McGruff®
The Crime Dog
Animated Costume

Congratulations on your purchase of the **McGruff Animated Costume** from ROBOTRONICS, Inc. Your costume system has been carefully constructed of the highest quality components. With its compact size and convenient features, you will find it an extremely effective tool for giving sound and movement to your McGruff costume. It is built for ease of operation and comfort.

Please read this manual carefully. It will help you make the most of your Costume system. As with any electronic device, proper care will greatly prolong the life of the system. 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, or repair.

Sincerely,

ROBOTRONICS, Inc.

Contents

Limited Warranty

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

Warranty work is specifically limited to correction of defects by repair or replacement of faulty equipment or parts. The costume or accessories 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 costume or accessories.

The buyer is responsible to ensure that proper and complete training be given to those operating the McGruff Animated Costume as all aspects of such operation cannot be covered in a brief manual such as this. In no event shall ROBOTRONICS, Inc. be liable for any incidental or consequential damages in connection with or arising from the use of this manual or any procedures contained herein.

> Record the vital information from your costume here for future access
>
> Date Received:_____
> Customer Number:_____
> Model Number:_____
> Serial Number:_____

If You Have a Problem Call Service 801-489-4466

- Call our service department and explain the problem. Most difficulties are minor and can be solved easily over the phone. If possible, have the costume near the phone when you call.
- **Important:** Have the costume serial number and model number ready. This will help our technician identify the model of costume that you have. The serial and model number sticker is located on the inside of the head.

If you need to send the costume back to Robotronics for repairs

- Go to our website, *Robotronics.com* and under the service tab find the repair form. Fill this out and send it back with the part.
- If you have saved the boxes and packaging this will make it easier to return the costume.
- Call the service dept. before shipping the part back to the factory. Pack it carefully and send it prepaid.
- The costume is best sent by a carrier such as UPS, FedEx. or U.S. mail. Be sure to insure the shipment for the correct value.
- 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. Most problems are easily solved. The costume design is very modular to make removal of a part easy. If you do need technical help or replacement parts, call our Service Dept. We can usually ship them the following day you call.

Service Department phone number: 801-489-4466.

What's Available on our Website

Parts for your costume: Our website contains a parts listing with pricing for some of the parts of the costume such as batteries, chargers, trench coat, pants, paws etc. Call us for parts not listed.

Maintenance and repair information: If your costume ever needs maintenance work to be done, you can send it to Robotronics. The website contains information about packaging and shipping. There is a form on the internet to fill out to print and send with your part.

Photo gallery: You can look at other costumes and robots including our McGruff robots.
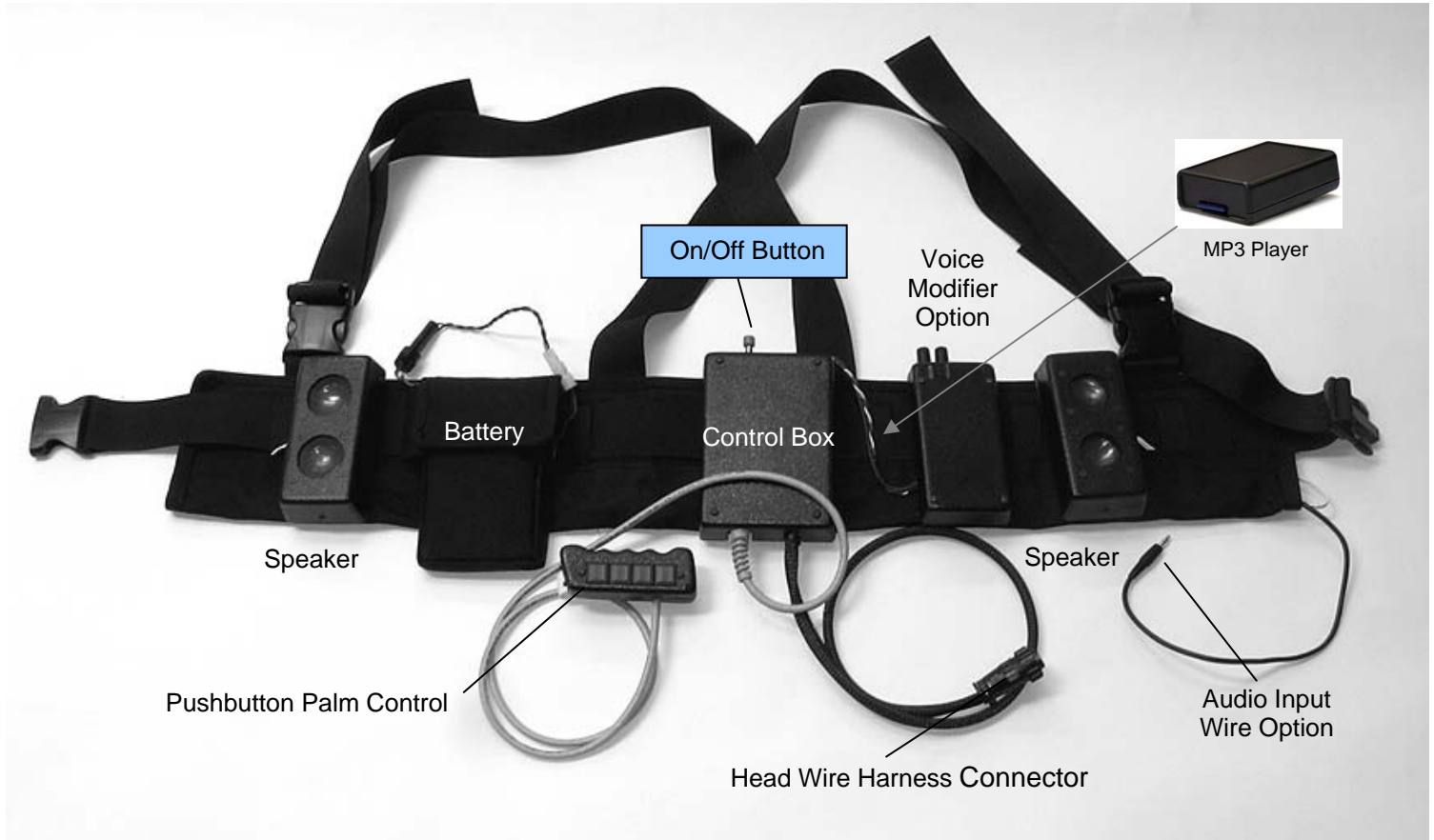
Precautions

- The wearer should use caution when walking in the McGruff costume. Visibility is restricted.
- Always have someone accompany the wearer of the costume, to help guide McGruff and indicate when there are children in his path. This person can also let McGruff know when someone wishes to speak to him, or when steps or other obstacles are nearby.
- Do not wear the costume if you have a heart condition, neck problems, or other medical condition. If in doubt, consult your physician.
- Exercise caution to avoid the effects of heat on the costume wearer. Use cooling techniques and take turns wearing the costume. During hot weather, such as above 85 degrees F, limit the length of wearing the costume to 15-20 minute periods. If you are wearing a Cool down vest this may increase the wearing time.
- Do not operate any machinery, eat or drink while wearing the costume.

