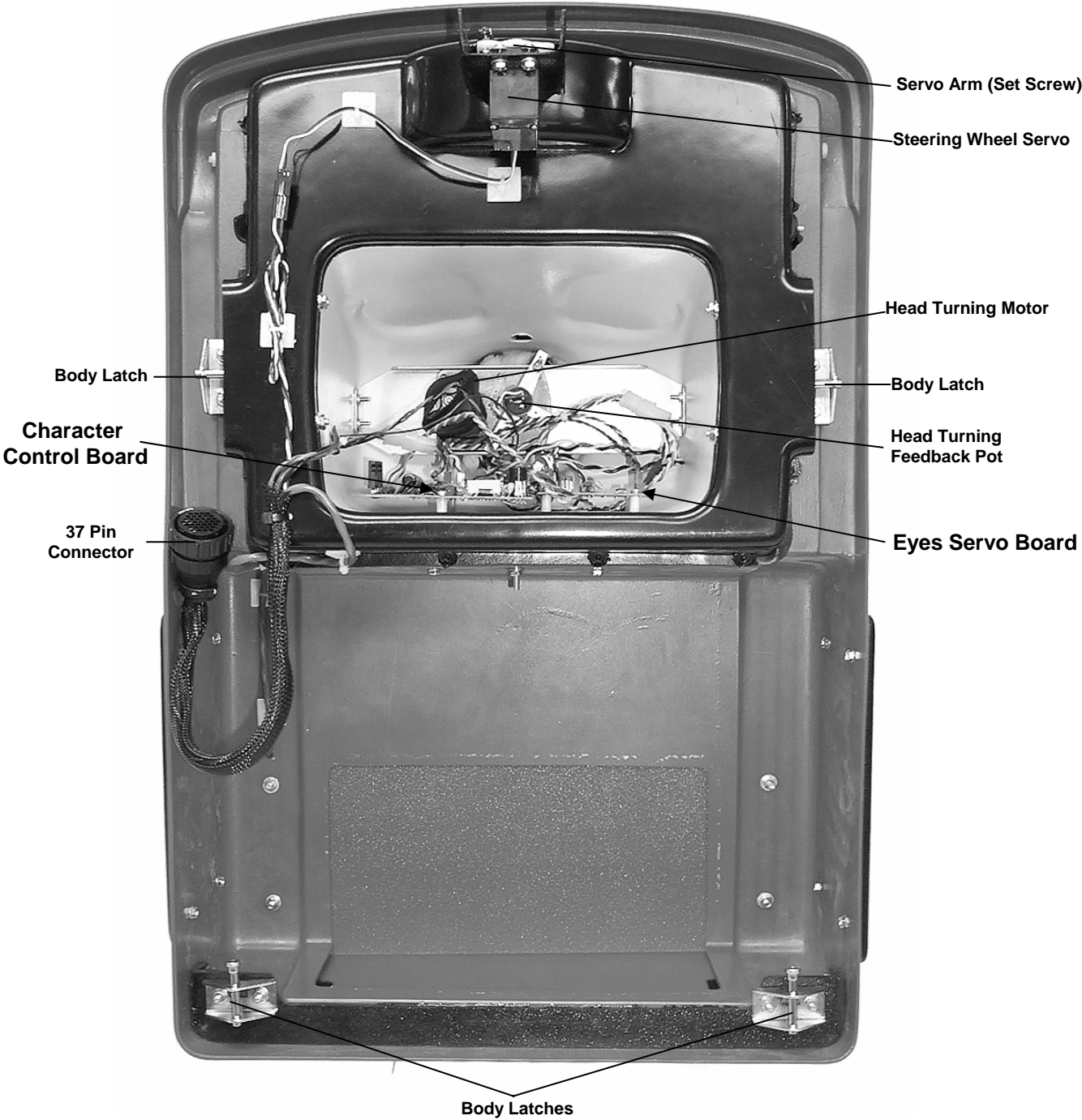
# Character Top 1 – Underside View (K.C.™/McGruff®)



See Character Board Diagram for detail of connections on the Character board.