McGruff the Crime Dog® Guidelines

- Read and follow the McGruff Guidelines from the NCPC located on the CD included with the costume.
- Use the costume only to further public information, education, and awareness in crime prevention.
- Use the costume only in programs or events where crime prevention is a factor.
- The costume should be put on and taken off in private.
- The character is to appear only in the full costume.
- The character should always be dignified, friendly, and professional.
- Keep the costume under cover before and after use.
- The character must always have an escort.
- The wearer should be careful not to frighten or startle children.
- Never engage in any activity that may detract from the important image of McGruff.
- Anyone appearing in the McGruff costume should not speak at any length. Conversations or explanations should be carried out by the accompanying crime prevention practitioner. If speaking becomes necessary, it should be limited to a brief "Hello" or "Goodbye" or appropriate phrases (for example, "Good morning, boys and girls," "Take A Bite Out Of Crime," "Don't talk to strangers," or "Say no to alcohol, tobacco, and other drugs"). These phrases should be uttered in a friendly, deep, gravelly voice. By using basic mime techniques and active listening, McGruff can readily interact with children and adults with minimal speaking. McGruff should never make speeches or engage in more than the shortest conversations.

The Belt System

On/Off Button

Voice Modifier Option

MP3 Player

Battery

Control Box

Speaker

Speaker

Pushbutton Palm Control

Audio Input Wire Option

Head Wire Harness Connector

Note: Some models may have different speakers than those shown above. Some models may have the speakers in the pockets of the coat.

There are shoulder straps attached to this belt unit. Lay the entire belt upside down on the edge of a table. Put it around your waist, buckle it, tighten the strap and then put the shoulder straps on. You can wear it at your waist or higher if it is more comfortable in a higher position.

The elements of the belt system will be connected as much as possible when you receive it. Generally keep it connected together like this between uses. You can activate the system on a table and run through the functions. This will help you become familiar with everything.

1. Charge the battery. The light on the charger will flash when it has a full charge.
2. Place the battery in the pocket of the pouch. Connect the battery at the white in line connector.
3. To become familiar with the controls you can operate the features with the head and belt on a table. This will also allow you to set the volume.
4. Put the belt on your waist and the shoulder straps on. Buckle it and tighten the straps.
5. If you have the Cool Down Vest option, put this on now.
6. Turn on the system with the Master On/Off pushbutton on the main box. The MP3 player will take a few seconds to start up before you can operate it.
7. Set the master volume level with the palm control if needed.
8. Connect the 9 pin round connector from the belt to the head connection. Spin the ring until it stops. This wire will run along your back.

Ring

> **Turn the ring only when connecting or disconnecting. Avoid pulling and jerking on the cable.**

Caution: Spin the ring only not the housing of the connector. This will avoid twisting and damaging the wires.

9. Put on the McGruff costume head. Adjust the chinstrap for comfort. There are two adjustments, one on the chin strap and the other on the back of head strap system. There are straps between the foam pads that can be adjusted for comfort also. These adjust the relative position of the foam pads.

Tip: You may find it more comfortable to wear a bandana or hat for added comfort.

10. Feed the palm control through the left sleeve of the coat. You may find it easier to do this before you put the coat on.
11. If your speakers are in the pockets, feed the wires to connect to them.
12. The pushbutton palm control will typically be used in the palm of your left hand. There is a strap to hold it in your palm. The diagram on the next page shows the function of each button. You may need to put the palm control in the glove first and then your hand. You can pull your thumb and a few fingers out of the glove to operate the controls.
13. If you have the integrated MP3 player there will be songs loaded on the SD memory card. You can load additional music also. See the section on the MP3 player.

As you go through the process of putting everything on you will find an order that works best for you.

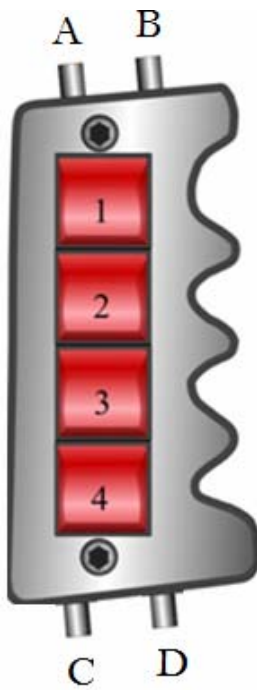**Using the costume in different environments**
The volume of the costume is typically good for classrooms or small groups. If you are doing a program in a large group, you may want to use the PA system or an amplified speaker system. One idea would be to play your audio of McGruff singing or talking from the MP3 player or a CD player connected to the sound system. The sound system at the event could be a PA system or a portable amplified speaker that you bring along. The person portraying McGruff could move the mouth manually with the palm control in sync with the music or softly sing into the mic so that the mouth will move.   You could clip a lapel mic on McGruff's coat to give the appearance of using a wireless mic.

Operation Guidelines and Features

Turning the system on and off
The Master On/Off switch is on the electronics box on the belt. Push the switch to turn on and push again to turn the system off. The LED will let you know if the power is on.

<div style="border:1px solid black; display:inline-block; padding:5px;">

Pushbutton Palm Control

</div>

A+1 =Play/Pause
A+2 =Stop
A+3 =Back mp3 track
A+4 = Forward mp3 track

B+1 =Snd1
B+2 =Snd2
B+3 =Snd3
B=4 =Snd4

1= Mouth
2= Blink
3= Wink R
4= Wink L

C+1 =Volume up
C+2 =Volume down
C+3 =mp3 volume up
C+4 =mp3 volume down

D+1 =auto blink on/off
D+2 =fan on/off
D+3 =mic gain up
D+4 =mic gain down

Palm Control Functionality
The typical functions are shown above. There are additional functions shown in the table below, when the A,B,C, or D mode buttons are pushed. The power on defaults are: **automatic blink on** and **fan on**.

	Normal	A Button pushed	B Button pushed	C Button pushed	D Button pushed
1	Mouth	Play/Pause	Snd1	Volume up	Auto blink on/off
2	Blink	Stop	Snd2	Volume down	Fan on/off
3	Wink Right Eyelid	Back track	Snd3	Mp3 Vol. up	Mic Gain +
4	Wink Left Eyelid	Forward track	Snd4	Mp3 Vol. down	Mic Gain -

Operation Guidelines and Features

Setting the Volume Level

Before setting the master volume, set the mp3 volume and confirm that the mouth is working properly with the music. This is important because the mp3 volume has a direct effect on how well the mouth sync is working. Set the master volume at the level that you want by pushing the C mode and button 1 or 2. There is a separate Mic gain control that is adjusted with the D mode, button 3 or 4. After setting the master volume you may need to adjust the mic gain because they are related.

Caution: If the mic gain is too high the mouth may move more often than it should.

Tip: Set your volume levels before putting on the costume.

Eyelid operation

When you first turn it on, the eyelids will be in auto blink mode. Every so often the eyelids will very naturally blink. You can also wink with either eyelid whenever you want. This is done on the pushbutton palm control.

Mouth operation

The mouth operation is automatic when programmed music is playing. The mouth will move in sync with the music. If you do not have programmed music, you can operate the mouth manually from the palm control.

Turning the System Off

1. Turn off the power with the Master On/Off switch on the electronics module.
2. Disconnect the battery and recharge it **immediately**. Do not wait even until the next day. This will help prolong the life of the battery.

Eyelid Operation

The eyelids can be on auto blink mode or manual. When you turn on the system, the eyes will be on auto blink. The main processor sends a signal to the servo board in the head and the servo board sends a pulse to the servo to move. If you operate it manually, the palm control communicates with the processor on the main board and then the processor forwards this signal to the servo board. Mechanically, there is a servo arm on the servo shaft and a rod that transfers this movement to the eyelid.

Mouth Operation

When the mouth is triggered by the music, one of the music tracks is recorded with only sound to move the mouth. This goes from the audio source such as an MP3 player, to the processor. The processor decodes this audio to move the mouth servo. When the microphone is used, the mic input also goes through an audio detector circuit then the processor, which activates the mouth servo. The palm control can also be used to move the mouth manually.
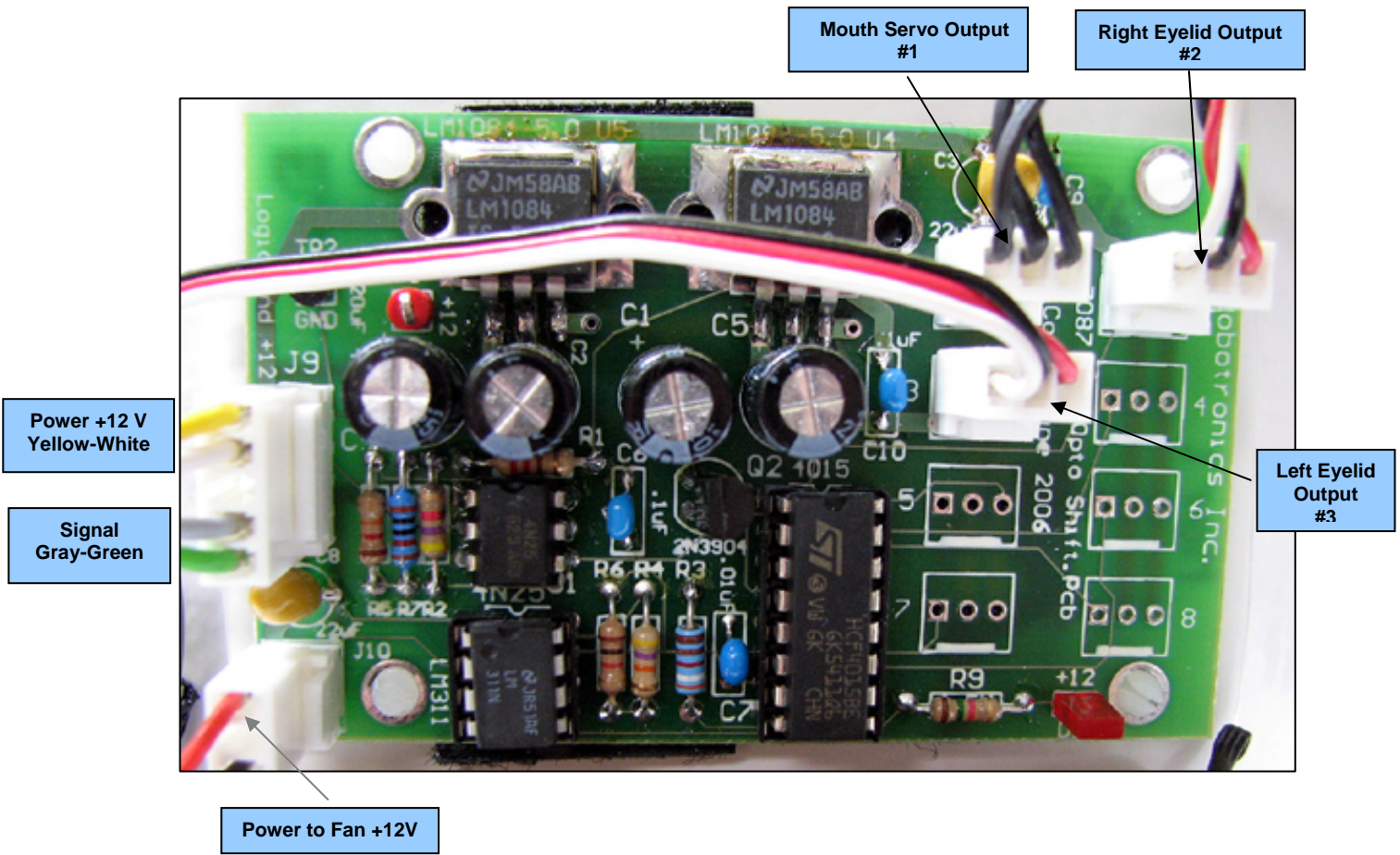
MP3 Player

Integrated MP3 Player Features

- Ability to play MP3 files through the costume.
- Memory Storage Card: SD or Multimedia(MMC) Card.
- Space on the card to load your own music.
- Selection of songs is done with the palm control.