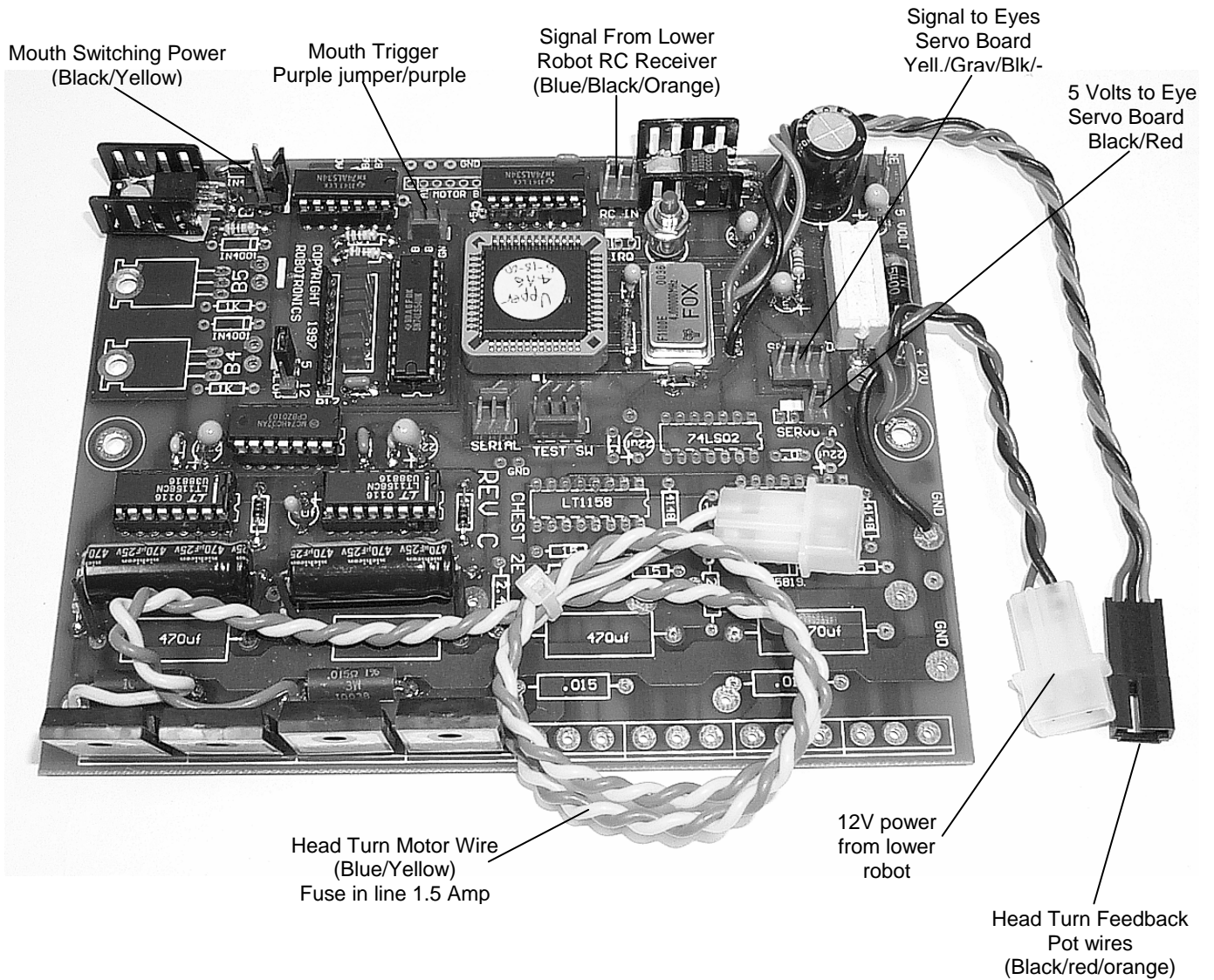
# Character Top 2 - Underside View (Patches™/Sparky®)



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

# Character Control Board

(Only on robots with character)



# Notes

# Technical Tips