There are songs that are pre-loaded on the SD card. These songs have a track that causes the mouth to move with the song.

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


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

Play Sound Effects
Sound effects or sound bites that are in the soundfx folder on the card can be activated from the palm control. These files must be named snd1, snd2, snd3, snd4. Hold the B mode button and the respective button 1-4.

Play Music
The MP3 player will take a few seconds to start up before you can operate it. To play a song, hold the A mode switch and push the play switch shown on the diagram below.
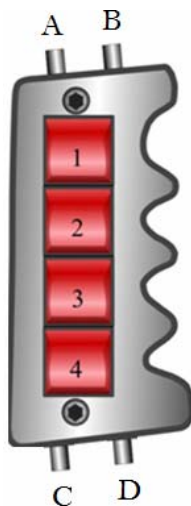
A+1 =Play/Pause
A+2 =Stop
A+3 =Back mp3 track
A+4 = Forward mp3 track

B+1 =Snd1
B+2 =Snd2
B+3 =Snd3
B=4 =Snd4

C+3 =mp3 volume up
C+4 =mp3 volume down

Tips
- When you scroll to the last track it will stop there. If you want to go to the first track you need to back track.
- If you stop on a song, it will remember that position when you start the mp3 player again but

it will start the song from the beginning.
- If you want to change the volume of the MP3 player push the mode C button as shown in the diagram.
- If you add sound effects to be played in the place of snd1-4 they must have the filename of snd1, snd2, snd3, snd4 to play in their place. The sound effects files must be in the soundfx folder.
- You can customize the songs and sound effects that you use for different programs by getting additional cards and adding your own set of sound effects and music.

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

To Load Music on the Memory Card
Place the card in a card reader. Go into 'My Computer' on your desktop and find the drive that represents the card. Open this and you will see the sound effects folder. Open the source folder where you have your MP3 music or sound effects to transfer to the card. Drag and drop a copy of these files to the card. Make sure to put these files separate from the sound effects folder and not in a folder. You can place the files in the order that you want to use them. Put the memory card back in the MP3 player.

Order of the songs playing
The songs will play based on the number at the beginning of the song such as 01, 02 … If the song does not have a number at the beginning, then it will be the order that you transferred the song to the card.
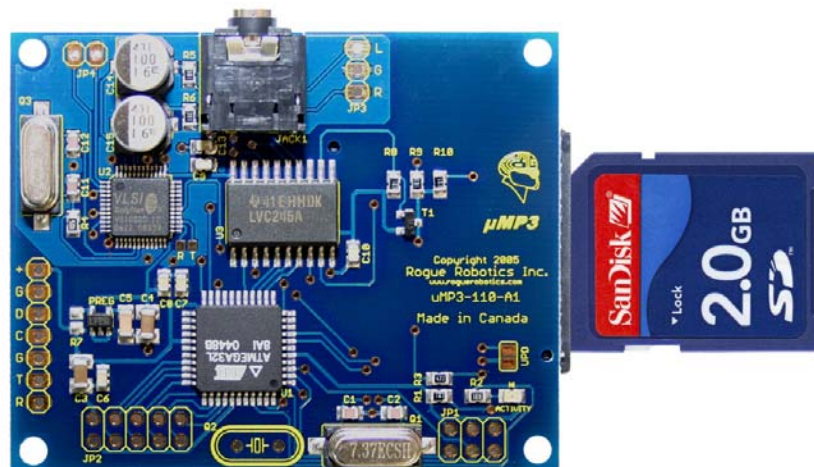

MP3 Player Board
This shows black box inside view

Voice Modifier (Option)

The pitch shifter (voice modifier) can change the operator's voice to disguise it and create a modified character voice. The operator's voice signal is received like normal by the amplifier/mixer in the main box. The modified signal is then amplified and sent out to the speakers.

The shifter receives power from the main box; no internal battery is needed. When the pitch shifter is plugged into the main box, it comes on automatically when the amplifier is turned on. The shifter will take a few seconds to power up. You will know that it is on because it will modify your voice.

Voice Modifier Control Descriptions

Voice Modifier Controls on Front Panel
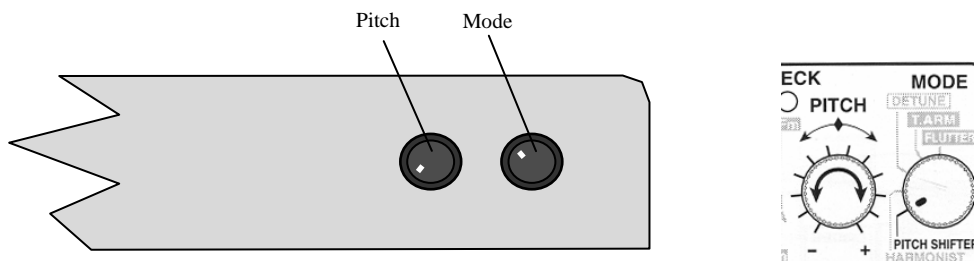
Pitch Switch. Adjusts the amount of pitch shift.
Mode Switch. Selects the mode. Typically use the pitch shifter mode. Fully CCW.

Normal Voice
If you want to use your normal voice, turn the pitch knob in the center position or go to a mode that is normal voice. This will give you a direct voice without any effect.

Set the mode knob to Pitch shifter and then vary the pitch knob until you get the sound of voice that you want. Pitch shifter mode is fully counter clockwise.

For a McGruff Animated Costume change the pitch until you get just the right voice for the operator. This unit will not give you a McGruff voice without the operator changing his own voice.

Voice Modifier (Option)

Hook up for a voice modifier option:

1. The control box is the large box already on the belt. It has a number of wires running from it. Open up the control box by removing the four Allen screws.
2. Find the 5 pin connection with the jumper. Remove the jumper and connect the voice modifier wire.
3. Run the wire out the slot in the right side of the box and close the box.
4. Remove the belt strap so that you can thread it through the bracket on the voice modifier. Typically put the modifier to the right of the control box.
5. The modifier is now ready to use.

**5 Pin Connection for Voice Modifier.**
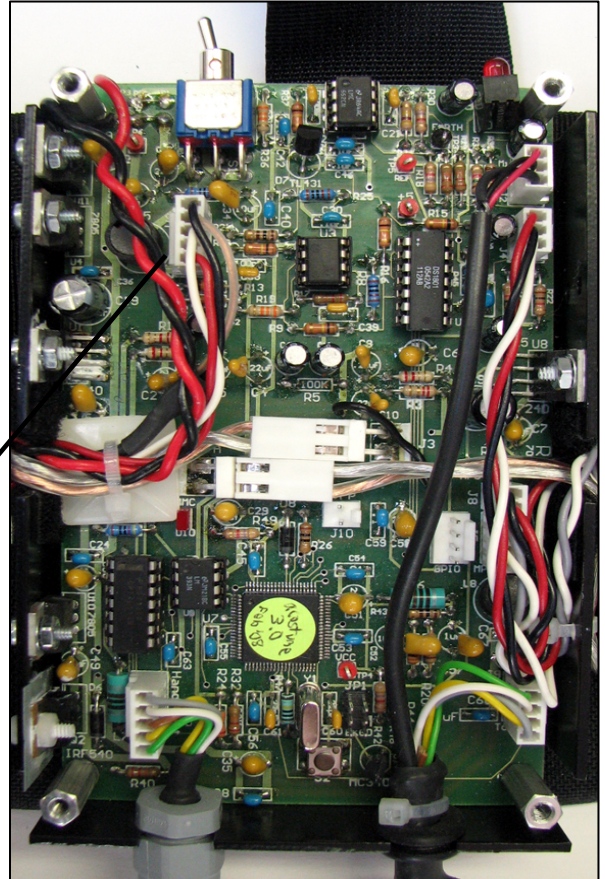
Charging and Care of the Costume Battery

The battery is a 12 Volt 2 Amp Hour (AH) rechargeable Gel Cell lead acid type battery. This type of battery is very dependable and safe. It can be repeatedly charged and discharged but must be brought to a full charge immediately after each use. You should get about 3-4 hours fan operation.

To recharge the battery, first unplug the battery at the white .084 connectors and remove from the pouch. Connect the charger to it. Finally, plug the charger into a 110-volt AC outlet. The red LED on both types of chargers indicates the battery is charging. You will have one of two types of chargers.

EDS charger- charged when red LED is flashing.
Powersonic charger- Green LED indicates full charge, float charge mode and power on. If lights are flashing green to red to green, this indicates incorrect polarity.
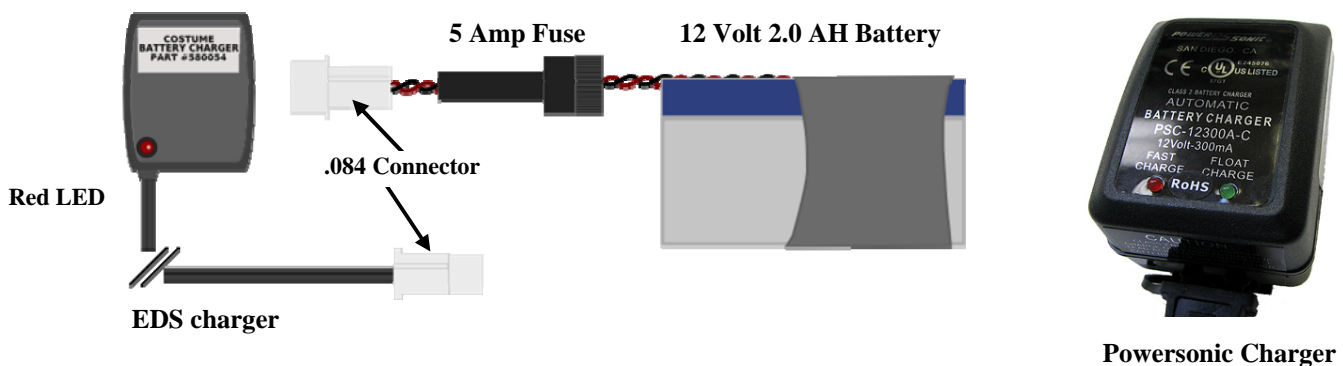
IMPORTANT: Leaving the battery in a discharged condition for a length of time is the single most abusive condition encountered in Gel Cell battery usage. You can avoid this by charging the battery after each use. A stand in the discharged condition of two or three days is not serious, but two or three months most likely will damage the battery.

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

Batteries are provided with a polarized connector to avoid connecting the battery backwards. If these connections are disturbed, please be careful to observe proper polarity when reconnecting the battery. The red wire goes to the positive (+) terminal and the black goes to negative (-).

CAUTION: When charging, a Gel Cell battery gives off hydrogen gas. This battery has pressure relief 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:
- Do not position your face over the battery at any time while making connections.
- Do not smoke, strike a match, or cause a spark in the vicinity of the battery during charging.
- Charge battery in a dry, well ventilated area.
- Always unplug the AC supply cord **before connecting or disconnecting** the charger lead from the battery.
- Do not expose the charger to rain.

- Replace defective cords and wires immediately.

<u>Storage and Maintenance</u>
Fully charge the battery **monthly** in storage, because of self- discharge. If the fan does not operate, check the fuse and connections before replacing the battery. Use a Voltmeter if needed. The Voltage of a good battery charged will be about 12-13 Volts.

Maintenance

To maintain peak comfort and performance, do an occasional check up to make sure all parts are in good condition. Check all straps and buckles for frayed or broken parts. Check wiring and connectors to see that none are damaged or loose. Check battery for any problem with the wiring or connection. Also check all components to make sure there are no loose or missing screws. Please follow all care instructions so that it may stay with you for a long time to come.

Clean up

The cases of the electronic equipment may be cleaned with a damp cloth or sponge and a mild cleaning solution. Do not spray the electronic equipment directly with any kind of cleaner; spray the cloth or sponge instead. Excess cleaner sprayed directly on the case may leak inside and cause electronic circuit damage.

Storage

Always make sure the battery has been disconnected and fully charged before storing. Store all components in a plastic bag to keep the dust off. Always store it indoors in a clean area.

Care of the Fur

General maintenance of your costume should include caring for the fur. After each use, clean and brush the fur and clothing so the oils and dirt do not become permanent. Keep the costume covered when not in use to keep dust and dirt off and to protect the fur and clothing.

1. Always remember to hang the body on a hanger and brush out after each use. Store in a well-ventilated area away from excessive temperatures. Car trunks and back seats are abusive.

2. The head should be brushed regularly, stored in its natural shape, and kept clean with a sponge and mild detergent. You can also use upholstery cleaner and a damp soft cloth. One fabric cleaner that works well is 303 Fabric Cleaner. Spray disinfectant can be used on the inside of the head to eliminate odor. Never store damp! Store in a plastic bag.

3. Paws can be washed on delicate cycle with mild detergent, and fabric softener. Allow to drip dry, brush while damp. Store in plastic bag. Do not store damp!

4. Pants and shirt can be washed separately on delicate cycle cold water, mild detergent and fabric softener. Press with a cool iron if needed.

5. If your costume has a trench coat, this should be dry cleaned according to the instructions on the trench coat itself.

6. Remember that minor repairs with hot glue, contact adhesive, or needle and thread can keep small problems from becoming large ones. Replacement parts are available.

7. Remember also that a clean costume lasts longer.

Plastic Repair

Materials
ABS or PVC clear medium bodied glue
Fiberglass mesh
Rubber/Latex 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.

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 part, so that the seam or crack is horizontal to the table. This will keep the glue from running. Apply some of the PVC glue along the seam or crack. 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 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 PVC container labeling.

To remove the internal head module

1. Turn the head upside down on a table.
2. Un-velcro the red velour in the mouth.
3. Open the mouth and pull the neck fur with the label over the mouth. This is necessary so that it is out of the way.
4. Pull the head fur downward out of the way.
5. Remove the two mounting bolts that go into the cheek area.
6. Remove the 4 bolts along the bottom edge, 2 in back and 2 on the sides.
7. Rock the internal head module back and forth slightly and pull it out.

To install the internal head module

1. Put the inner head straight in, mouth in first.
2. Flex the jowl/cheek plastic out so that it clears.
3. Attach the bolts, 2in the cheeks and 4 around the bottom edge.

Note: You would typically only need to remove the inner head if you need to get to the eyelid servos and the mouth mechanics.

To open the main electronics box

1. Remove the 4 Allen screws on top of the plastic side.
2. Carefully remove the lid moving any wires out of the way that may catch.

APPENDIX

Trouble Shooting Section

Trouble Shooting Chart	
General	
No functions operate, including no fan	1. Check fuse on the battery wire. 2. Charge the battery until the light flashes.
Mouth is not moving	1. Master Volume or audio volume is not turned up loud enough. 2. Check wire harness connection going to the McGruff head. 3. Check the mouth servo linkage in the head especially if you can hear the servo motor.
Audio problems	
No voice	1. Check the battery voltage. 2. Is the **system** "ON" and working? If not, check the wiring, plugs and the fuse on the battery wire. 3. Is the mic wire connected in the main control box? 4. Make sure the mic volume is turned up.
Sound only comes out of one speaker	1. Make sure both speaker wires are plugged into the speaker jacks on the wiring. 2. Are the speaker wires connected inside the main control box?
Audio Source Problems	
No sound from audio source	1. Are there fresh batteries in the MP3/CD player? 2. Is the Master Volume knob turned up enough? 3. Make sure the audio wire to the main control box is plugged all the way in to the player.
Poor sound quality from audio source	1. Check battery voltage. Recharge or replace the battery.
Eyelid(s)	
Both not moving	1. Is the wire harness up to the head connected well.
One not moving	1. Is eyelid servo wire disconnected in head? Reconnect. 2. If you hear motor but no movement: Either eyelid linkage rod is loose or the servo is bad. Tighten linkage or replace servo.
Fan	
No fan operation	1. Turn the fan mode to on with the palm control. 2. Turning the costume power on and back on will reset the defaults to fan on. 3. Check wires from the fan back to the control module to try to find a broken wire.

Main Control Box

Power On/Off

Power Connection from Battery
Blk/Red- Audio Section
Blk/Red-Digital Section

Power LED
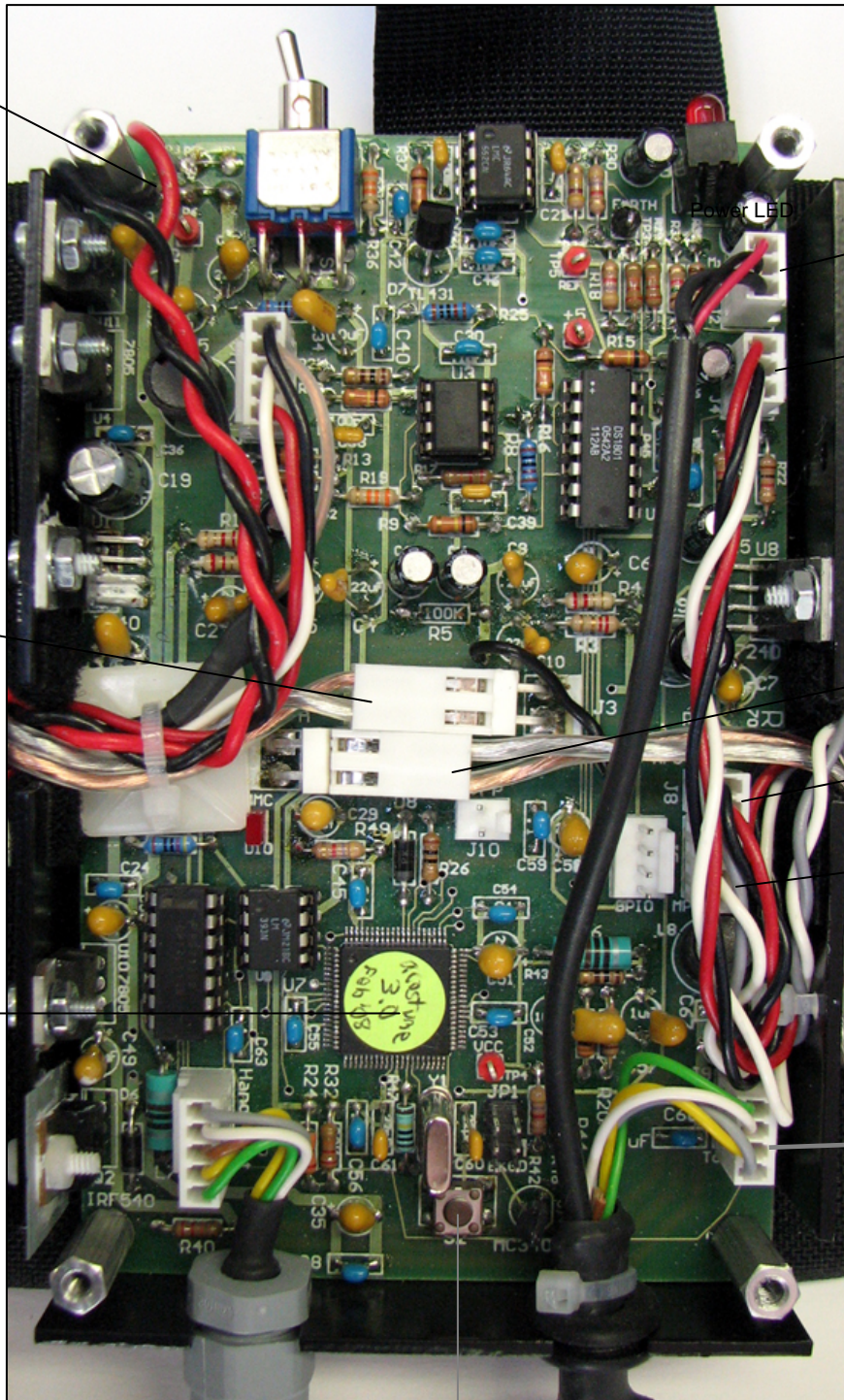
Mic Input
Red-audio +
Blk- audio –
Shield

MP3/Audio Input
Optional

Speaker Wires

Speaker Wires

MP3 Power 5V
Red/Blk

MP3 Signal
Gray/White

Processor Chip

Signal to Head

Palm Control
Connection

Reset

Head Wire
Connection

Head Inside View

Microphone

Strap Adjustments

Strap Adjustments

Foam Insert Pads can be
removed for cleaning
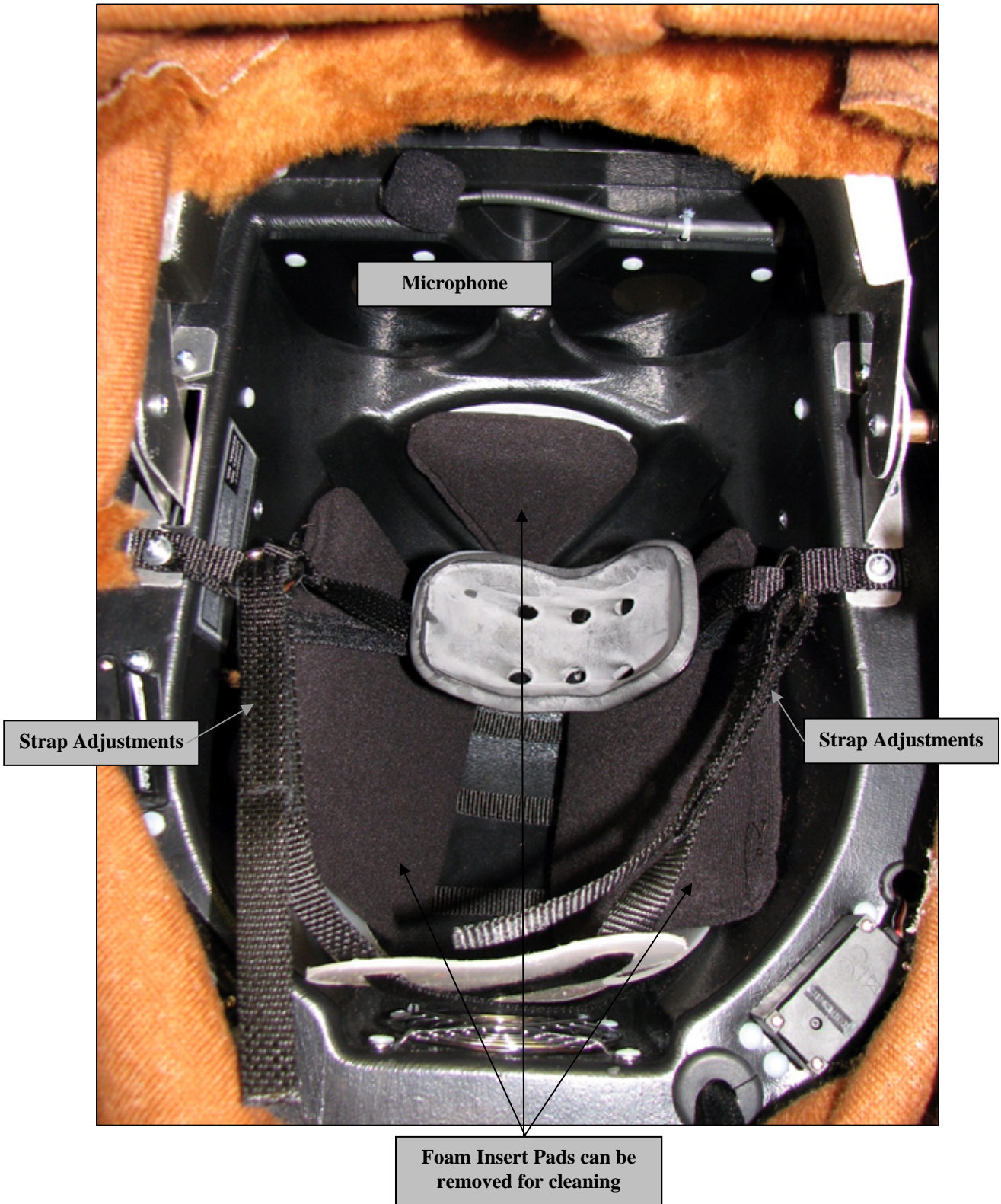
Internal Head Electronics/Mechanics

Eye and Mouth
Servo Board

Left Eyelid Servo
Arm

Right Eyelid Servo
Arm

Left Eyelid Servo

Right Eyelid Servo

Mouth Mechanics
and Linkage

Mouth Servo – Servo Arm - Rod

Back of Head
X Cover

9 Pin Connector Pinout

1 Gray Gnd Servo	2 Green +12V	3 White Signal
4 Yellow Gnd fan	5 Black Mic -	6 Red Mic +
7	8	9 Shield Mic
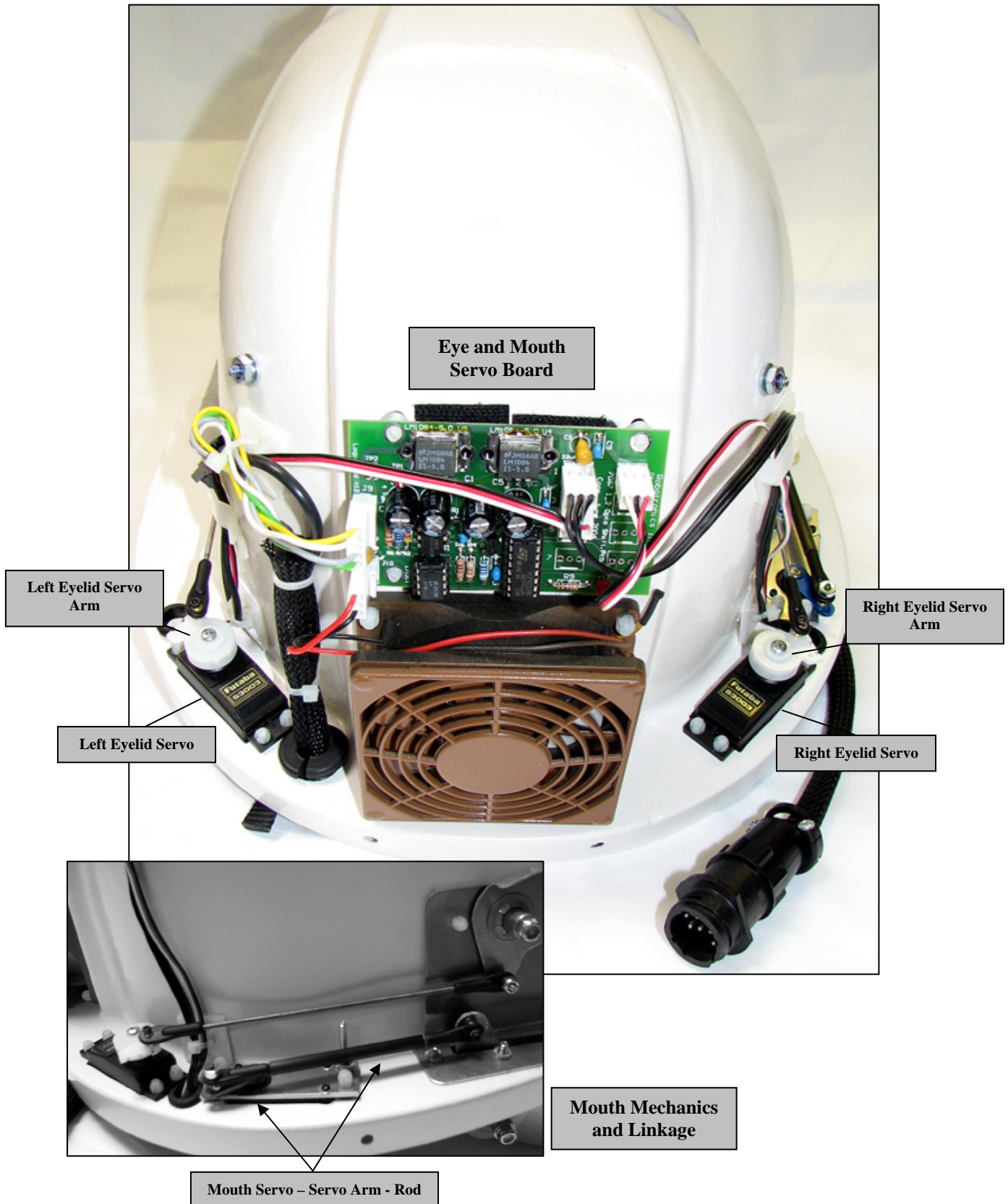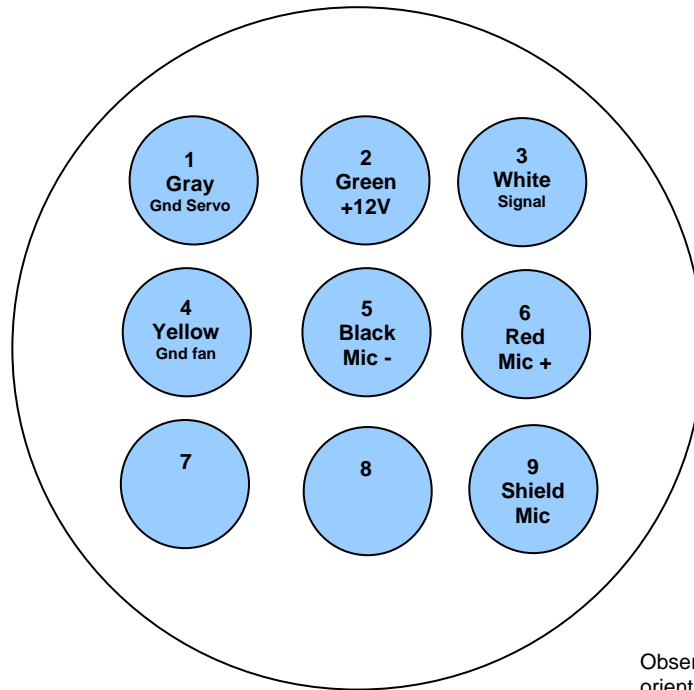
Observe Pin numbers not orientation.

Servo Board Wires-Gray, Green, White, and Yellow
Green - +12V
Yellow - Gnd to fan
Gray Gnd- for servo board
White- Signal

Mic Wire- Red, Black, and Shield

Ring

Turn the ring only when connecting or disconnecting.